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iClicker boosts academic performance in a moderately-sized Economics course

Macmillan Learning partnered with a Microeconomics instructor at Lorain County Community College to explore iClicker use and evaluate how it is related to instructor and student outcomes

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About iClicker

iClicker is built on the science of active learning. A synthesis of educational research in the areas of effective active learning, formative assessment, and interactive learning guided the development of iClicker. With its simple, reliable technology and focus on pedagogical content, iClicker makes it possible for instructors to take attendance, engage students in all sized classrooms and lecture halls, and use the students' responses to decide which topics to emphasize.

iClicker is a flexible solution that can adapt to an instructor's pedagogical approach. A 2017 implementation study identified the "engagement model" as one of the most often implemented approaches. In this model instructors write their own iClicker questions, pose the question to the class and ask them to respond. Responses are used to gauge understanding and spark classroom discussion. Students receive credit for participating in the iClicker activity and in some cases the responses are marked as correct or incorrect. The goal of this model is to increase comprehension and understanding through engagement.

Institution and course context

Lorain County Community College is a community college offering associate, bachelor's, and master's degrees in person and online. The institution serves over 11,500 students with one main campus in Elyria, Ohio, and three learning centers. This Principles of Macroeconomics class was taught face-to-face to 45 students. Students met twice a week and were expected to keep up with their reading and assignments throughout the week. The instructor has been teaching for 12 years and has been teaching in this specific department for four years. The instructor has used digital learning tools in the past and has been extremely comfortable implementing them.

Course challenges and goals

Initially, Lorain County Community College received a grant, and iClicker remotes were acquired as part of that grant, allowing this instructor to implement iClicker into the classroom. This instructor reported using iClicker to increase effort and engagement within the classroom and to support students' ability to test their understanding. The instructor upgraded to newer versions of the iClicker remote and transitioned to using iClicker Reef so that students can access iClicker from their mobile devices.

iClicker use case

The instructor used iClicker Reef to track student participation. Students received one point per class session for answering iClicker questions (used as a proxy for

"Students like that it breaks up the lecture and they can discuss with one another what the answer might be."

- Instructor

being present in the class lecture), and they earned a second point per class session if they answered at least 75% of the iClicker questions correctly. The combination of iClicker participation and performance accounted for approximately 5% of the students' overall course grade. The instructor implemented iClicker questions in 89% (26 out of 29) of the class sessions, with a total of 367 questions asked over the course of the semester. Seventy-eight percent of the questions were multiple-choice, 2% were short answer, and 20% were numerical.

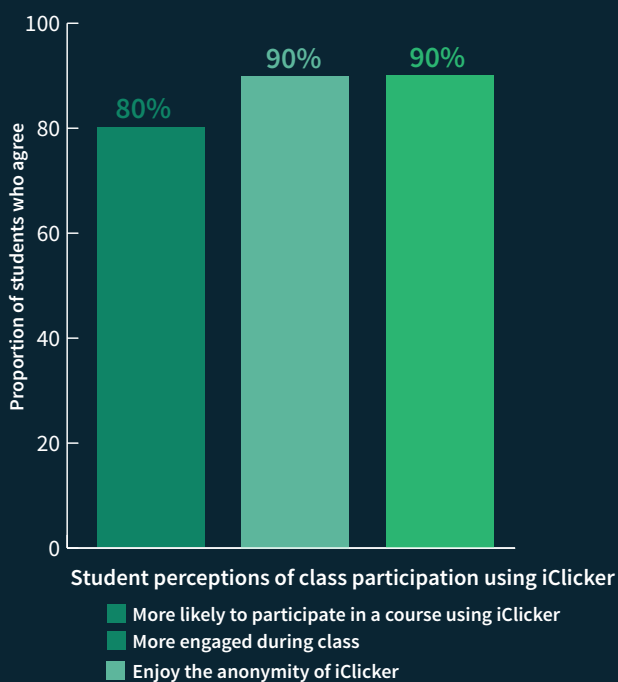### Figure 1. Student perceptions of using iClicker
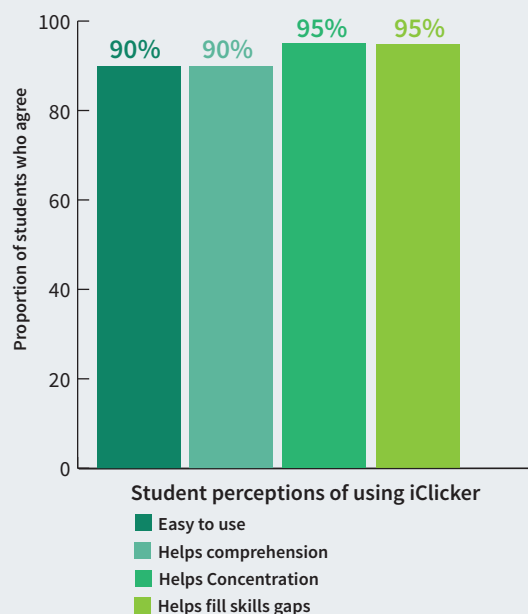
90% of students in the study reported that iClicker is easy to use, 90% said that the immediate feedback they receive helps them better comprehend the coures material. 95% of students say that using iClicker helped them concentrate in class and 95% say that using iClicker in class helps them fill their skills gaps

iClicker Reef supports student participation and engagement.

