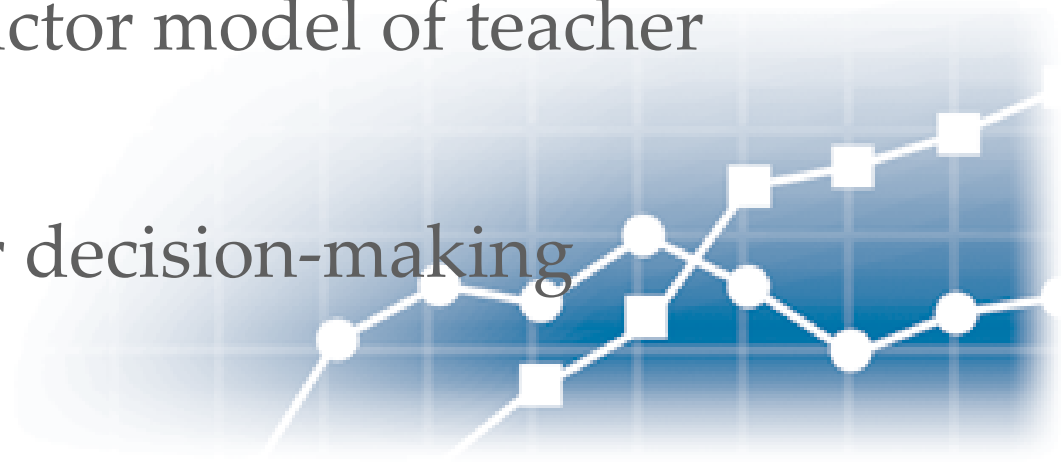


# Can Multifactor Models of Teaching Improve Teacher Effectiveness Measures?

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# Outline

1. Motivation: States adopting “multi-measure teacher evaluation systems” (MMTES)
2. Issues: What are teacher evaluations measuring?
3. Approach: factor analysis of MET data
4. Results: three factor model of teacher effectiveness
5. Implications for decision-making



# Motivation

- Teacher evaluation is currently a major policy issue, driven in large part by DoE requirements (NCLB waivers, RTTT grants).
- States adopt multi-measure teacher evaluation systems (MMTES).
- We need to understand what we are measuring and how to combine various measurements.



# Related Work

- Measures of Effective Teaching (MET) project: Massive data collection and analysis of correlations between various aggregate measures of teacher performance (value-added, observation and survey scores). Correlations are significant positive but small (Kane and Staiger, 2012).
- Optimal composites – weighting summative measures of student achievement, classroom observations, and student surveys - assuming a one-dimensional underlying “teacher effectiveness” (Hansen et al. ,2013; Mihaly et al. , 2013)



