Two Types of Educational Apps for In-Person and Remote Learning: Student Perceptions and Learning Outcome

Fang Zhao
California State University, Chico

This study examines students' feedback on using different educational apps and the relationship between their perceptions and learning outcomes. Two educational apps, each typical of a distinct category (gamification apps and standard apps), were used for in-class exercises in both in-person and online accounting courses. Student feedback was collected at the end of the semester. The results indicate that students have varying preferences for educational apps, with each app featuring characteristics that cater to students' needs. However, these preferences are not associated with learning outcomes. Additional analysis reveals that students who more strongly agree that using the gamification app for in-class exercises helps them review course materials demonstrate better course performance. This study provides insights for instructors to effectively implement different educational apps to enhance student engagement in both in-person and remote courses, thereby improving teaching practices in higher education.

Keywords: educational apps, in-person learning, remote learning, engagement, gamification

INTRODUCTION

Educational apps have been extensively used to engage students in classrooms. With increasing flexibility in course delivery modes, these apps can be utilized in in-person and remote courses. While prior studies have examined the effects of educational apps on student learning, few have investigated students' feedback on using different educational apps and the relationship between their perceptions and learning outcomes across various course modalities. Understanding students' feedback on different apps helps instructors effectively utilize these tools to engage students and enhance learning experiences.

This study examines students' feedback on using different educational apps in in-person and remote courses and the relationship between their perceptions and learning outcomes. Two educational apps are examined: a typical standard app with a straightforward interface and a gamification app with game and competition features. These apps are used for in-class exercises in both in-person and remote courses.

The results show that students have different preferences for each type of educational app, but these preferences are not associated with their learning outcomes. In-person and remote students provide different feedback on certain aspects of the apps. Comments preferring the standard app due to it being "less competitive," "more anonymous," and "more comfortable" all come from in-person students, indicating that these students don't enjoy the pressure posed by in-class competition. Conversely, comments including "engaging" or "engaged" are predominantly from remote students and mostly about the gamification app, suggesting that learning engagement is more important for remote students, who appreciate tools and efforts that enhance their class engagement.

Additional analysis indicates that students who more strongly agree that "doing in-class exercises using the gamification app helps them review the course materials" have better course performance. Further analysis reveals that in-person students drive this positive and significant association.

This study makes several contributions. First, it compares two educational apps, each representative of a distinct type (standard apps and gamification apps), and summarizes the differences between their features. Prior studies often treat interactive educational apps as homogeneous, referring to them broadly as either educational apps or gamification apps. This study differentiates between apps with and without gamification features and examines the differences in students' feedback on using these apps for in-class exercises. Second, it compares feedback from students in in-person and remote courses, revealing different perceptions between students in different course modalities. Third, it examines the association between students' feedback on using different apps and their learning outcomes.

This paper provides insights for college instructors to effectively apply educational apps to enhance student engagement and facilitate both in-person and remote learning, thus improving teaching practices in higher education.

The following sections review related literature, summarize the similarities and differences between the apps, describe the sample, report the results, and conclude the study.

LITERATURE REVIEW

Standard Apps (Apps With a Straightforward Interface)

Standard apps have been widely applied in classrooms and positively impacted student learning. Coca and Slisko (2013) conduct an initial feasibility study with prospective teachers on applying a standard app in physics classes, finding that this app helps teachers achieve learning goals. Wash (2014) describe how to engage students using a standard app in class and show that students have positive attitudes towards its use. Kaya and Balta (2016) find that a standard app helps improve student engagement in English classrooms. Manning et al. (2017) discuss integrating technology to teach millennial students and provide a conceptual framework for introducing Socrative and Twitter into sports management classrooms. Guarascio et al. (2017) compare a standard app with traditional student response systems and find that students perceive the standard app as more helpful in learning. Kokina and Juras (2017) describe applying a standard app in a managerial accounting classroom and provide suggestions for its effective application. Beyond in-class exercises, standard apps can also be used as homework platforms. Balta et al. (2018) find that using a standard homework app significantly correlates with students' final exam scores.

