Part Two:
The UC Berkeley Athletic Study Center Evaluation
Case Study Context: UC Berkeley Athletic Study Center
Athletic Study Center Program Theory

UC Berkeley Athletic Study Center (ASC)

- Tutorial Program
- Advising Program
- Academic Development Program

Student athletes are retained

Student athletes are academically successful

Student athletes feel a sense of belonging

Student athletes graduate

Student athletes have post-grad plans

Student athletes graduate as independent, self-reliant, successful young adults
Research Questions:

1. How can evaluators construct and analyze measures in a way that improves both the multicultural (Kirkhart, 2005) and psychometric validity (American Psychological Association, 2014) of program evaluations?

2. How can an evaluator apply the latent growth item response model (LG-IRM) to analyze pre-post data in a way that aligns with a culturally competent evaluation approach?
The Four Building Blocks Approach (Wilson, 2005)

- Principle 1: Developmental Perspective

- Principle 2: Match between Instruction and Assessment

- Principle 3: Management by Teachers

- Principle 4: Evidence of High Quality Assessment
Building Block #1: Construct Development

- Input from program staff
- Bi-weekly Observation of Freshman Seminar for Student Athletes
- Document Review of Seminar Syllabus and Course Textbook
- Literature Review of Existing Measures of ‘Self-Reliance’ & ‘Sense of Belonging’
<table>
<thead>
<tr>
<th>Level 1 (Low)</th>
<th>Community Enthusiasm</th>
<th>Identity Acceptance</th>
<th>Shared Purpose</th>
<th>Recognize Group Dynamics</th>
<th>Interpret External Forces</th>
<th>Holistic Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would never want to participate in on-campus or extracurricular activities</td>
<td>Does not acknowledge or address the challenges that arise from his/her unique identity</td>
<td>Does not acknowledge resources because he/she feels like campus resources outside of the ASC are not meant for students like him/her</td>
<td>Does not realize that different students have different values, and feel alienated as a result</td>
<td>Does not realize that external/political forces impact his/her life and feel alienated as a result</td>
<td>Does not feel that he/she has to abide by certain procedures and protocols for navigating campus spaces</td>
<td>Does not feel that he/she has to abide by certain procedures and protocols for navigating campus spaces and is therefore not aware of how to do so</td>
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<tr>
<td>Level 2</td>
<td>Does not understand why he/she should participate in on-campus or extracurricular activities</td>
<td>Acknowledges, but feels like he/she cannot address the challenges that arise from his/her unique identity</td>
<td>Is aware of specific campus resources outside the ASC that may help him/her, but does not feel comfortable connecting with such resources</td>
<td>Does not recognize that different students have different values, and tries but struggles to work with others different from him/herself</td>
<td>Is aware that external/political forces may impact his/her life but does not know how to overcome this</td>
<td>Is aware of, but does not know how to follow the procedures and protocols for navigating campus spaces</td>
</tr>
<tr>
<td>Level 3</td>
<td>Is hesitant to, but still participates in on-campus or extracurricular activities</td>
<td>Accepts that there are challenges that result from his/her unique identity but does not consistently address them</td>
<td>Has made appointments, but still needs encouragement from others to connect with the campus resources outside the ASC to best meet his/her academic and personal needs</td>
<td>Recognizes that different students have different values, but feels like he/she is still learning how to productively engage with students from different backgrounds</td>
<td>Is aware of what kind of external/political forces impact his/her life, but still lets these forces result in feelings of alienation from time to time</td>
<td>Is aware of, but is still learning how to follow the procedures and protocols necessary to navigate campus spaces</td>
</tr>
<tr>
<td>Level 4 (High)</td>
<td>Meaningfully involves him/herself with on-campus or extracurricular activities</td>
<td>Accepts and consistently addresses the challenges resulting from his/her unique identity</td>
<td>Has made appointments and feels comfortable communicating and investing in relevant relationships with campus resources outside the ASC on his/her own</td>
<td>Recognizes that different students have different values, and feels that he/she can understand and productively work with students from backgrounds different from him/herself</td>
<td>Is aware of what kind of external/political forces impact his/her life and does not allow them to derail him/her from finding a community at Cal</td>
<td>Is aware of procedures and protocols, and feels that he/she can successfully navigate campus and community spaces</td>
</tr>
</tbody>
</table>
Building Block #2: Item Design

