

Clickers: Help or Hindrance to Motivating and Engaging Students in Small Non-major Introductory Science Classrooms

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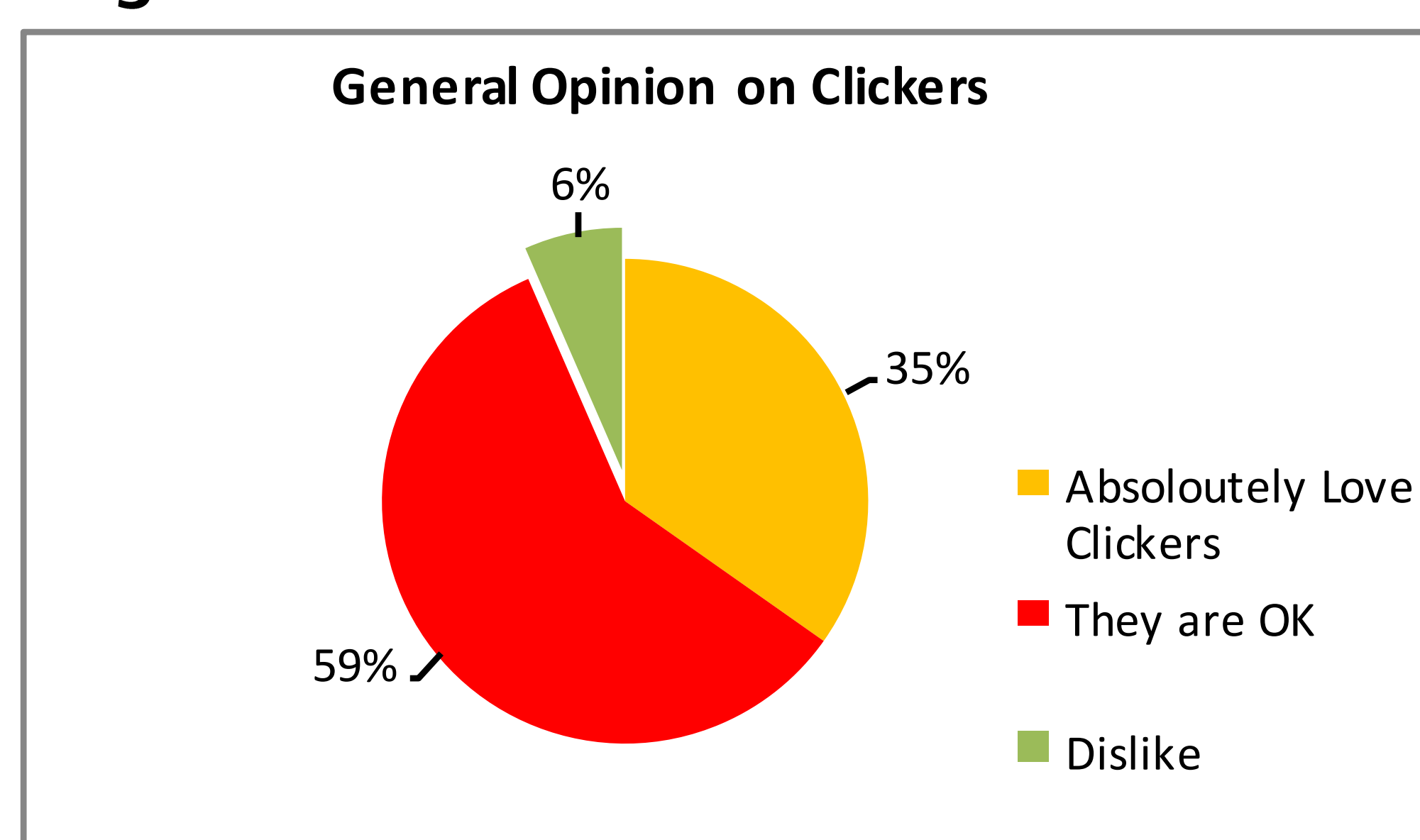
ABSTRACT