Gamification Apps (Apps With Game and Competition Features)

MacNamara and Murphy (2017) introduce gamification apps as educational tools that apply the concept of gamification. Boulden et al. (2017) use a gamification app alongside other educational apps to help students recognize the differences between productive and nonproductive questions. Gamification apps have also been successfully implemented in flipped class lectures (Porcaro et al. 2016; Dayal et al. 2016). Several studies find that gamification apps have a positive impact on student engagement. For example, Hamilton-Hankins (2017), Suo et al. (2018), and Zhao (2019) all report increased student engagement when using gamification apps in various educational settings.

While both types of apps have shown positive effects on student learning and engagement, there is a need for more comparative studies to understand the specific benefits and limitations of each app type across different course modalities and subject areas.

This study fills several gaps in the existing literature. First, it directly compares standard apps and gamification apps, providing insights into their distinct features and impacts on student learning. Second, it examines these apps' effectiveness across different course modalities (in-person and remote), an area that has received limited attention in previous research. Finally, this study investigates the relationship between students' perceptions of these apps and their learning outcomes, offering a more comprehensive understanding of how educational apps influence the learning process. This research contributes to a more nuanced understanding of educational app use in higher education by addressing these aspects.

COMPARASION BETWEEN A STANDARD APP AND A GAMIFICATION APP

The standard app (Socrative) and the gamification app (Quizizz) used in this study share several similarities. Both are comparable to iClicker systems when used as in-class interactive tools. Neither requires registration or account creation, allowing students to use them directly on websites or as downloadable apps. They are compatible with various electronic devices and provide immediate feedback after students submit their answers. Both apps can be utilized for in-class exercises, quizzes, tests, and homework. Instructors can print questions and download reports of students' performance after exercises are completed. Both platforms allow instructors to design questions, including multiple-choice, true/false, and open-ended questions. Additionally, they can be used for synchronous in-class exercises or asynchronous homework assignments.

The main differences between the two apps lie in their features and functionality. The standard app lacks certain elements in the gamification app, such as avatars, memes, music, and bonus game points. A key distinction is the competition aspect: the gamification app allows students to compete with each other during exercises by displaying their live ranking on a leaderboard, while the standard app does not offer this feature. In the standard app, student rankings are only visible to the instructor after completing each exercise. Furthermore, the apps differ in their review functions, print options, customization and teamwork features. These distinctions highlight the unique characteristics of each app type, potentially influencing their effectiveness in different learning environments and for various educational objectives. Table 1 summarizes the similarities and differences between the two apps used in this study.