- Guttman-type items *as opposed to Likert*
- Item stem scenarios grounded in real student athlete experiences
- Item panel with Program Staff
- ‘Cognitive Labs’ with six student athletes
Imagine you are the student athlete in the above scenario, how are you most likely to respond in Panel 3?

a. “Unfortunately, the site visits will be a problem with my schedule. But, I can put together the final presentation, and I will try to work as many site visits into my schedule as possible.”

b. “The site visits are going to be a problem for me. I’ll try to think of some ways to either work it into my schedule or make up for it.”

c. “I’ll probably have to miss a lot of the site visits, and I’m not sure how to make up for that.”

d. “I won’t be able to go do the site visits, so it will just be you two doing that part of the project.”

e. Other, please write:

How are you most likely to feel about the comment in Panel 1: “It looks like everyone else has a group. I guess us three should work together.”

a. Even though my groupmates are different from me, it’s an opportunity for me to show that student athletes work just as hard as everyone else and are great collaborators.

b. My classmates might judge me because I’m a student athlete, but I’ll try to show them that I’ll do my fair share of the work.

c. Hopefully we can all work together. It seems that I always struggle to work with people I don’t know.

d. I always feel like non-student athlete purposely avoid picking me for group projects. I will probably feel uncomfortable during this whole project.

e. Other, please write:
Building Block #3: Outcome Space

- Each item maps onto one characteristic in the Construct Map
- Each option maps on to one of four levels
- Two items created for each characteristic
### Measure = Sense of Belonging

**Characteristic = Group Dynamics**

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Levels</th>
</tr>
</thead>
</table>
| **(GSI Scenario)** If your GSI responded with Option C: “Sure, maybe you and your classmate have the same questions, let’s all sit down together,” how are you most likely to respond? | a) Leave office hours immediately, not wanting to interact with an unfamiliar student.  
  b) Sit in the group but feel hesitant to ask your own questions, letting the classmate ask all their questions.  
  c) Ask the GSI your questions and try to see if your classmate’s questions can help you understand the material.  
  d) Ask both the GSI and your classmate questions about the material, trying to learn as a group.  
  e) Other, please write: | 1. Does not recognize that different students have different values, and disassociates from students that are different from him/herself  
  2. Does not recognize that different students have different values, and tries but struggles to work with others different from him/herself  
  3. Recognizes that different students have different values, but feels like he/she is still learning how to productively engage with students from different backgrounds  
  4. Recognizes that different students have different values, and feels that he/she can understand and productively work with students from backgrounds different from him/herself |
| **(Group Project Scenario)** How are you most likely to feel about the comment in Panel 1: “It looks like everyone else has a group. I guess us three should work together.” | a) I hate group projects. I only want to work with people who I know.  
  b) Hopefully we can all work together. It seems that I always struggle to work with people I don’t know.  
  c) My classmates might judge me because I’m a student athlete, but I’ll try to show them that I’ll do my fair share of the work.  
  d) Even though my groupmates are different from me, it’s an opportunity for me to show that student athletes work just as hard as everyone else and are great collaborators.  
  e) Other, please write: |
PILOT TEST
Building Block #4: Measurement Model/Wright Map

• Analyze data via the Rasch Partial Credit Model
• Validity & reliability analyses using American Psychological Association Standards for Validity (2014)
  • Item fit/Person fit
  • Standard Error of Measurement
  • Internal Consistency
• Visualize data via a Wright Map
Partial Credit Model (Wright and Masters, 1982)

\[ \eta_{pik} = \theta_p - (\delta_i + \tau_{ik}) \]

