

Problem

High school physics labs do not effectively reinforce the material taught in class.

Solution

Online pre-labs provide students with a better understanding of the material than traditional pre-labs.

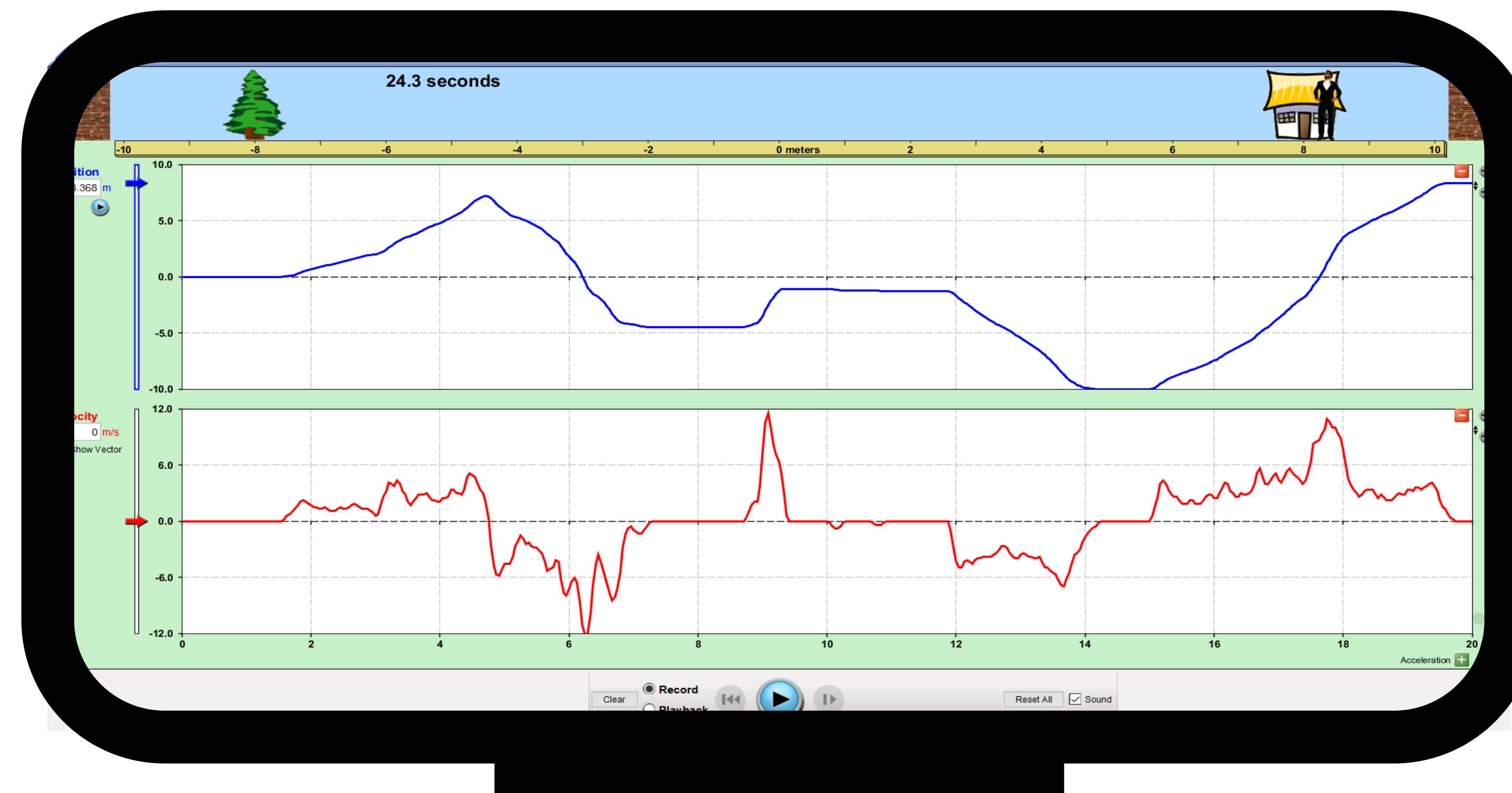
Pre-Test

Traditional Pre-Lab

Online Pre-lab

Lab Experiment

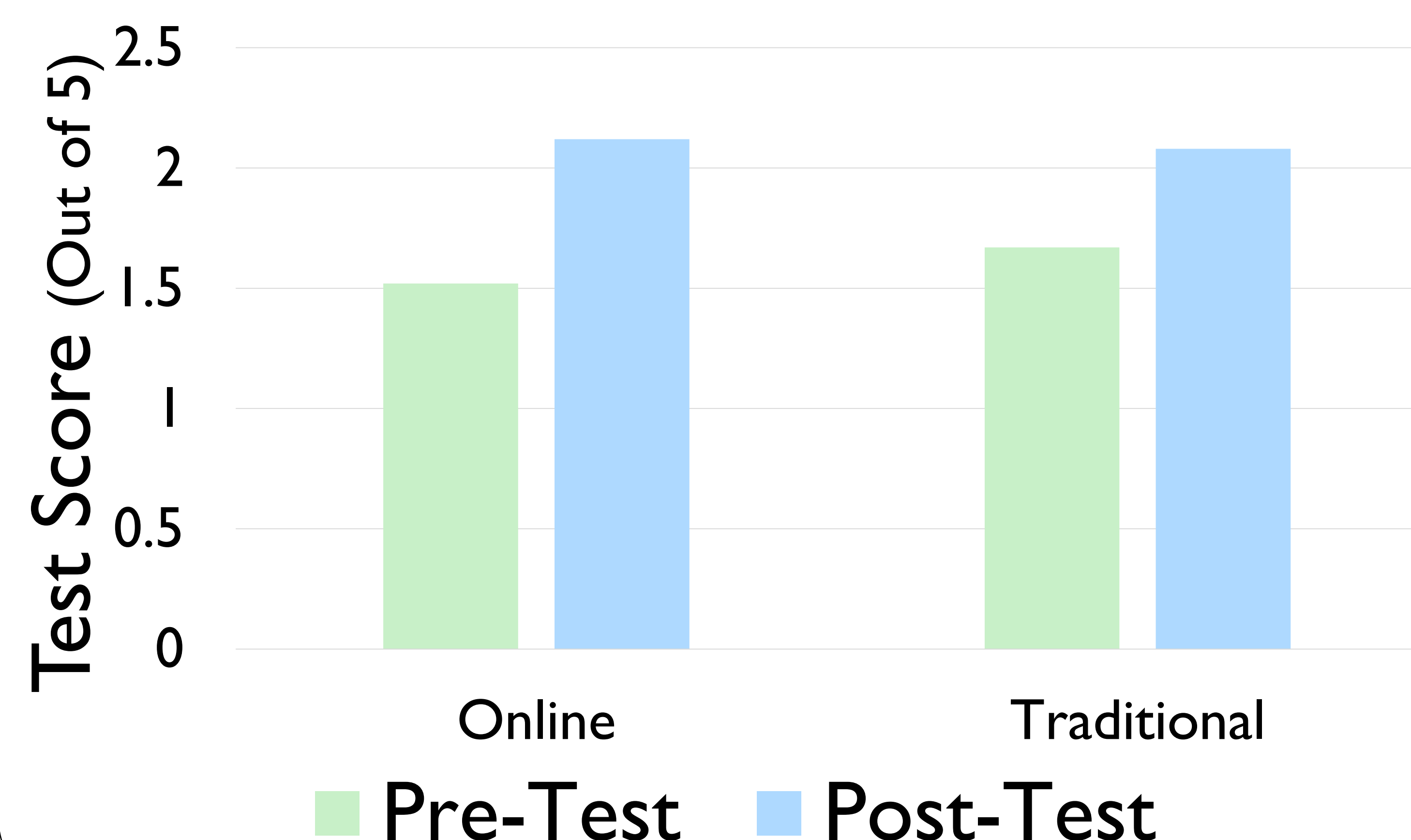
Post Test & Survey



The Lab

- Online PhET Simulation: The Moving Man
- Focus on properties and relationships of position vs. time and velocity vs. time graphs
- 25 students use online pre-lab
- 24 students use traditional pre-lab

Pre-lab and Post-lab Test Scores



Do Online Labs Help You Understand Physics Topics?

No
35%

Yes
65%

Conclusions

Our data was inconclusive.

- 12% score increase for online pre-lab students
- 8% score increase for traditional pre-lab students

This difference is too small to draw any conclusions without further research.

However, our survey results indicate students prefer online to traditional pre-labs.

References

- Abraham, L., Reiss, M. J., & Sharpe, R. (2014). The impact of the 'getting practical: Improving practical work in science' continuing professional development programme on teachers' ideas and practice in science practical work. *Research in Science & Technological Education*, 32(3), 263-280. doi:10.1080/02635143.2014.931841
- Chacko, P., Appelbaum, S., Kim, H., Zhou, J., & Montclare, J. K. (2015). Integrating technology in STEM education. *Journal of Technology and Science Education*, 3(1), 5-14. doi:10.3926/jtse.124