TABLE 1
COMPARISON BETWEEN THE GAMIFICATION APP AND THE STANDARD APP

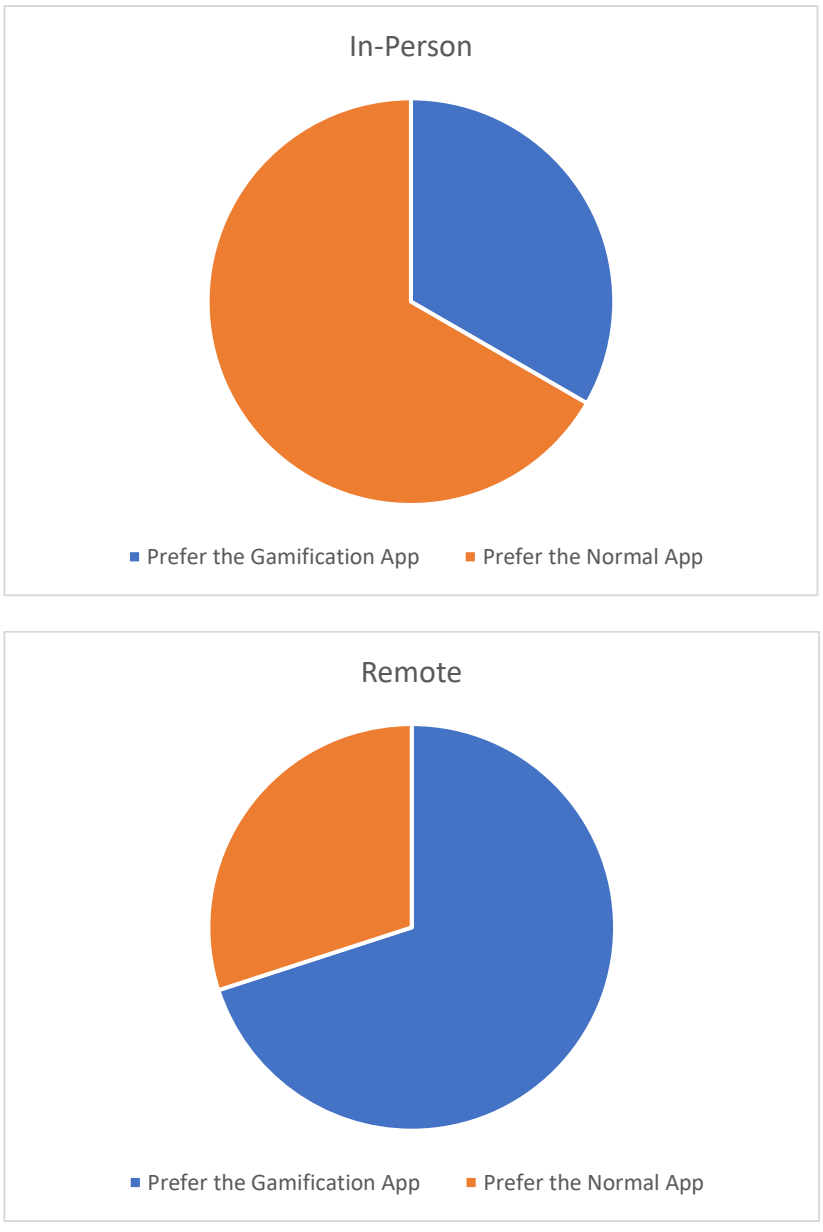
Feature	Gamification App (Quizizz)	Standard App (Socrative)
Similarities		
Access	No registration required, accessible via website or app	No registration required, accessible via website or app
Device Compatibility	All electronic devices	All electronic devices
Feedback	Immediate feedback after submission	Immediate feedback after submission
Usage	In-class exercises, quizzes, tests, survey, homework	In-class exercises, quizzes, tests, survey, homework
Instructor Tools	Print questions, download performance reports	Print questions, download performance reports
Question Types	Multiple choice, true/false, open-ended	Multiple choice, true/false, open-ended
Synchronicity	Synchronous (in-class) and asynchronous (homework)	Synchronous (in-class) and asynchronous (homework)
Differences		
Gamification Elements	Avatars, memes, music, bonus game points	None
Competition Feature	Live leaderboard during exercises	No live competition (unless working in groups)
Student Ranking	Visible to students in real-time	Only visible to instructor after exercise
Review Function	Extensive review options	Limited review options
Print Options	More flexible printing options	Basic printing options
Customization	More customization options	Fewer customization options
Teamwork Features	None	Teamwork features

SAMPLE AND DESCRIPTIVE STATISTICS

The sample consists of undergraduate students attending a public university in the United States. Two educational apps (Socrative and Quizizz), each typical of a distinct category (standard apps and gamification apps), were applied in both in-person and online accounting courses taught by the same instructor. Surveys using a 5-point Likert scale were conducted at the end of the semester (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 =strongly disagree)

A total of 111 students participated in the study, with 71 students from in-person courses and 40 students from remote courses. As illustrated in Figure 1, students in the in-person courses show a stronger preference for the standard app over the gamification app. In contrast, the opposite trend is observed in the remote courses.

FIGURE 1
APP PREFERENCE FOR IN-PERSON AND REMOTE STUDENTS



RESULTS

Survey Responses

Table 2 presents the summary statistics of the survey questions (Questions 3-8). Questions 1-2, which inquire about students' preferences and reasons for those preferences, were not answered using the Likert scale and are therefore not included in this analysis.

TABLE 2
SURVEY RESULTS

Panel A

Questions	Mean	Median	Std.Dev	Q1	Q3
Q3: To what extent do you think the normal app is effective to improve class engagement	4.26	4.00	0.58	4.00	5.00
Q4: To what extent do you think the gamification app is effective to improve class engagement	4.21	4.00	0.73	4.00	5.00
Q5: Doing in-class exercises using the normal app helps me review course materials	4.19	4.00	0.75	4.00	5.00
Q6: Doing in-class exercises using the gamification app helps me review course materials	4.13	4.00	0.85	4.00	5.00
Q7: Doing in-class exercises using the normal app is fun	3.87	4.00	0.81	3.00	4.00
Q8: Doing in-class exercise using the gamification app is fun	4.19	4.00	0.75	4.00	5.00

