

# Tier 1: Using Strong Evidence to Inform Educational Technology Use

## Measuring Practice Impact to Guide School Implementation

### Building evidence that meets Tier 1

The [Elementary and Secondary Education Act](#) of 1965 (ESEA) encourages state and local educational agencies to prioritize evidence-based interventions, strategies, and approaches. Under ESEA, there are four tiers of evidence: [\(1\) Strong Evidence](#), [\(2\) Moderate Evidence](#), [\(3\) Promising Evidence](#), and [\(4\) Demonstrating a Rationale](#). The Department has defined those terms for use in ESEA and other programs in its regulations (see [34 CFR 77.1](#)). At the *Strong Evidence*<sup>1</sup> tier, education practices are supported by at least one well-designed **experimental** study exploring the **causal relationship** between variables. In education, such a study would examine the effects of an intervention on student or teacher outcomes. To be considered well-designed, the study must meet the Institute of Education Sciences' **What Works Clearinghouse Evidence Standards without Reservations**.

### Tier 1 and educational technology use in schools

Information from Tier 3 or Tier 2 activities can be used to develop a Tier 1 study plan for using and evaluating educational technologies in schools. Building Tier 1 evidence may require partnering with internal and external education evaluation organizations to:

- ❖ select the **study population** from a population of participants in a school or educational program
- ❖ use an experimental study design (i.e., a **randomized controlled trial**) to **randomly assign** the study population to an **intervention** or **control group**
- ❖ implement the educational technology intervention so that the intervention group would receive the new intervention, while the control group would continue with traditional instruction
- ❖ collect and analyze data on student outcomes in the intervention and control groups to determine whether the educational technology intervention had a **significant** effect on participant outcomes
- ❖ incorporate **control** variables (e.g., age, gender, grade level) that may affect participant outcomes using statistical methods such as **regression analysis**



### Key Evidence Terms

- **Experimental:** An approach using random assignment to measure whether changing a factor or process results in desired outcomes
- **Causal relationship:** When one variable (i.e., an intervention) has a direct effect on another variable (i.e., an outcome)
- **What Works Clearinghouse:** U.S. Department of Education-funded repository of reviews of educational research
- **Study population:** The entire unit of participants where subsets represent the entire population
- **Randomized controlled trial (RCT):** a method to control non-experimental factors using random assignment
- **Randomly assign:** Placing participants in an intervention or control group by chance to ensure each group has similar characteristics
- **Intervention group:** Participants receiving an intervention, aka treatment group
- **Control group:** Participants not receiving an intervention, aka the non-treatment group
- **Significant:** Statistical confidence that a given relationship is not due to chance
- **Control:** variables that are accounted for to prevent them from affecting study results
- **Regression analysis:** A statistical method used to estimate the relationship between dependent and independent variables

<sup>1</sup> For full definitions in the Education Department General Administrative Regulations of key terms, please visit <https://www.ecfr.gov/current/title-34/part-77>



## Case Study: Putting Tier 1 into Action

A school district is interested in district-wide adoption of a science app intervention, installed on students' laptop devices, that shows moderate evidence for increasing 3rd-6th graders' science identity development. The school districts' technology team previously collaborated with the local university's school research partnerships program to conduct a correlation study (see Tier 3). Results were used to secure an external research grant to conduct a larger scale experimental study exploring the causal relationship between science app use and student science identity development.

**Your turn! What might be some reasons that a school or district would seek strong evidence to identify an educational technology intervention?**

With guidance from the university's school research partnerships program, the school district technology team developed an experimental design to measure the relationship between the science app intervention and student science identity development. They chose an RCT study design to estimate the effect of the intervention on students' science identity by comparing levels of identity development between two groups, controlling for students' identity development prior using the intervention. The team was approved to implement an RCT design because randomizing classrooms to the intervention or control group was both feasible and ethical. Given this approval, the team collaborated with the university to decide on the following study design:

### Experimental Study Plan for a Science App Intervention

<i>Research Question: Does science app use increase students' science identity development compared to the control group?</i>				
Intervention	Frequency	Outcome Measure	Participants	Data Analysis
Intervention use during home room classroom hours	3 times per week for 24 weeks for 60 minutes per week, per intervention classroom	Student Science Identity Survey	School A: 100 students, 4 classrooms School B: 100 students, 4 classrooms School C: 100 students, 4 classrooms School D: 100 students, 4 classrooms (2 intervention, 2 control classrooms per school, grades 3-6, randomly assigned)	Use regression analysis, incorporating controls (e.g., student demographics etc.)

The school district's plan included using a computer-generated randomization schedule to assign 16 3rd-6th grade classrooms across 4 schools in 2 districts to either the science app intervention group (use of the science app during home room class time 3 times per week for 24 weeks for 60 minutes per week) or the control group (no use of the science app). The district technology team administered a high-quality outcome measure of students' science identity development. Finally, the team used statistical techniques that accounted for classroom randomization to determine if the science app intervention had a significant effect on students' science identity.

**Your turn! What are the pros and cons of a randomized design that results in some students receiving - and other students not receiving - an educational intervention? How might your school or district partner with research organizations to pursue a Tier 1 evidence strategy?**

Data analysis revealed higher levels of science identity among students in the experimental group than the control group, and that the difference was statistically significant. Accounting for [additional considerations](#), this finding indicated strong evidence the science app use had a significant, positive, effect on students' science identity. The school district voted to allocate the budget to adopt the science app intervention across the district. The district also gave the technology team permission to partner with the university to submit a report describing the findings to the [Education Resources Information Center](#).

