A STUDY OF STUDENT ENGAGEMENT IN TRADITIONAL AND BLENDED HIGH SCHOOL PHYSICS COURSES

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Investigative Questions

Primary Question: How does student engagement affect academic achievement in a blended learning (BlendEd) physics course compared to a traditional physics course?

Sub-question 1: How do hands-on, traditional labs compare to online lab simulations in fostering high student engagement?

- Student Surveys
- Instructor Observations
- LMS Behavioral Data

Sub-question 2: How do hands-on, traditional labs compare to online lab simulations in fostering high academic achievement?

- Formative Assessments
- Summative Assessments

Sub-question 3: How do the personal situations of students in the BlendEd Physics course affect student engagement and academic achievement?

- Student Surveys
- Formative Assessments
- Summative Assessments

Sampling

The participating students were a mix of 10th, 11th, and 12th grade. There were a total of 7 BlendEd students and 23 traditional students who participated, though not all at once. Five data collection methods were used:

1. Student Surveys
2. Direct Instructor Observations
3. LMS Behavioral Data
4. Formative Assessments
5. Summative Assessments

Treatment

Students took an intro survey at the beginning of the study. After each activity in the study, they took a short survey to determine their engagement during the activity. These activities were also used as formative assessments to assess how well students were understanding the content. The instructor directly observed student engagement during the hands-on, traditional lab activities, and used LMS data to determine more general behavioral data for the BlendEd students. The unit tests for Unit 1 and Unit 3 were used as summative assessments. The students took one final Exit Survey about online labs versus hands-on traditional labs and their relative engagement during each.

Unit 1 Motion

#1 Distance-Time Graphs Gizmo

(online lab simulation)

#2 Pull-Back Cars Lab

(hands-on, traditional lab)

Unit 3 Momentum

#3 Pumpkin Drop

(hands-on, traditional lab)

#4 Air Track Gizmo

(online lab simulation)

Results

Both the BlendEd students and traditional students reported higher engagement during the hands-on traditional labs compared to the online simulations. Students also learned and retained the content of the hands-on labs better than the content learned in the simulations, suggesting that higher engagement leads to higher academic achievement. The BlendEd students who were already comfortable working independently with higher levels of intrinsic motivation felt close to equal levels of engagement for both types of activities, and also learned and retained the content better.

Findings

Average Engagement Levels for Each Activity
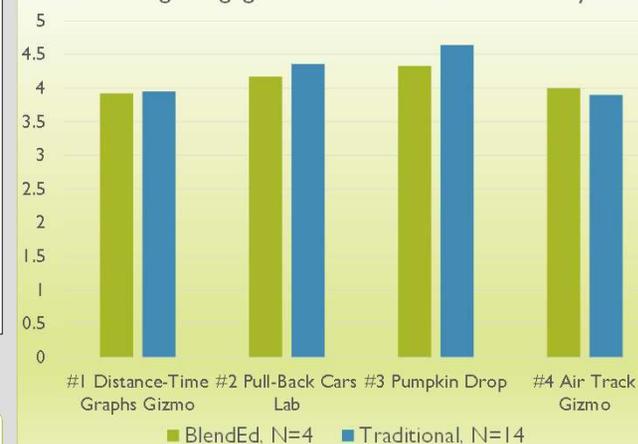
Summative Assessment Content Accuracy Data

	#1 Distance-Time Graphs Gizmo	#2 Pull-Back Cars Lab
BlendEd, N=7	0.762	0.86
Traditional, N=20	0.783	0.9

	#3 Pumpkin Drop	#4 Air Track Gizmo
BlendEd, N=4	0.75	0.42
Traditional, N=21	0.86	0.67

Student Comment about BlendEd Physics

"I wanted to take physics, but I also needed more time to do homework because my schedule is super busy, so I decided it was a good way to balance the two." – S.O.