Building Terracotta: A Platform for Conducting Randomized Controlled Experiments in the LMS

Educause Webinar
October 12, 2021

POLL - VALUE OF LEARNING DATA

Rate your agreement with the following statement:
Learning data are valuable for improving student outcomes and student success.

1 - Strongly disagree
2 - Disagree
3 - Neither agree nor disagree
4 - Agree
5 - Strongly agree
**POLL - VALUE OF LEARNING DATA**

Rate your agreement with the following statement:
I have a clear understanding of how learning data can a practical impact on student outcomes and student success.

1 - Strongly disagree  
2 - Disagree  
3 - Neither agree nor disagree  
4 - Agree  
5 - Strongly agree

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**DATA, DATA, EVERYWHERE**

*understanding and optimizing student success*

• What classroom practices result in better outcomes?  
• What instructional designs increase engagement?  
• What materials improve performance?  
• What interventions boost grades?  
• What X causes Y?

➔ Correlational analysis isn’t well suited to answer these questions  
➔ To understand what works, the most compelling method is to conduct an experiment

◆ How can digital learning platforms support experimental research?
the solution is: 🌻 terracotta

INTRODUCTIONS

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The Learning Agency Lab

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Unicon
**LEARNING ENGINEERING**

an interdisciplinary field that employs an iterative design process for improving learning, driven by data, where *experimentation is front and center*

- Everyone’s experimenting
  - Teachers, learning platform designers, etc.
- Let’s actually collect data on these experiments
  - Grounding theory
  - Improved understanding of context
  - Better recommendations for teaching

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**EXPERIMENTATION IN CLASSES**

01. When you try something new

02. When someone recommends something new

03. When a student asks for help
TEACHERS AS RESEARCHERS

Leverage teacher expertise

Democratizing the research process

Building teacher-researcher communities

THE TEACHER-RUN EXPERIMENT NETWORK

Background

Participants

Research Topics

Outcomes

Challenges
Although Pressley and Harris (1994) and Levin (1994) argued for “better” intervention studies, the perceived obstacles and costs may dissuade investigators from conducting such research.

The requisite resources are generally far in excess of what most educational researchers could hope to amass in the absence of considerable extramural funding. Consequently, researchers elect to conduct more manageable, less ambitious, and typically, less carefully-controlled classroom-based investigations.

However, building an online experiment still requires a relatively burdensome amount of technical knowledge, and so is presently only available to researchers and teachers who themselves have expertise, or a substantial budget.

Randomized experiments of interventions applying to entire classrooms can be extremely difficult and expensive to do.

ManyClasses

2015:

2016:

2017:

2021:
We need experimentation to be easier:

So that it can
Be more common, having bigger impacts
and so that it can...
Be more diverse
Be large-scale.

**terracotta**

- Tool for Educational Research with Randomized Controlled Trials
- An experiment-builder in the learning management system (LMS)
  - Create different variations of a single LMS assignment
  - Randomly assign students to different versions of assignments
  - Enable within-subject crossovers
  - Incorporate grades in the LMS as experiment outcomes
  - Collect informed consent in the LMS without exposure to instructor
  - Export de-identified data for participants
**POLL - LEARNING DATA AND ACCESS**

Who on your campus has the most access to students’ learning data?

- IT Units
- Executive Leadership
- Institutional Research
- Department Chairs
- Instructors

**SOLVING THE DATA PROBLEM**

- Apache 2.0 Open Source License
- Canvas Tool
- IMS Caliper Data Standard
- LTI 1.3 Interoperability
- AWS Infrastructure
**PROJECT APPROACH**

- **Product Vision**
  - Understanding vision and requirements

- **Getting Started**
  - Assembling Team
  - Deciding Technologies
  - Setting up Environments

- **Development**
  - Sprint Development Iterations
  - Product Demos

- **POC Release**
  - Release to IU
  - Documentation
  - Knowledge Transfer

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17 months

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**terracotta next steps**

On your end:
- [https://terracotta.education/i-want-terracotta](https://terracotta.education/i-want-terracotta)

On our end:
- IES Digital Learning Platforms to Enable Efficient Education Research Network
  - Stable beta release scheduled for Summer 2022
  - Expanded submission types, new features through 2025
- XPRIZE Digital Learning Challenge
  - Multisite experimental research pilot of Terracotta
Questions? Answers.

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