SCALES Lab Handbook

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2025-04-12

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Preface

Welcome to the SCALES Lab!

Study of Cognition and Learning in Educational Systems

The SCALES Lab investigates how educational outcomes emerge from the complex interplay of cognitive, social, institutional, and environmental forces. We approach education not as a collection of isolated interventions or outcomes, but as a dynamic system shaped by feedback loops, structural conditions, and resource distribution.

Our research focuses on understanding these systems through rigorous, theory-driven modeling — integrating insights from cognitive science, ecology, data science, and education policy. Rather than centering normative agendas, we aim to develop tools and evidence that clarify how learning environments function and how access to educational resources can be broadened across diverse contexts.

Who We Are

SCALES is a collaborative research space for graduate students, faculty, and partners who are curious, rigorous, and ready to rethink how we study education. We welcome scholars from diverse disciplines — especially those who care about educational equity, systems-level change, and developing stronger methods for understanding how learning happens.

What We Do

- Build ecological models of learning and achievement
- Use AI and simulation to test educational theories
- Develop new tools for causal inference and data integration
- Mentor students in cutting-edge methods and policy-relevant research
- Collaborate across institutions, disciplines, and communities

1 Introduction

2 Summary

In summary, this book has no content whatsoever.

3 Conferences

Table 3.1: SCALES Lab Recommended Professioal Organizations and Conferences

Organization	Research Alignment	Conference Timing	Submission Deadline	Location	Annual Dues	Primary Journal	Impact Factor
Cognitive Science Society (CogSci)	Cognitive science, computational modeling, theory development	July 30 – Aug 2, 2025	Feb 3, 2025	San Francisco, CA	Regular: $105; Student: $55	Cognitive Science	2.3
International Society of the Learning Sciences (ISLS)	Learning sciences, educational technology, collaborative learning	June 10–13, 2025	Nov 27, 2024	Helsinki, Finland	Regular: $100; Student: $50	Journal of the Learning Sciences	4.0
International Society for Systems Sciences (ISSS)	Systems thinking, ecological modeling, interdisciplinary research	July 2025	Mar–Apr 2025	Varies annually	Regular: $150; Student: $50	Systems Research and Behavioral Science	1.6
International Congress on Agent-Based Modeling (ICABM)	Agent-based modeling, simulation, complex systems	Varies	Varies	Varies	Regular: $100; Student: $50	Journal of Artificial Societies and Social Simulation	2.0

Organization	Research Alignment	Conference Timing	Submission Deadline	Location	Annual Dues	Primary Journal	Impact Factor
American Educational Research Association (AERA)	Education research, policy, methodology	Apr 23–27, 2025	Jul–Aug 2024	Denver, CO	Regular: $250; Student: $75	Educational Researcher	5.0
Association for Education Finance and Policy (AEFP)	Education finance, policy analysis, quantitative methods	March 2025	Oct–Nov 2024	Varies annually	Regular: $150; Student: $50	Education Finance and Policy	2.1
Association for the Advancement of Artificial Intelligence (AAAI)	Artificial intelligence, machine learning, AI in education	Feb 25 – Mar 4, 2025	Aug 2024	Philadelphia, PA	Regular: $125; Student: $50	AI Magazine	1.7
International Educational Data Mining Society (IEDMS)	Educational data mining, learning analytics, AI applications	July 2025	Jan–Feb 2025	Varies annually	Regular: $100; Student: $50	Journal of Educational Data Mining	1.5
Society for the Advancement of Socio-Economics (SASE)	Socio-economic systems, interdisciplinary policy research	June 2025	Jan–Feb 2025	Varies annually	Regular: $150; Student: $50	Socio-Economic Review	3.2

Organization	Research Alignment	Conference Timing	Submission Deadline	Location	Annual Dues	Primary Journal	Impact Factor
Society for Research on Educational Effectiveness (SREE)	Educational effectiveness, causal inference, policy evaluation	March 2025	Sept–Oct 2024	Varies annually	Regular: $200; Student: $75	Journal of Research on Educational Effectiveness	2.9
International Mind, Brain, and Education Society (IMBES)	Cognitive neuroscience, education, interdisciplinary research	2026 (Biennial)	TBD	Varies	Regular: $100; Student: $50	Mind, Brain, and Education	2.5

4 SCALES Project Template

SCALES Project Template Github page

Understanding the distinction between scripts and modular functions is key to organizing a clean, scalable, and reproducible research project. Here's a breakdown tailored to your workflow in the SCALES Lab:

4.1 Scripts vs. Modular Functions

Feature	**Scripts**	**Modular Functions**
Purpose	Perform a specific task or workflow	Define reusable logic that can be called elsewhere
Structure	Linear and executable top-to-bottom	Encapsulated into functions or classes
Typical Location	`scripts/`	`src/` (e.g., `src/r/`, `src/py/`)
Example	`clean_data.R` runs the full cleaning pipeline	`remove_outliers()` is used inside that script
Task Reusability	Low — task-specific	High — written to be reused in multiple scripts
Execution	Run as a whole (`python analyze.py`)	Loaded or imported into other files
Naming	Verb-based (e.g., `analyze_data.py`)	Noun/action-based (e.g., `utils.py`, `metrics.R`)

4.2 In Practice

Example Script: scripts/analyze.py

```python
import pandas as pd
from src.py.utils import remove_outliers, standardize_scores

df = pd.read_csv("data/processed/student_data.csv")
df = remove_outliers(df)
df = standardize_scores(df)
df.to_csv("data/processed/cleaned.csv")
```

Example Function File: src/py/utils.py

```python
def remove_outliers(df, threshold=3):
    return df[(df < threshold).all(axis=1)]

def standardize_scores(df):
    return (df - df.mean()) / df.std()
```

4.3 Why This Matters for Reproducibility

* Scripts make your research pipeline transparent.
* Modular functions make your code clean, testable, and scalable.
* This separation supports version control and collaboration - team members can modify or

Would you like me to generate template function and script files in both R and Python as part of the GitHub template repo?

References