

# Inq-ITS: Developing Microworlds for Virtual Simulation Learning


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## ABSTRACT

Inq-ITS is a science-based inquiry program used in classrooms that allows teachers to provide their students virtual learning laboratory experiences. Inq-ITS produces its laboratories through verified Next Generation Science Standards (NGSS), giving science outcomes and expectations for students to adapt. Within Inq-ITS, students conduct experiments by manipulating multiple variables within the laboratories to understand the results on their screens. Afterward, they analyze the results and create hypotheses, claims, and reasoning based on the results, which is inquiry-based learning. This displays these students comprehending the science concepts of the virtual laboratory and practicing the scientific method that demonstrates their knowledge through inquiry. Within Inq-ITS we have added pre and post-assessment questions that gauge the students' understanding of the laboratory before and after. These questions are designed based on the laboratory itself to display their current knowledge of the sciences. Depending on their correctness rate, this is further analyzed on whether students are comprehensive of the material or if they're lacking out on false positives. Inq-ITS is an excellent tool for students to use the scientific process to learn through inquiry, allowing inquiry-based learning to be more effective than traditional style methods.

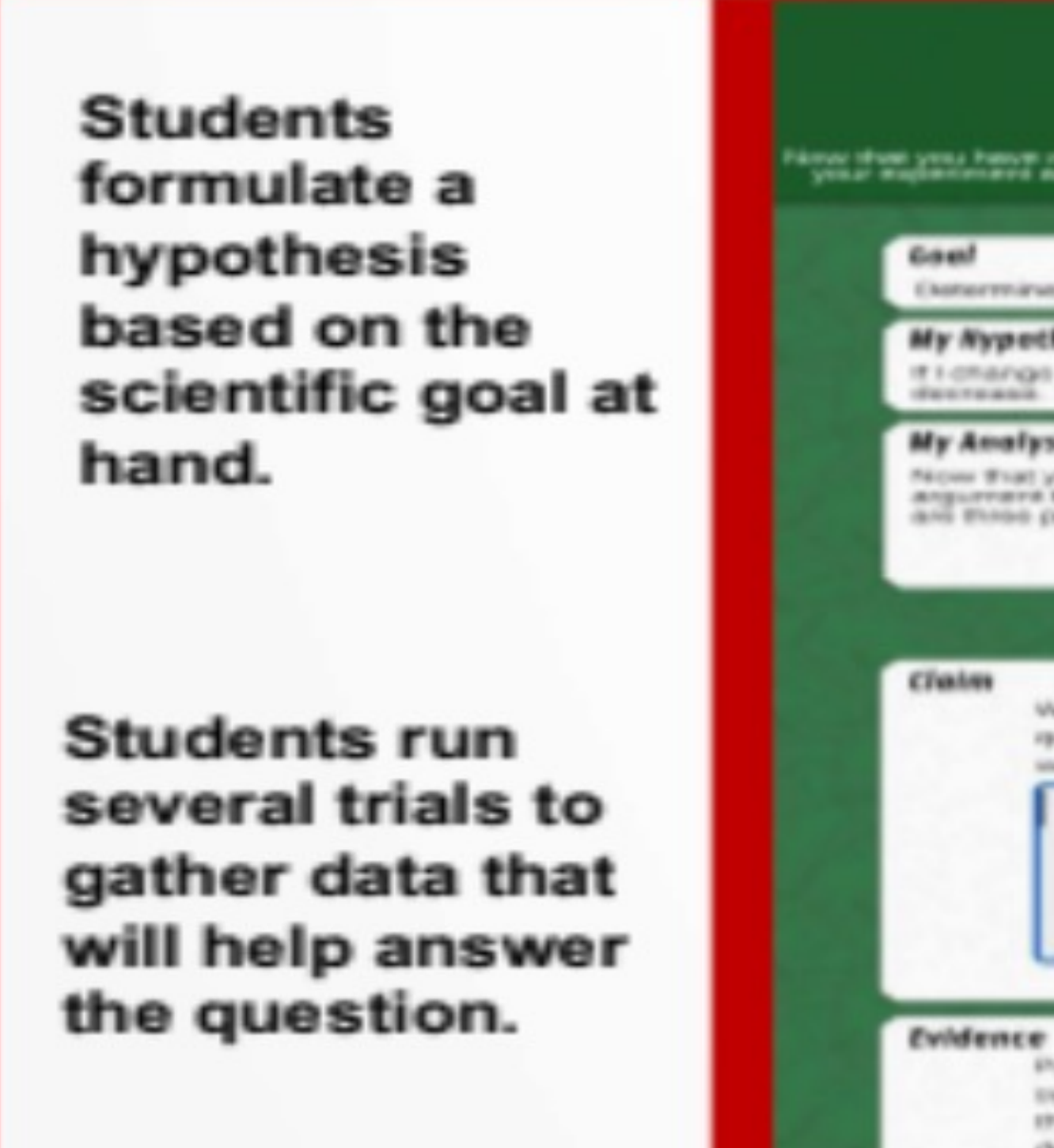
## INTRODUCTION



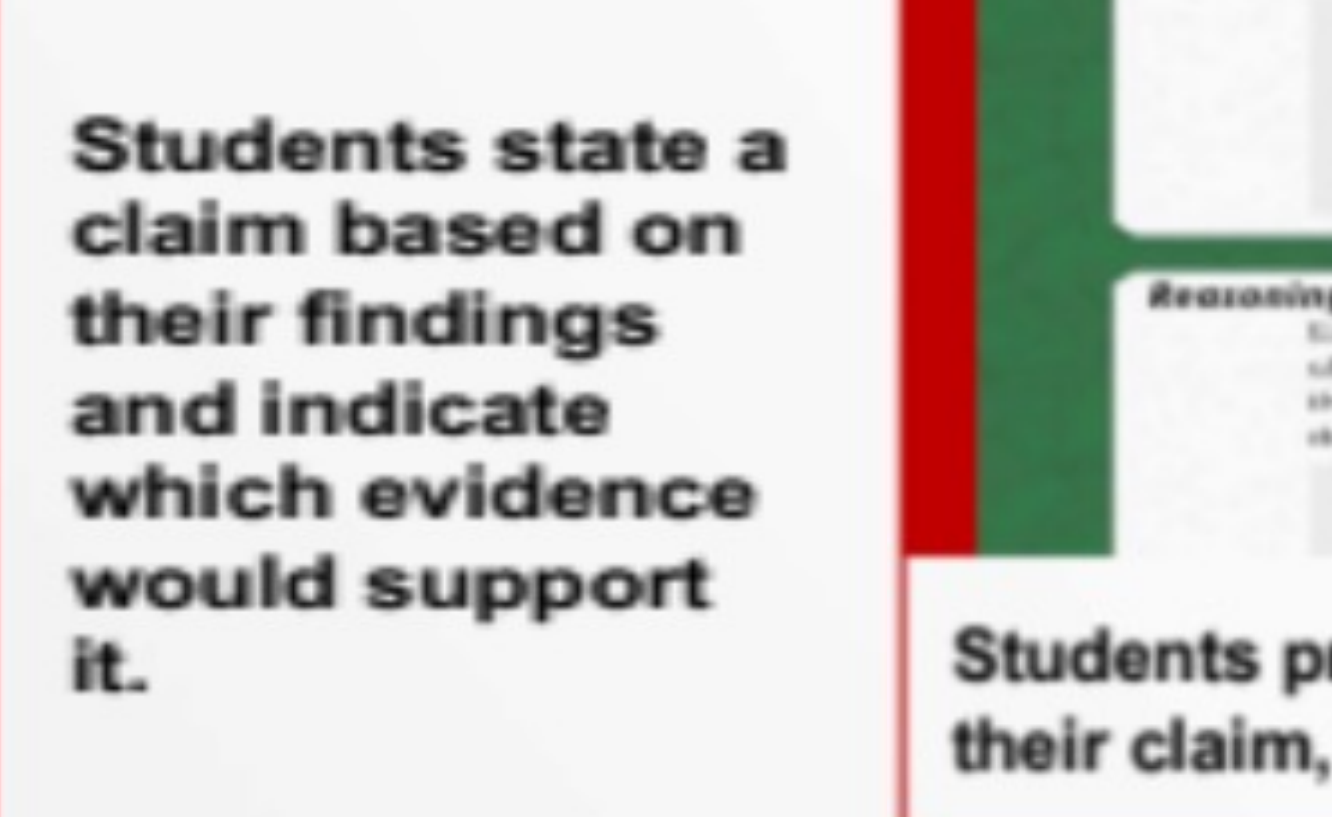
**Students formulate a hypothesis based on the scientific goal at hand.**



**Students run several trials to gather data that will help answer the question.**



**Students state a claim based on their findings and indicate which evidence would support it.**



**Students provide written responses elaborating on their claim, evidence, and reasoning (CER).**

- Inq-ITS is aligned with the Next Generation Science Standards (NGSS) which allows students to understand all aspects of scientific practice
- Virtual learning in home-based environments does not allow most students to retain academic information which ultimately causes them to be unsure of their learning goals, (Garcia, 2020).