Panel B

Questions	Mean In-Person	Mean Online	Diff (t-value)
Q3: To what extent do you think the normal app is effective to improve class engagement	4.33	4.10	0.23 (1.06)
Q4: To what extent do you think the gamification app is effective to improve class engagement	4.11	4.40	-0.29 (-1.04)
Q5: Doing in-class exercises using the normal app helps me review course materials	4.19	4.20	-0.01 (-0.03)
Q6: Doing in-class exercises using the gamification app helps me review course materials	4.05	4.30	-0.25 (-0.77)
Q7: Doing in-class exercises using the normal app is fun	4.05	3.50	0.55 (1.84)*
Q8: Doing in-class exercise using the gamification app is fun	4.19	4.20	-0.01 (-0.03)

As shown in Panel A, students generally agree or strongly agree that both the standard app and the gamification app effectively improve class engagement. They also concur that both apps help them review course materials. While students agree or strongly agree that using the gamification app for in-class exercises is fun, they express less enthusiasm about the standard app. The mean response to question 7 is 3.87, while the mean responses to other questions all exceed 4.

Panel B compares survey responses between the in-person and remote sub-samples. The two groups show similar responses to most survey questions, with a notable exception in question 7, which asks about the level of agreement with the statement, "Doing in-class exercises using the standard app is fun." A significant difference emerges between in-person and remote students, with remote students expressing less agreement. This disparity could be attributed to the different contexts in which these student groups use the apps. For in-person students, the standard app provides an electronic platform distinct from their physical classroom environment, potentially making it more engaging. In contrast, remote students, already accustomed to screen-based interactions, may find the standard app less novel or exciting, as it closely resembles their usual class format.

Furthermore, both in-person and remote students show similar levels of agreement regarding the fun aspect of using the gamification app for in-class exercises. This suggests that the gamification features provide additional entertainment value that transcends the course delivery mode, appealing equally to students in both in-person and remote settings. The gamification elements appear to offer engaging experiences that are not inherent in either the traditional classroom or standard online learning environments.

Reasons for App Preference

In addition to the agreement scale, students participating in the survey were asked to indicate which app they prefer and provide reasons for their preference. The following comments highlight students' diverse perspectives regarding the two educational apps.

Reasons for Preferring the Gamification App (Quizizz)

"The music, presentation, and overall vibes are better."
"There is a competitive aspect that I think the normal app lacks."
"It is a more enjoyable platform."
"The game style quiz with powerups and leaderboard to compete with others"
"Easier format"
"The interface for the gamification app is a lot easier to navigate through and also the way it is setup makes it enjoyable to interact."
"It supports self-paced learning, enabling students to work at their own speed and convenience. It is also very engaging as well!"
"The game felt more engaging."
"It gives more option to take quiz at my own pace, very interactive"
"I like how it's more game-like. It's more fun and captures my attention especially because it is timed."
"The website interface is more engaging, and the metrics show to professor can show them where we are struggling"
"I liked how engaged it made me and it was very handy to be able to use it on my phone."

Reasons for Preferring the Standard App (Socrative)

"I like the format more and the way results are displayed."
"I like the layout more."
"It just makes me feel comfortable."
"Less competitive, more anonymous."
"The normal app feels more about the material, and gamification app feels more competitive. A kind of game-like competitiveness. Not the good kind either."
"It has a better layout."

"I like how it is structured and ease of logging in and using the platform."
"It didn't show our names and took a little pressure off me"
"The simpler format makes it easier to understand (less music, pictures, etc.)"
"I believe it is more engaging to use"
"I think the interface is more user-friendly."
"It's more about answering the questions correctly rather than answering the questions quickly."

Discussion

Based on students' responses, preferences for the gamification app and the standard app are divided, with each app appealing to different student needs and preferences. Students who prefer the gamification app cite its game and competition features as key attractions. They describe it as fun, engaging, and enjoyable. On the other hand, those who favor the standard app appreciate its layout, simple format, and user-friendly interface. These students often dislike competition and value the app's anonymity feature, which they find less stressful. There is no clear dominant preference for either app, suggesting that each has merits suitable for different students. The choice seems to depend on individual preferences, with those who enjoy competition gravitating towards the gamification app, while those who prefer an anonymous environment opt for the standard app.

