

WIP: Bingo! Gamification to Promote Course Community, Engagement, and Instructor Rapport in a BME Course

Rachel Childers

Rachel Childers, PhD is an Associate Professor of Practice at The Ohio State University. She teaches hands on courses in Biomedical Engineering including laboratory courses. Her scholarly interests are in curriculum development, DEI, gamification to promote learning, and cost-effective medical technologies.

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Introduction: Some challenges of teaching that have been exacerbated during the COVID-19 pandemic are building course community and establishing instructor-student rapport [1]. Building rapport between students and faculty is especially difficult in lecture-style courses and in courses with large enrollment size. Student-instructor rapport has been shown to be an important factor in learning at the university level and has been able to predict student outcomes, specifically grades [2]. Student-instructor rapport can increase student motivation, student enjoyment of the material, and class attendance [3]. Rapport is increased when an instructor is open, engaged, and caring.

One thing that helps to build rapport between students and instructors is if the instructor learns and uses students' given name. Teachers that do not learn names may seem unapproachable. Learning and using students' names in class has been shown to help build classroom community by promoting relationships between the instructor and student but also between other students when they hear each other's names [4], [5]. The use of names by the instructor is a message of respect, that the student is a valuable part of the class, and recognizes them as individuals [6], [7]. Using names helps students feel more comfortable in the course which can increase student engagement [5].

Student engagement has been a target of interest for many forms of gamification in higher education, and is increasingly being used to increase student engagement and motivation [8]. Gamification uses aspects of game design to engage students and motivate action, with the goal of promoting learning. Gamification does not necessarily use an actual game, but rather game design elements such as specific rules, reward systems, rapid feedback, and competitive elements [9]. To address the challenges of building course community and instructor-student rapport, a course Bingo sheet was developed. One impetus of creating the bingo sheet was to help the instructor learn student names. It also had secondary goals of motivating attendance of an 8 am lecture section and to help student development by increasing course and department engagement through gamification.

This paper describes the outcomes of a low-stakes, low time commitment, and easy to implement "bingo sheet". The bingo sheet uses aspects of gamification including rules, goals, and reward to promote learning [8]. The goal of the bingo sheet was to help build instructor-student rapport, encourage course engagement in an early morning class, while promoting professional development and community building in the course.

Methods: Items on the bingo sheet include 16 different items randomly organized in a 4×4 grid. The options are meant to include activities from different categories such as course engagement, professional development, course community, and personal connections (Figure 1). Students were asked to use the bingo sheet to earn an additional attempt at a final project paper. Getting a bingo earned the student the ability to resubmit a final paper after receiving feedback to earn

back up to half the points they miss on their first attempt. Students had ~14 weeks to earn the 4 stamps before they would need to turn it in if they wished to do a paper redo.

During the Fall 2021 semester the bingo sheet was implemented in a mid-sized in-person upper-level course of 55 biomedical engineering students. A survey was provided to students to ask questions about the course, as well as specific questions related to the bingo sheet and their perceptions of their instructor. Questions from an verified Professor-Student Rapport Scale survey instrument [2] were included in the survey, but are not analyzed in this paper due to very poor response rate (8/55 students). This study was approved by the Institutional Review Board.

Analysis of the course outcome effects of the bingo sheet come from record review of students who turned in a completed sheet and those that did not. In addition, a comparison of overall grades from the previous semester Spring 2021, before bingo sheet implementation, are compared. A two-sample, two-sided t-test is used to make comparisons between two groups with an α of 0.05 to find significance.

Add a song to the course playlist	Attend an Engr career fair (& show proof)	Show proof of attending a BME seminar	Volunteer to speak up/ answer in class
Share a picture of your pet/other cute thing	Use a Wednesday Wellness Tip	Attend a department event (& show proof)	Add a picture/drawing to the course wall
Meet someone new in BME	Post a BME meme on the course wall	Add a haiku about course content to the wall	Share picture of your hobby
Point out a typo in course materials	Provide a game recommendation	Attend Prof's student hours	Show proof of attending a BMES chapter meeting

Figure 1: Example Bingo Sheet

Results: Learning Names: Students were asked to write their names on top of the bingo sheet, which served as a covert way to check the instructor's memory of names when they acquired a stamp. Even by the 4th or 5th week, not all students may have acquired a stamp, but in each semester this bingo sheet was implemented, it helped the instructor confidently learn almost all the students' names. In addition, to the research that shows the positive effect of an instructor learning students' names, there is a research study that shows that the *perception* that the instructor knows a student's name (by referencing a name tent on the desk in front of a student, for example) is what matters, even when the instructor may not know their name [5]. In survey results, several students remarked in open feedback that the instructor "knowing everyone's name"... "after the first week of class" helped them feel supported in the class.