Why Rasch?
1. Can be analyzed for bias with respect to background variables
2. Identifying problems in respondent comprehension of items or potential guessing/cheating
3. Identifying the failure of some items to contribute to definition of the variable (construct)
4. Objectively comparing values over different populations and time periods – sample free
5. Creates a Wright Map: Places items and persons on the same scale so one can visualize the utility of the items for the sample by seeing how well the items are targeted on the persons. Allows for designing and refining constructs.
REVISE & REPEAT!

- Principle 1: Developmental Perspective
- Principle 2: Match between Instruction and Assessment
- Principle 3: Management by Teachers
- Principle 4: Evidence of High Quality Assessment

Diagram:
- Construct Map
- Item Design
- Wright maps
- Outcome Space
How can an evaluator apply the latent growth item response model (LG-IRM) to analyze pre-post data in a way that aligns with a culturally competent evaluation approach?
62 student athletes took both the pretest and the posttest

- 17 different sports
- 40% identified as female
- 11% identified as international students
- 15% participated in Freshman Edge
- 3% participated in Summer Bridge

### Racial/Ethnic Distribution of Pilot Survey Participants

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Percentage (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>5(3)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>8(5)</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>0(0)</td>
</tr>
<tr>
<td>Native Hawaiian/Pacific Islander</td>
<td>3(2)</td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>63(39)</td>
</tr>
<tr>
<td>Mixed Race</td>
<td>21(14)</td>
</tr>
</tbody>
</table>
Analysis Outline

1) Latent Growth Item Response Model (LG-IRM) using pre/post data (equivalent to the Embretson 1991 model)

2) Differential Item Functioning analyses for both the pretest data and the posttest data

3) Latent regression analyses on key covariates
Andersen’s (1985) ‘Multidistributional’ Model

Ability of Person \( p \) at Time 1, Time 2, and Time 3

Two items per time point

Item parameters for the two items, which are assumed constant over time

Latent variables are assumed to be correlated

Residuals
Emretson’s (1991) Model

Abilities at later time points are decomposed into one dimension for baseline ability.

Dimension representing change between successive pairs of time; explains the additional response variance that cannot be explained by the common ability measure.

Item difficulties remain constant across time.
Linear Model of Change

**Baseline/Initial Status**

- $\theta_{p1}$
- $\theta_{p2}$

**Linear Growth**

- $x_{1p1}$
- $x_{2p1}$
- $x_{1p2}$
- $x_{2p2}$
- $x_{1p3}$
- $x_{2p3}$

**Additional Growth Parameter**;
represents the change in the person’s magnitude of the latent ability

\[
\logit(P_{ip1}) = \theta_{p} + 0\eta_{p} - \delta_{i},
\]
\[
\logit(P_{ip2}) = \theta_{p} + 1\eta_{p} - \delta_{i}, \text{ and}
\]
\[
\logit(P_{ip3}) = \theta_{p} + 2\eta_{p} - \delta_{i},
\]

**Constraint to obtain a linear model of change**

$\eta_{p2} = \eta_{p3} = \eta_{p}$
### Self-Reliance LGIRM Person Parameter Estimates

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Mean</th>
<th>SE</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.794</td>
<td>0.101</td>
<td>0.380</td>
</tr>
<tr>
<td>Growth</td>
<td>0.235</td>
<td>0.114</td>
<td>0.306</td>
</tr>
</tbody>
</table>

### Sense of Belonging Andersen Model Person Parameter Estimates

<table>
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<tr>
<th>Dimension</th>
<th>Mean</th>
<th>SE</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>1.023</td>
<td>0.095</td>
<td>0.333</td>
</tr>
<tr>
<td>Growth</td>
<td>0.004</td>
<td>0.081</td>
<td>0.039</td>
</tr>
</tbody>
</table>
Differential Item Functioning (DIF) Analysis