Notably, comments about preferring the standard app for being "less competitive," "more anonymous," "more comfortable," and taking "a little pressure off" predominantly come from in-person students. This could be attributed to the inherent pressure of participating in in-class exercises in a physical classroom setting, leading these students to avoid additional stress from competition. Remote students, however, may not experience the same stress level during in-class exercises. Interestingly, most comments mentioning "engaging" or "engaged" are from remote students, with most referring to the gamification app. This trend might reflect the greater challenge of engaging students in remote courses compared to in-person classes, leading remote students to particularly appreciate tools and efforts that enhance their engagement.

Additional Analysis

Table 3 presents the regression analysis results, using final course grades as the dependent variable and survey question responses as independent variables.

TALBE 3
SURVEY RESPONSES AND COURSE PERFORMANCE

	Whole Sample Dependent Variable= Course Performance		**In-Person Sub-Sample Dependent Variable= Course Performance**	
	Coefficient	t value	Coefficient	t value
Q3	-2.741	-0.70	-1.216	-0.21
Q4	2.788	0.86	1.825	0.35
Q5	3.967	1.41	4.661	1.37
Q6	5.250	2.21**	8.048	2.66**
Q7	-1.516	-0.80	-4.615	-1.37
Q8	-3.898	-1.52	-4.502	-1.02
Intercept	79.775	6.60***	78.907	4.77***
Adjusted R^2	44.26%		62.43%	

The coefficient of question 6 ("Indicate your level of agreement: doing in-class exercises using the gamification app helps me review course materials") is positive and significant. This indicates that students who more strongly agree that the gamification app helps them review course materials perform better in the course. This positive correlation remains consistent when analyzing the entire sample and the sub-sample

of in-person course students. However, for the sub-sample of students taking the remote courses, the coefficient is not significant.

Given that prior studies have found that students' gender can influence learning outcomes, an additional set of regression analyses was conducted, incorporating student gender as a control variable. The results are reported in Table 4.

TABLE 4
SURVEY RESPONSES, GENDER AND COURSE PERFORMANCE

	Whole Sample Dependent Variable= Course Performance		**In-Person Sub-Sample Dependent Variable= Course Performance**	
	Coefficient	t value	Coefficient	t value
Q3	-3.416	-0.84	-4.468	-0.67
Q4	2.738	0.84	4.851	0.79
Q5	3.528	1.21	4.003	1.15
Q6	5.606	2.29**	7.936	2.62**
Q7	-1.062	-0.53	-4.065	-1.19
Q8	-3.564	-1.35	-6.081	-1.29
Female	2.066	0.72	4.261	0.96
Intercept	78.932	6.43***	86.018	4.74***
Adjusted R^2	43.01%		62.19%	

The table shows that the positive and significant correlation between course performance and responses to question 6 persists even after controlling for student gender. This suggests that the relationship between perceived usefulness of the gamification app for course material review and academic performance is robust, independent of gender influences.

These findings highlight the potential benefits of using gamification apps, particularly in in-person learning environments, and underscore the importance of students' perceptions of educational tools about their academic performance.

CONCLUSION

This study investigates students' feedback on using two educational apps (Socrative and Quizizz), each representative of a distinct category: standard apps and gamification apps. The standard app category features a straightforward interface that provides an interactive platform for students to answer questions on electronic devices. The gamification app category offers the same platform, including gamification and competition features.

Survey results indicate mixed preferences among students for these two apps (55% prefer the standard app and 45% prefer the gamification app), with no correlation between preference and course performance. Students in both in-person and online courses agree or strongly agree that both apps effectively improve class engagement and help them review course materials. They also concur that using the gamification app for in-class exercises is fun.

However, opinions diverge regarding the enjoyment of using the standard app for in-class exercises, with in-person students expressing more agreement than online students. Notably, comments preferring the standard app for being "less competitive," "more anonymous," and "more comfortable" predominantly come from in-person students, suggesting they may not enjoy the additional pressure of in-class competition.

Interestingly, most comments including “engaging” or “engaged” are from remote students, primarily about the gamification app. This indicates that learning engagement may be more critical for remote students, who appreciate tools and efforts that enhance their class participation.

Regression analysis reveals a positive correlation between students’ course performance and their level of agreement with the statement that using the gamification app for in-class exercises helps review course materials. In-person students primarily drive this result and remains consistent after controlling for gender.

Overall, this study provides valuable insights for instructors to effectively implement educational apps in both in-person and online courses, contributing to improved teaching and learning practices in higher education.

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