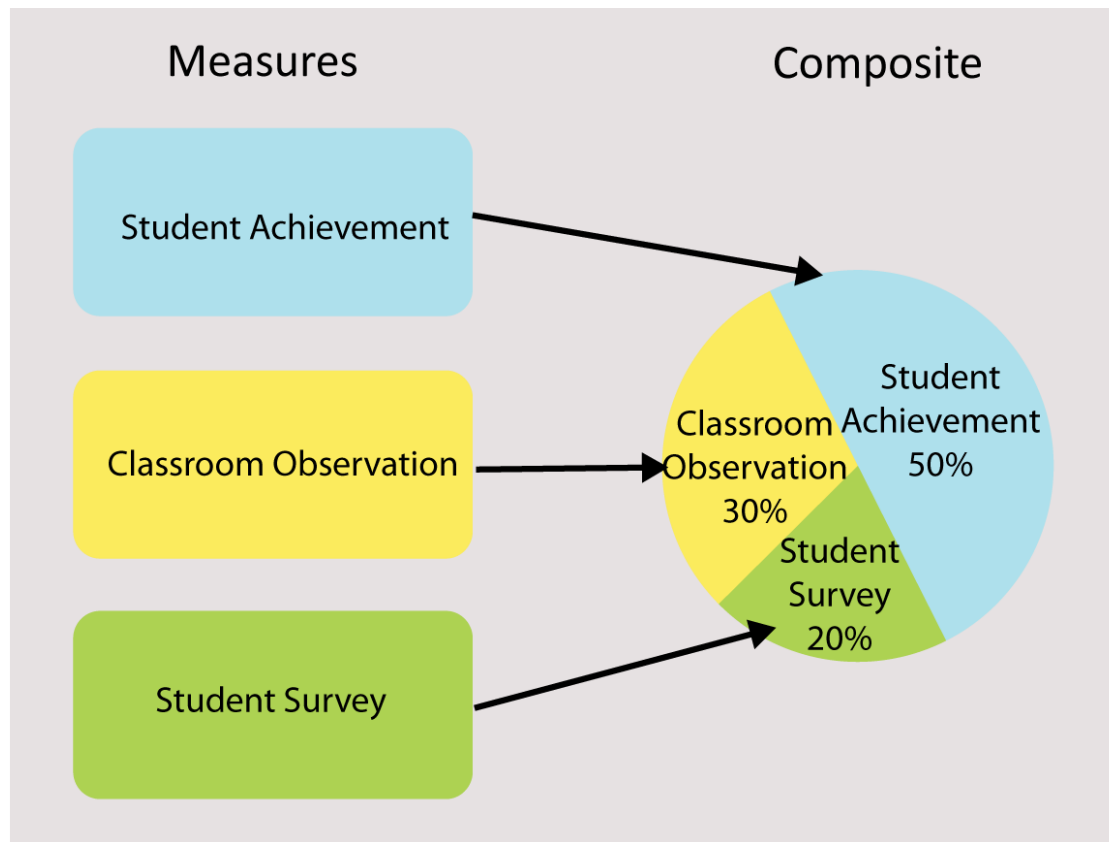
# Questions

- What are we measuring with observations and surveys?
  - What if “teacher effectiveness” is multidimensional?
  - Can we identify a (small) set of underlying factors that are being measured?
- What impact might additional factors, unrelated to test performance, have on the overall effectiveness of our education system?
- How can the factors underlying the evaluation results be used in personnel decisions?



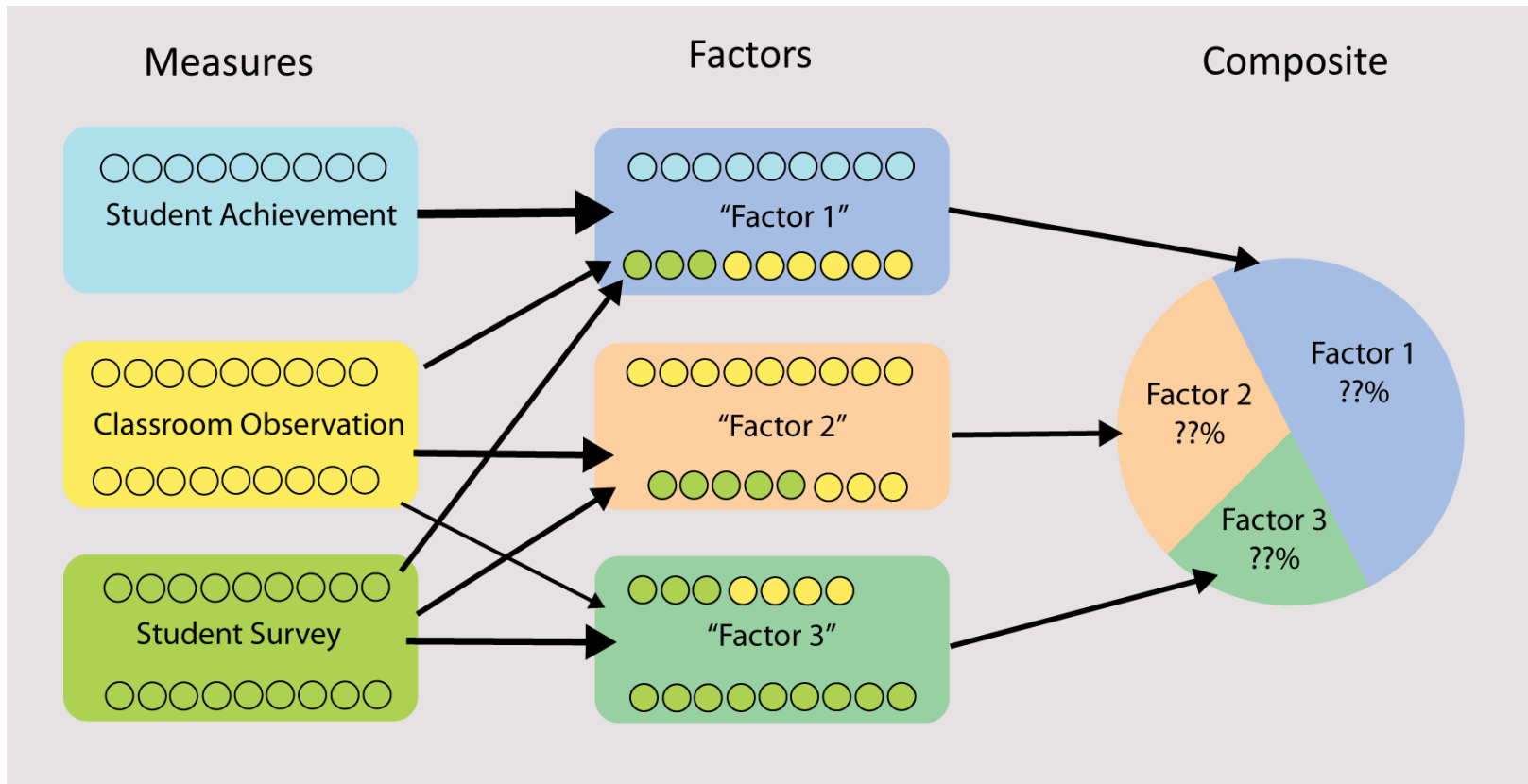
# Combining Measures vs. Singling Out Factors

