INTRODUCTION

• Science laboratories are important to science education, but researchers and educators have criticized the weak student laboratory experiences because they are (1) not authentic and (2) excluded from large-scale assessments (National Research Council, 2004)
• Computer simulated science laboratories (CSSLs) have been shown to improve these shortcomings by:
  1) providing real-life contexts to a hands-on and minds-on activity in which students may try different approaches for implementing various scientific methods (e.g., making errors and repeating experiments with enhancements) (Hsu & Nicholson, 2006)
  2) measuring students’ performance by capturing their interactions during the laboratory (Shu & Venster, 2013)
• Although CSSLs have been many benefits, the implementation of these tools require investigation in order to maximize their potential
• Purpose of this research aims to investigate two condition treatments - pre-laboratory activity and learning error intervention (LEI) - designed to magnify the benefits of CSSLs

METHOD

Participants
• 298 Grade 8 students (typically 13 years old, 47% male, 41% female, and 12% undisclosed)
• All students completed a CSSL assessment designed by the National Assessment of Educational Progress (NAEP; Bennett, Persky, Weiss, & Jenkins, 2007; NAEP, 2007) and a series of surveys measuring their affective orientation towards education
• A two-factor quasi-experimental design was used to evaluate students’ science knowledge and skills using the NAEP CSSL

RESULTS

Students who received the pre-laboratory activity reported significantly lower levels of general test anxiety, F(1, 239)=7.70, p<0.01

Students who received LEI significantly outperformed their peers in three areas of the CSSL problem (data organization & conclusion, prediction, and method; F(4, 264)=3.58, p<0.01) and one area of the post-intervention assessment (listing materials needed for the experiment; F(1, 244)=8.084, p<0.01)

CONCLUSION & DISCUSSION

Pre-Laboratory Activity: Lowers General Test Anxiety
• Students who completed the pre-laboratory activity reported lower levels of general test anxiety than their peers who did not complete the activity
• This may be due to the activity better preparing students for the subsequent CSSL by drawing out their real understanding of the concepts and orienting them to the principles needed for the assessment

Future Research & Next Step
• Analyzing the action logs created from the CSSLs to investigate whether the sequencing and timing of events provide additional evidence of knowledge and skills
• Investigating the reliability of score reports generated from CSSLs
• Tracking students’ improvement using multiple CSSLs administered through a course
• Investigating the use of scientific methods skills by developing more open-ended problems in CSSL environment

REFERENCES