



Do Clickers Make a Difference?

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Background

Since their introduction, Student Response Systems (clickers) have been hailed as a novel way of engaging students in large classrooms. While our previous research has upheld this argument, we recently conducted an experiment comparing two classes—one with clickers and one without.

Method

We compared two sections of a second semester calculus-based physics course. The instructor taught both in exactly the same manner except the earlier class used clickers.

During the first class, the students were asked multiple choice questions displayed in a PowerPoint presentation and would use clickers to select an answer. The instructor would note how much time was used and then discuss the responses. In the second class, the same questions were displayed for the same amount of time.

If more than 2/3 answered correctly in the clicker class, the instructor would move on. With the corresponding question in the non clicker class, he would ask students to raise their hands to answer the question.

If fewer than 2/3 answered correctly in the clicker class, the students discussed their answers with each other and then answered the question again. In the non clicker class, the same opportunity for discussion was given before they would answer the question by raising their hands.

Data Collection

Data was gathered from test scores. There were two portions to every exam: multiple choice and written problem solving. The scores were collected and the averages between the clicker class and non clicker class were compared via a t-test.

		Test 1		Test 2		Test 3		Test 4		Final		
		MC	PS									
t-test for Equality of Means ¹	t	-0.787	-0.347	-1.832	-0.639	0.518	-1.056	-1.410	1.727	-0.433	-0.732	
	df	65	65	65	65	61	61	67	67	67	67	
	Sig. (p)	0.434	0.730	0.072	0.525	0.606	0.295	0.163	0.089	0.666	0.467	
	Mean Difference	-.03466	-.01637	-.07649	-.02357	.01970	-.04097	-.06031	.07082	-.01629	-.02231	
	Std. Error Diff.	.04406	.04717	.04175	.03690	.03810	.03880	.04277	.04101	.03759	.03049	
	95% Conf. Interval of the Diff.	lower	-.12266	-.11058	-.15988	-.09726	-.05631	-.11855	-.14569	-.01103	-.09133	-.08317
		upper	.05334	.07784	.00690	.05013	.09570	.03661	.02506	.15267	.05874	.03856

The Surprising Answer: No!

The important result of this test is the significance value, or p value. A p value of less than 0.10 indicates that one class outperformed the other with marginal significance. This occurs in two situations: (1) the clicker class performed better on the multiple choice portion of Test 2 ($p = 0.072$) and (2) the non clicker class performed better on the problem solving portion of Test 4 ($p = 0.089$).

A p value of less than 0.05 would mean that there was a statistically significant different between the scores of the classes. This does not happen on any of the tests. The implication is that clickers are not making a difference in test performance.

Why?

The clicker class is pushing a button to answer the questions, but the non clicker class is writing down the question more frequently, according to a course survey. Both of these are engaged learning.

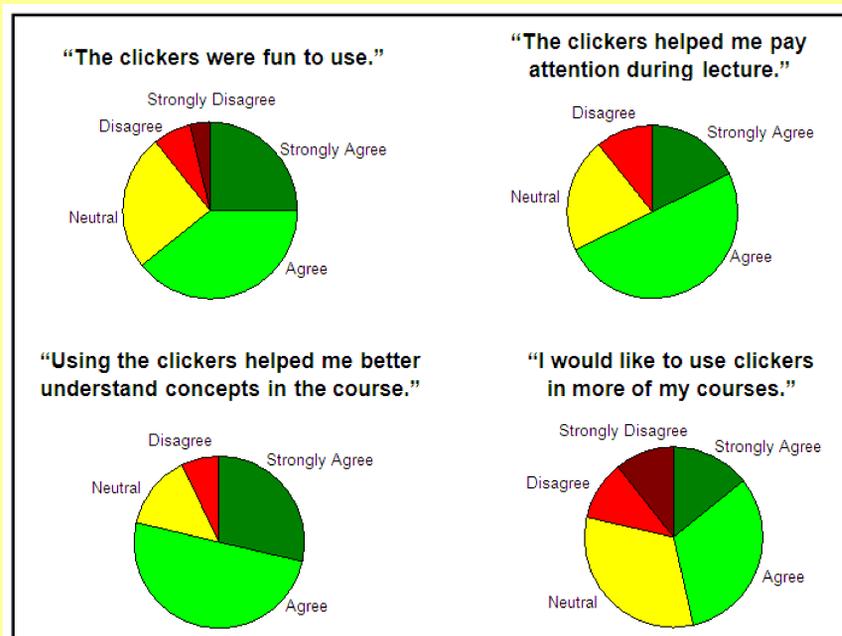
Survey Results – Writing Down Questions

When multiple choice questions were asked in class, I would write them down.

	Clicker class	Non clicker class
Always	0%	25%
Often	4%	22%
Sometimes	21%	19%
Rarely	43%	28%
Never	32%	6%

So Why Use Clickers?

If clickers don't make a difference in test performance, are they still worth using? Yes—students benefit from their use.



Conclusion

Clickers are a great educational tool, but they are not necessary for engaged learning, and while the use of clickers does not make a difference in test performance, students (and instructors) still benefit from their use.

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