

# ITLS 4160 Measuring Learning and Performance

## Course Description

Students learn basic principles of effective measurement techniques, their development, and underlying theories. Topics include surveys, rubrics and tests for both formative and summative assessment. Classical test theory and item response theory are introduced, with an emphasis on practical application.

## Goal of the course:

The goals of this course are (1) to introduce conceptual and practical issues in measuring learning and performance and (2) to train students to design educational evaluations and analyze the data they generate. Of particular emphasis will be the application of gap analysis to diagnose the causes of underperformance in varied organizations.

## Text:

Tools of System Thinkers by Albert Rutherford (link is for the kindle edition)

[https://www.amazon.com/gp/product/B08S1QYHKT/ref=ppx\\_yo\\_dt\\_b\\_d\\_asin\\_title\\_o00?ie=UTF8&psc=1](https://www.amazon.com/gp/product/B08S1QYHKT/ref=ppx_yo_dt_b_d_asin_title_o00?ie=UTF8&psc=1)

Other readings will be provided as pdfs.

## Units

1. Being Data-Driven (one week)
  - a. Quality / Availability / Caveats
    - i. What do/can we have?
    - ii. What can we get?
      1. Include rubrics here - how can we describe what we are trying to measure ... what attributes does/should it have?
    - iii. What will we not have access to?
    - iv. What connections are there?
      1. Yellowstone wolves example
    - v. What delays impact the data?
  - b. Reading
    - i. Tools of Systems Thinkers (ToST): Intro & Chapter 1
  - c. Assignment - Rubric graded
    - i. Describe educational system with a boundary of an individual school
      1. At least 2 delays
      2. At least 5 relationships
2. Gap & Cause Analysis (four weeks)
  - a. Gap Analysis pt 1 (one week)
    - i. Where do we want to be? (~Vision board)
    - ii. Reading
      1. [McGonigal](#) article (linked) or Imaginable chapter 1
    - iii. Assignment - Discussion (Post/Comment) graded
      1. What might that educational system look like 10 years from now?  
What is different? What are the impacts of that change?
  - b. Gap Analysis pt 2 (one week)
    - i. Where are we now?

1. Box's law
2. Think like a modeler
3. Mad's law - model to understand, not to predict
4. What if I'm wrong?
- ii. Reading
  1. ToST: Chapter 2
  2. Imaginable: Chapter 5
- iii. Assignment - Checking Stereotypes & Assumptions
  1. Two options:
    - a. Stereotype exercise from ToST Chapter 2
    - b. Flipped facts - list of 100 assumptions about education and the flipped version
- c. Root Cause Analysis (two weeks) - Why are we where we are now?
  - i. Describe & Prove the problem
  - ii. Week 1 - Cluster Mapping & Brainstorming
    1. Reading: ToST Chapter 3
    2. Assignment - Jamboard full course
      - a. Graded on participation (# of posts)
        - i. Because the point of a brainstorm is to get *all* the ideas - more the better
  - iii. Week 2 - 5 whys deep
    1. Reading:
      - a. 8D p.86, 174
      - b. ToST Chapter 4
    2. Assignment
      - a. Create interconnected circle map
        - i. Use arrows and s/+ o/- to show relationships
3. Learning & Performance (nine weeks here - one budgeted for spring break)
  - a. (maybe - Krakauer comments on time - know the starting & ending points)
  - b. Performance (four weeks)
    - i. Performance Measurement Theories/Styles (three weeks)
      1. *According to classical test theory, a score obtained in the process of measurement is influenced by two things: (1) the true score of the object, person, event, or other phenomenon being measured and (2) error (i.e., everything other than the true score of the phenomenon of interest).* [SOURCE](#)
      2. Week 1: Classical
        - a. Reading: CTT introduction
        - b. Assignment: Discussion post/comments
      3. Week 2: IRT
        - a. Reading: IRT introduction
        - b. Assignment: Discussion post/comments
      4. Week 3: Surveys, Tests, & Tools
        - a. Topics

- i. Surveys & Tests
        - 1. Likert
        - 2. Snapshots (formative) & Portraits (summative)
        - 3. Question wording & placement
      - ii. Context
        - 1. Brazilian candy sellers - the context of the performance
      - iii. Tools
        - 1. Cockpit
        - 2. Vodka Test
    - b. Readings
      - i. Saxe 1988
      - ii. Hutchins & Klausen 1996
      - iii. Lynch et al 2022
  - ii. Python/R examples (one week)
    - 1. Ways to evaluate individual problems
    - 2. Use jupyter notebook environment
    - 3. Assignment - notebook in github repo
- c. Change or Learning (five weeks)
  - i. Specify what we mean
    - 1. Learning ~ change in knowledge state
    - 2. Learning Analytics (use SoLAR definition)
  - ii. Learning Analytics (videos) - Behavior Change (four weeks)
    - 1. Week 1: Prove It - Getting really descriptive about what we mean
      - a. Reading: ToST Chapter 5
      - b. Some guiding questions
        - i. What do we mean by [x]?
        - ii. How would we know if [x]?
          - 1. What data would it take?
          - 2. What transformations?
          - 3. What display?
        - iii. What might correlate, but not connect, with [x]?
          - 1. Xkcd comic here
      - c. Assignment: Discussion with Causal Loop Diagram
    - 2. Week 2: Move It - Changes in [behavior] over time
      - a. Reading: ToST Chapter 6
      - b. How can we look at change over time here?
      - c. Where might external events matter?
        - i. e.g., enrollment in September & January
      - d. Assignment: Discussion with BoTG
    - 3. Week 3: Stocks & Flows
      - a. Reading: ToST Chapter 7
      - b. Assignment: Stock & Flow Diagram - calculable

- 4. Week 4: Python/R examples - tracking change over time
      - a. Assignment - notebook in github repo
  - iii. Measuring conceptual change (one week)
    - 1. Reading/Presentation: Knowledge & Interaction & other micro-analyses
    - 2. Assignment: Take change over time from week 4 - how could we look at an even finer grain? (discussion most likely)
- 4. Final Week of Class (one week)
  - a. Final paper - due end of finals week
    - i. Option 1: Portfolio
      - 1. 10 year possibility
      - 2. Current state
        - a. Include RCA
      - 3. Performance Check
        - a. what/where/when/how could we evaluate performance
      - 4. Learning Check
        - a. what/where/when/how could we evaluate learning process
      - 5. Micro-Possibilities
        - a. How could we look at learning *moments* within the overall *process*
    - ii. Option 2: Prove your grade
      - 1. Have their own canvas activity, etc. data
      - 2. Make your case for what grade you should have in the class?
        - a. Participation?
        - b. Accuracy?
        - c. Individual week scores?
        - d. Change over time?
      - 3. How should your learning/performance be measured?