Instructor-Student Rapport: One of the possible benefits of this activity is to facilitate instructor-student interactions and to help build rapport and relationships between the instructor and students in a relatively large lecture style course (this course ranges from 36 to 72 students) during the pandemic. Interacting with students to give stamps provided an easy opportunity for the instructor to share small details with the student and to have quick conversations throughout the semester. This activity might not be as effective for building rapport if the instructor does not also share back with the students. In open-ended response, one student said "I think it is a great option to explore various activities outside of the classroom and sharing them amongst classmates and professor allows for bonding and networking, as well as benefiting the student academically in the long run."

Benefits to student: The open-ended feedback about the bingo activity was almost entirely positive. Students reported enjoying the activity as well as the ability to earn a redo on the project report. When asked what students thought about the bingo sheet in an open response question, respondents in the survey described how this sheet motivated them to seek opportunities outside of the class within the department. One student said “Great way to get students engaged in the BME department and class”. Other students mentioned appreciating the reward of being able to redo the final project.

Comparing students that completed the bingo sheet (36 out of 55 students) and students that did not, in the same semester, students who completed the sheet had a higher overall course grade (Fig. 2A, $p=0.0005$). This may not be surprising since the reward for completing the bingo was a second attempt on the project paper for up to half the points back (which was used by 23 out of 36 students that turned in the sheet). Overall grades before the redo papers were also compared (Fig. 2B). Even without the grade increase from the paper redo, students that submitted the bingo sheet had statistically higher ($p=0.0157$) overall grades than students that did not submit the sheet (Fig. 2B). This suggests students that were already engaging well in the course were more likely to be the ones that use the bingo sheet.

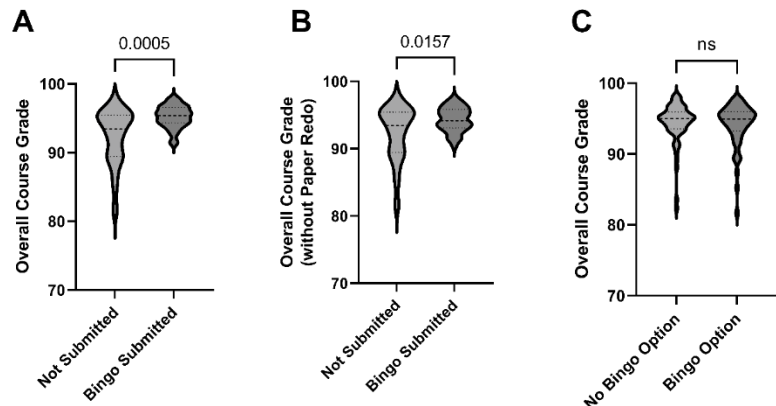


Figure 2: (A) Overall course grades for students who submitted a bingo sheet and those that did not. (B) Overall course grades before redo paper grades were factored in for students that submitted a bingo sheet and those that did not. (C) Overall course grades with and without bingo as an option.

To see if the bingo sheet might increase learning outcomes, overall grades were compared between a semester where the bingo sheet was utilized and the previous semester where bingo sheets were not utilized (Fig. 2C). In the semester where bingo sheets were not utilized, students did not need to earn a paper redo. There was no difference ($p=0.6$) in the overall course grades of students where the bingo sheet was utilized and the semester where it was not utilized (Fig. 2C). This suggests the higher grades in students that submitted bingo sheets might be from students that are already highly engaged and motivated. The fact that grades were not different between students also suggests that requiring a bingo to earn a paper redo likely did not hinder students from being able to do the redo.

Conclusions: The bingo sheet provided benefits to the instructor such as easy icebreakers to initiate conversations with students. It also greatly aided in learning students’ names in a mid-sized course where face masks were required throughout each semester. Further data is needed to be able to measure if professor-student rapport was measurably affected by the activity.

Free responses from students showed that students enjoyed the activity to encourage instructor-student interactions and course/department community. It is not clear if the bingo sheet results in additional learning gains since it may have only been utilized by students already highly engaged and motivated. However, the potential positive impacts of motivating students to seek out networking, professional development opportunities, and course community are still beneficial.

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