- Cryer, P., Mendenhall, E., Shattuck, C., & Montclair, J. (2016). Interactive online physics labs increase high school students' interest. *Journal of Technology and Science Education*, 6(3), 166-187. doi:10.3926/jtse.191
- Hazan, Z., Sonnetti, G., Sadler, P. M., & Sluutjans, M. (2010). Connecting high school physics experiences, outcome expectations, physics identity, and physics career choice: A gender study. *Journal of Research in Science Teaching*, n/a. doi:10.1002/jrse.20363
- Lavonen, J., Jaakkola, J., Koppola, L. T., & Kirki-Suonio, K. (2004). Effect of a long-term in-service training program on teachers' beliefs about the role of experiments in physics education. *International Journal of Science Education*, 26(3), 309-328. doi:10.1080/09500690320007433
- N. G. Holmes, Jack Olsen, James L. Thomas, & Carl E. Wieman. (2017). Value added or misattributed? A multi-institution study on the educational benefit of labs for reinforcing physics content. *Physical Review Physics Education Research*, 13(1), 010129. doi:10.1103/PhysRevPhysEducRes.13.010129
- Wolf, S., & Frazer, B. (2008). Learning environment, attitudes and achievement among middle-school science students using inquiry-based laboratory activities. *Research in Science Education*, 38(3), 321-341. doi:10.1007/s11665-007-9052-y
- Yuan, P. U., & Çalgın, S. (2016). Development of an attitude scale towards high school physics lessons. *Journal of Education and Training Studies*, 3(1), 56. doi:10.11114/jes.v3i1.1974