Unidimensional DIF analysis on both pretest and posttest results for the following groups:

1. Male vs Female
2. Freshman Edge/Summer Bridge Participant vs Non-Freshman Edge/Summer Bridge Participant
3. Non-White vs White

Standards for Determining DIF:

• A: if $\gamma \leq 0.426$ or if $H_0: \gamma = 0$ is not rejected below .05;
• C: if $\gamma \geq 0.638$ and if $H_0: |\gamma| \leq 0.426$ is rejected below .05; and
• B: otherwise
DIF Results

Pre-Test:
• Significant DIF showing that Question 7 is easier for females than males (no DIF in Post)

Post-Test
• Significant DIF showing that Question 11 is easier for females than males (no DIF in Pre)
• Significant DIF showing that Question 12 is easier for non-White student athletes than White student athletes
In the scene below, it’s the end of class and the professor has asked students to organize into groups for the upcoming group project. You’re the only student athlete in the class (wearing the Cal sweatshirt) and don’t know your other classmates. You are approached by two classmates who always sit in the front of the class.

7. Please select the option that best describes how you feel about the comic scenario:
   a. The group project for this class will be challenging for me, but I am confident that I can plan my time and utilize the resources I need to help me do well in the course.
   b. There might be some challenges with fitting in all the work that is required, and I’m not sure if I can figure out how to manage everything.
   c. I can’t fit in all the work that’s required; I should probably drop the course.
   d. The group project will not present any challenges for me; my groupmates will just have to accommodate my schedule.
   e. Other, please write:
In the scene below, you have decided to go to Caltopia to check out the booths and explore campus. Student groups and other organizations are there to talk to students and promote their organization.

1. Imagine that you are interested in going to the kick off meeting, but realize that the event conflicts with dinner plans with your teammates. In general, how are you most likely to react?
   a. You tell your teammates that you must reschedule dinner, and then invite them to come with you to the kickoff meeting instead.
   b. You tell your teammates that you want to go to a meeting related to your major and need to reschedule dinner.
   c. You go to dinner with your teammates, but sign up for the student group’s email list to learn about upcoming events.
   d. You go to dinner with your teammates and don’t reach out to the student group.
   e. Other, please write:
Latent Regression Analysis

**Latent Regression Completed for the Following Coefficients:**

- Female (male reference group)
- Revenue Athletes (non-revenue reference group)
- Non-White Athletes (White reference group)
- Summer Bridge/Freshman Edge Participants (non-participant reference group)
## Latent Regression Results

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Sense of Belonging</th>
<th>Self-Reliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female (male reference)</td>
<td>-0.268 (0.153)</td>
<td>0.109 (0.183)</td>
</tr>
<tr>
<td>Non-White (White reference)</td>
<td>-0.062 (0.149)</td>
<td>0.089 (0.183)</td>
</tr>
<tr>
<td>Revenue Generating (non-revenue generating reference)</td>
<td>0.088 (0.245)</td>
<td>0.169 (0.303)</td>
</tr>
<tr>
<td>Summer Bridge/Freshman Edge (non-participant reference)</td>
<td>0.244 (0.216)</td>
<td>0.393 (0.250)</td>
</tr>
</tbody>
</table>
To Summarize

1. Evaluators can better engage with culture via quantitative methods through engaging stakeholders in measurement.

2. The Four Building Blocks approach provides a framework that allows evaluators to create measures consistent with the essential practices of culturally competent evaluators.

3. By utilizing item response models (including the Rasch model) as part of the measurement approach, evaluators can improve both the psychometric and multicultural validity of evaluations and their measures.

4. The LG-IRM and its extensions produced growth estimates while considering specific contextual factors, thus corresponding to a culturally competent approach.
What’s next...
Thank you!

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