Students in core non-major introductory science classes are often apprehensive, unmotivated, and underprepared. This presents significant challenges in their ability to have a positive, meaningful, learning experience. Active learning strategies such as the use of personal response systems or clickers have been shown to be phenomenally successful in stimulating interest and promoting learning in very large classrooms. While the use of personal response systems have been shown to be effective in large classrooms, their effectiveness in smaller science classrooms (n<30) has not been investigated. This study looked at the usefulness of clickers in motivating and engaging students in the small classroom. Are they as effective in smaller classrooms? This study involved students in both core non-major Human Biology or General Biology courses (n<30). Classroom pedagogy primarily included the alternate use of clickers or worksheets, and occasionally other techniques such as videos, group work and discussion were added. Students were given pre- and post-motivation surveys, a mid-semester attitude survey and reflected daily on their level of engagement. The results suggest that although approximately 7% of students disliked clickers, overall their usage engaged and motivated student learning just as well as other active learning strategies proven to be effective in smaller classrooms. Consequently, the use of clickers can stimulate and promote learning regardless of class size – they work as well in small or large classrooms.

INTRODUCTION

Various active learning techniques such as groupwork and discussions have been shown to be effective in small classrooms, leading to improved student learning [1]. Implementation of many of these techniques are more challenging in larger classrooms. Studies have shown that personal response systems or clickers can increase interactivity and active learning in large classrooms [2]. This study investigates the whether clickers can also stimulate interest and promote learning in small classrooms.

Figure 1



METHODS

The study was conducted with undergraduate students enrolled in 3 non-majors Human Biology or General Biology courses (24-26 students per course). The primary instructional technique was PowerPoint lectures with either clicker questions or worksheets completed in class. Videos, group work or discussion sessions were also included as appropriate.

Data Collection

- Pre and post Science Motivation Questionnaires[3] -in class assignment, during the first and last week of the courses.
- Midsemester Student Assessment of Learning Gains (SALG) survey for extra credit.
- Written daily reflection on level of engagement during the last 5 minutes of lecture.
- Occasional surveys were administered throughout the semester.