Both the instructor and students reported that iClicker Reef increased student participation in class. Eighty percent of students said they were more likely to participate in a class that uses iClicker Reef than a class where they must raise their hand to participate. Ninety percent of students said they enjoyed the anonymity iClicker provides. In addition to the students, the instructor felt that the use of iClicker within the classroom increased student participation.

Ninety percent of students reported that they were more engaged in class material because they used iClicker Reef. Students rated their overall engagement levels as higher than average (4.45 on a 5-point scale). Students were asked to share their favorite iClicker feature in an open-ended question, and several students said they enjoyed answering questions with iClicker. Students also reported that iClicker helped them see how other students answered questions and that iClicker encourages engagement and participation in the classroom. The instructor reported that the primary goal for using iClicker was to engage students, allow them to practice, and test their understanding of the material.

> "iClicker REEF is an interactive quizzing system that encourages students to think and react quickly. It allows students like myself, test their own abilities and learned knowledge of the course. "
>
> *-Student*

iClicker Reef is related to student academic performance.

There was a moderate but positive relationship (.371) between the number of iClicker questions students answered correctly and their performance in the course. Students who answered more iClicker questions correctly tended to have a higher overall course grade. Conversely, students who answered fewer questions correctly tended to have lower course performance. There was also a positive relationship (.367) between the mean percentage of iClicker questions answered correctly over the course of the semester and student performance.

These results, taken together with the qualitative findings that iClicker influences participation and engagement suggest that increased use of iClicker will support student success.

Figure 2. Student perceptions of class participation using iClicker

Student perceptions of class participation using iClicker

- More likely to participate in a course using iClicker
- More engaged during class
- Enjoy the anonymity of iClicker

Figure 3. Relationship between number of iClicker questions answered and final course grades
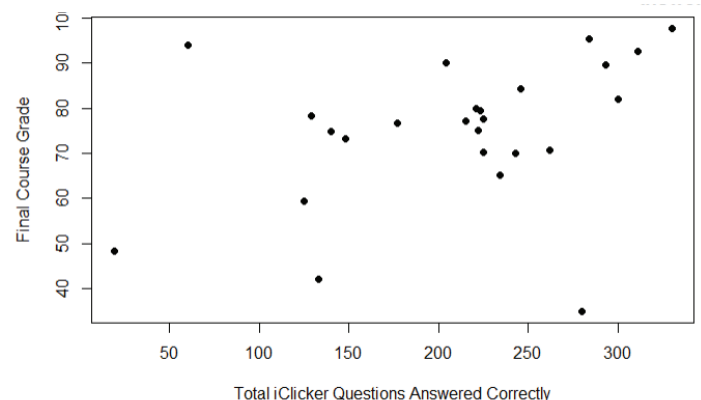
Insights for Optimization

The instructor has provided insightful feedback on several features to integrate into iClicker Reef. For example, iClicker previously offered roll call registration, which the instructor suggests would be valuable to still have. It is possible that the new attendance feature will support this instructor's suggestion. Nevertheless, the helpful feedback has generated recommendations for the iClicker Reef product team.

Insights for Instructors

One of the most critical findings from this educator study is the moderate positive relationship between the amount of iClicker questions answered and student course performance. As students participate more in the lecture by answering the instructor's iClicker questions, student course performance tends to increase. Students believe that use of iClicker increases their active participation and concentration during lessons and felt more engaged throughout the class. Students believe iClicker helped them better understand the material. Therefore, instructors in similar educational contexts might consider increasing the number of iClicker questions presented in class to increase overall student performance.

Study design

The study examined whether use of iClicker Reef was related to student outcomes, including learning, course completion, engagement, and satisfaction. In addition, information about instructor and student perceptions of iClicker Reef was gathered. iClicker usage was documented through platform data along with mid-semester observations of classroom implementation and instructor interviews. Student learning data were collected at the end of the semester via course records shared by the instructor. End-of-semester surveys were used to gather data on instructor and student perceptions of the product along with student engagement. Data were matched across sources, and descriptive and correlational analyses were conducted.

Study limitations

Although the data are rich and the findings important for product optimization and insights for instructors, they are specific to this course and cannot be generalized to all instructors who use iClicker Reef. The results are also descriptive and correlational and should not be used to infer causation.

Amplifying the IMPACT

Research on iClicker suggests that trying these strategies may increase the positive impact of iClicker

1. Ask more in-class iClicker questions
this is related to higher final course grades

2. Mark responses as correct or incorrect and incorporate scores into student grades
this drives engagement

3. Share the distribution of results and discuss trends that stand out
this helps to fill skills gaps and correct any misconceptions

4. Explore peer-to-peer discussion of results
this drives engagement and comprehension

Ethics and Data Privacy

Prior to data collection, this study and the associated consent forms and instruments were reviewed and approved (found exempt) by the Human Resources Research Organization (HumRRO). HumRRO is an accredited third-party Institutional Review Board organization with no affiliation with Macmillan Learning. Macmillan Learning seeks third-party review to eliminate any bias in decision of exemption. The data in this study, which are provided by the instructor and consenting students, are initially identifiable. However, once a random identifier is generated identifiable data are destroyed. Data are provided in secure storage locations, and access is permitted only to the primary investigator in the study.

Note: These results are part of a larger iClicker Reef comparison study across multiple institutions. To access the full report and results, please visit http://www.macmillanlearning.com/catalog/page/learningscience.