- Each instrument measures the same concept
- Weights (should) reflect relative reliability of each instrument



# Combining Measures vs. Singling Out Factors

- Each instrument measures one or more underlying concepts/factors
- Summative score is a combination of factor scores



# Approach

- Factor analysis – identify several latent independent (orthogonal) factors
- Assumptions:
  - Several underlying factors/dimensions,  $f$ , of effective teaching
  - Each item measures a combination of factors
  - Only one factor is associated with short-term student achievement gains (teacher value added)
- Method:
  - Factor analysis
  - Target rotation:  $\lambda_{VAM} \sim (1,0,0\dots)$





# Data

- MET data – a “model” of state MMTES
- Middle-school math and ELA teachers assessed on multiple metrics by MET project
- Value-added scores: based on study-administered BAM (math) and SAT9 (ELA) tests
- Observation rubrics:
  - FFT (eight components of two domains: “Classroom environment” and “Instruction”)
  - CLASS (all 12 components).
- Tripod survey (“7C”) – 36 items
- Total 57 measures/variables



# Results

Three factor model:

- Factor 1 (“Effective”): TVA, classroom procedures and behavior management (observation), control (survey)
- Factor 2 (“Constructive”): pedagogical devices (instructional dialog, feedback, and discussion)
- Factor 3 (“Positive”): teacher’s connection to students, students’ positive feelings and perception of the teacher’s empathy (most survey items)



## Measures

### Student Achievement

VAM  
Scores

### Classroom Observation

Classroom  
Procedures

Student  
Behavior

Engaging  
in Learning

Respect  
& Rapport

Communicating  
w/Students

Culture for  
Learning

Questioning  
& Discussion

Using  
Assessment

### Student Survey

CONTROL

CARE

CAPTIVATE

CHALLENGE

CONFER

CONSOLIDATE

CLARIFY

## Factors

### "Effective"

VAM  
Scores

Classroom  
Procedures

Student  
Behavior

Engaging  
in Learning

Respect  
& Rapport

Culture for  
Learning

CONTROL

### "Constructive"

Culture for  
Learning

Communicating  
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Questioning  
& Discussion

### "Positive"

CARE

CAPTIVATE

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CLARIFY



# What Impact Might These Factors Have on the Overall Effectiveness of Education System?

- All three factors may predict student outcomes
- “Effective” – spring test scores
- “Constructive” – study skills, future educational choices?
- “Positive” – longer-term impacts on positive behavior, attendance, and staying in school?
- A fourth factor? – peer interactions and leadership (based on performance outside of classroom – data not available)



# Implications for Personnel Decisions

- Decision-makers should weight the factors depending on the relative value in a particular context.
- For raises and bonuses, a single score with a high weight of test-related factor can be generally useful
- For terminations, a matrix can be used (minimum passing score on each factor)
- A specialist position calls for outstanding scores on “constructive”
- For promotion to a leadership position, the hypothetical fourth factor may be given a higher weight, etc.



# Future Work

- Closer link between theories of teaching and learning and empirical studies of teacher performance data
- Longitudinal data analysis to establish associations between the additional factors and distal outcomes – results will provide a basis for weighting
- Collection and analysis of broader evaluation data sets, in particular, including results of out-of-classroom observation, peer and parent surveys



# Thank you

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