Figure 2

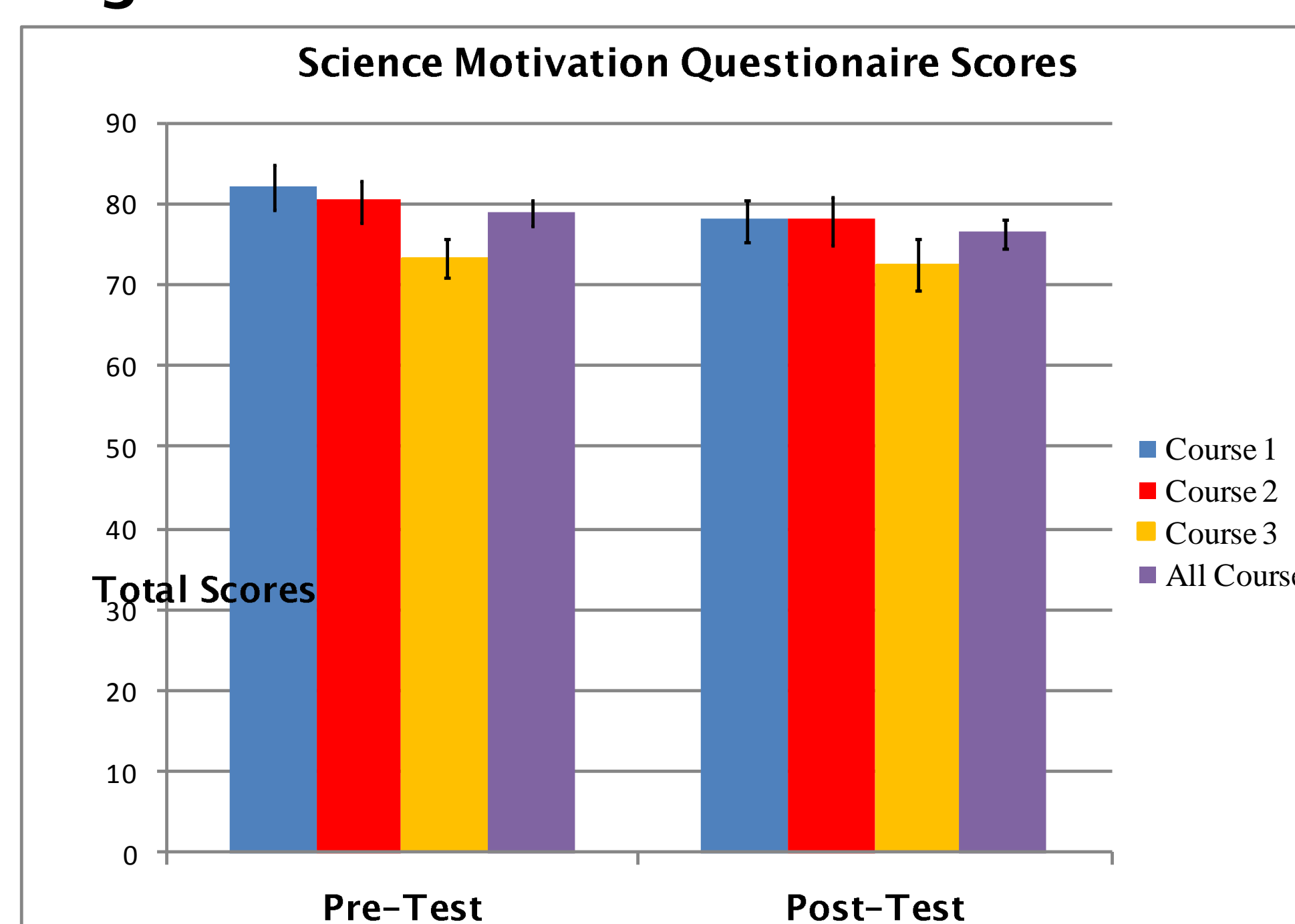


Table 1

Level of Motivation	Total Score
Never to rarely motivated	30-59
Rarely to sometimes motivated	60-89
Sometimes to often motivated	90-119
Often to always motivated	120-150

Table 2 Impact of class activities on student learning.

Class Activities	n	No help	A little help	Moderate help	Much help	Great help
Using clickers during lectures	51	18%	10%	37%	12%	24%
Completing worksheets	51	2%	12%	35%	20%	31%
Participating in discussions	51	10%	10%	18%	33%	25%
Participating in group activities	49	12%	8%	24%	25%	27%

RESULTS

Most students are “rarely to sometimes” motivated – average pretest motivation score =79(Figure 2, Table 1)

There is no significant difference between the pre and post total motivation scores $t=1.63$, $p=0.11$. (Figure 2)

7% of students did not like to use clickers. (Figure 1)

82% of students thought that the use of clickers helped to impact student learning. (Table 2)

Student Reflection on Clicker use in Lecture

- “The clickers forced us to think, which was good”
- “By forcing participation, it made me more aware of what was going on and in turn made me want to learn more.”
- “I think clickers are fun”
- “...helps us to be more engaged”
- “..makes you feel more required to answer the question, so it gets you thinking.”
- “..they help me stay more focused.”

CONCLUSIONS

Results suggest that clickers are effective in engaging and motivating student learning in the smaller classroom.

Although there was no significant difference between pre and post total motivation scores, data suggests that the active learning techniques used had an impact on learning.

Most of the dislike regarding the use of clickers in the classroom was due to unfamiliarity and insecurity with the new technology (data not shown). In spite of this, the majority of students recommend the adoption of clickers in other classes (data not shown).

REFERENCES

1. Gauci, S.A., Dantas, A.M., Williams, D.A., and R.E. Kemm (2009). Promoting student centered learning in lectures with a personal response system. *Adv Physiol Educ* 33, 60-71.
2. Caldwell, J. (2007). Clickers in the large classroom: current research and best-practice tips. *CBE Life Sci. Educ.* 6, 9–20.
3. Glynn, S.M., & Koballa, T.R. Jr., (2006). Motivation to learn in college science. In J.J. Mintzes & W.H. Leonard (Eds.), *Handbook of college science teaching* (pp. 25–32). Arlington, VA: National Science Teachers Association Press

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