

When Would Students Use Physical or Virtual Data? PER Jacquelyn J. Chini¹, Adrian Carmichael¹, Elizabeth Gire¹, N. Sanjay Rebello¹ and Sadhana Puntambekar² ¹Department of Physics, Kansas State University; ²Dept. of Educational Psychology, Univ. of Wisconsin

Introduction

• Students (N=134) enrolled in a conceptual-based physics laboratory performed physical and virtual activities about pulleys and inclined planes over four two-hour labs • At the end of the last lab, students responded to a survey about the usefulness of data collected from physical and virtual experiments

Description of Survey Questions Question **Pulley Systems** Variable Context Rental- A Rental Store Not specified Fixed & Movable Rental-B Rental Store Movable & Double Compound Not specified Fixed & Movable Test-A Exam Force Fixed & Movable Work Test-B Exam Movable & Double Compound Test-C Exam Force



Preferred Manipulative

	EXAIII	10100	movable à Double compound
Test-D	Exam	Work	Movable & Double Compound
Make Up-A	Missed Lab	Force	Not specified
Make Up-B	Missed Lab	Work	Not specified

Sample Question:

You need to rent a pulley system to help lift an oversized dresser to the second floor balcony of your home. An employee at your local rental store informs you they have several pulleys you can rent.

To help you decide which pulleys to rent, she offers to let you try out either *real toy pulleys* OR a *computer* simulation of pulleys

A) At the rental store, you have to choose between a **fixed pulley** and a **movable pulley** to help you lift the bed. What would you try out to help you make your decision? (Check **one**)

Real toy pulleys Computer simulation of pulleys

Which manipulative do students prefer?

• Either would be equally helpful

Chi-square goodness-of-fit test was significant at p<.001 for all Q's





Which manipulative do students prefer?

TRUST QUESTION:

If you could only analyze data from one of the activities – the experiments with real pulleys or the computer simulation of pulleys – which do you think you would **trust more**?

LEARN QUESTION:

If you were only going to do one pulley activity – the experiments with real pulleys or the



Preferred Manipulative

Physical Virtual **Either**

computer simulation of pulleys – which do you think would help you learn the best

Chi-square goodness-of-fit test was significant at p<.001 for both Q's

20 100 120 40 60 80 0 Number of Students

Conclusions

• Students preferred the virtual experiment in all posed situations

• Students were most likely to change their mind about which manipulative to move when the context of the situation changed

• In students' own judgment, the simulation was more trustworthy and more beneficial to their learning

This work is supported in part by U.S Department of Education, Institute of Education Sciences award R305A080507 and the NSF GK-12 Program, DGE-0841414, PI Ferguson.