- Using the virtual learning system Inq-ITS (Inquiry Intelligent Tutoring System) enables students to be productive in an online educational setting for science where they control their learning, (Gobert, 2000).

## METHODS

- Students can be accessed by pre and post questions pertaining to each science subject.
- Pre and post questions that have been developed in conservation of momentum questions to gauge student understanding of the topics before completing the Inq-ITS labs.
- Analyze the performance rate of students using the percentages of correct answers from the pre and post questions.

- Pre-Question Correct & Post Question Correct = **true positive**
- Pre-Question Correct & Post Question Incorrect = **false positive**
- Pre-Question Incorrect & Post Question Correct = **learning objectives met**
- Pre-Question Incorrect & Post Question Incorrect = **learning objectives not met**

This is an example of conservation of momentum

- air filled balloons
- motion of rockets
- system of gun and bullet
- all of these

Answer: 1

Law of conservation of momentum is related to which law of Newton's motion?

- Newton's first law
- Newton's second law
- Newton's third law
- all of these

Answer: 3

Which of these below is an example of conservation of momentum?

- all of these
- rocket launching
- gun firing a bullet
- balloons filled with air

Answer: 4

Which of Newton's laws of motion is closely related to the law of conservation of momentum?

- Newton's first law
- Newton's second law
- Newton's third law
- all of these

Answer: 3

## FUTURE DIRECTIONS

Results have not yet been established as we have not tested students with these questions to analyze their answers and the Inq-ITS overall system. However, from previous Inq-ITS labs, the majority of students are able to fit on the spectrum of learning from the lab and being able to answer the post question correctly afterwards. The results in the future will show the performance on the exams which will be analyzed to see the benefit of the Inq-ITS system in the physics's.

## REFERENCES

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- García, E., & Weiss, E. (2020, September 10). *COVID-19 and student performance, equity, and U.S. education policy: Lessons from pre-pandemic research to inform relief, recovery, and rebuilding*. Economic Policy Institute.

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