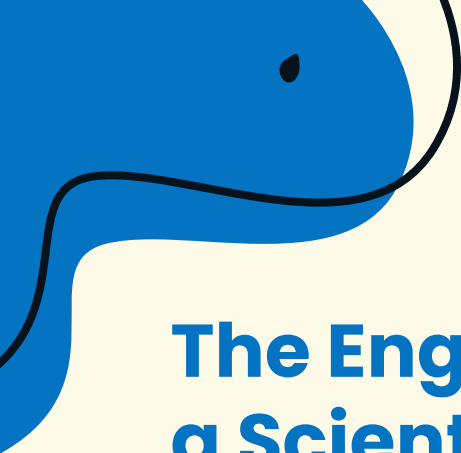





The Engaged Classroom: Using a Scientific Approach to Understand the Impact of Teaching Activities on Students



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Scenario

As an instructor, you want to understand the effectiveness of a new teaching activity.

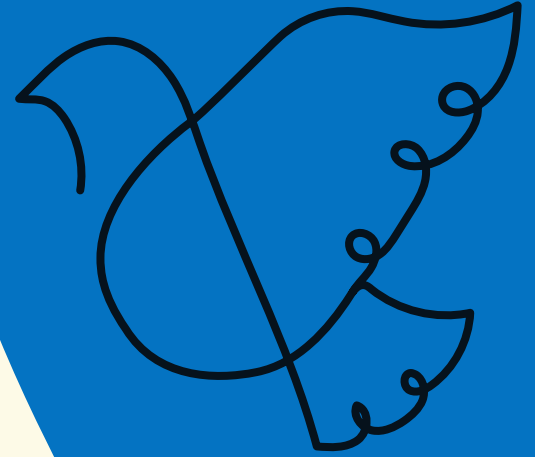
**A specific question:
To what extent does the new teaching activity affect students' engagement?**



What is engagement?

Conceptual Definition

**Student Engagement:
Active, enthusiastic
learners**



How do we get to engagement?

Effective Teachers:

- 1) Demanding
 - a) Articulate & Maintain high expectations for learning
- 2) Intentional
 - a) Know why they're doing what they're doing
 - i) Reflection is a key component here
- 3) Supportive
 - a) Provide a nurturing learning environment
 - i) This also requires meeting students where they're at and challenging them to grow

To what extent does the new teaching activity affect students' engagement?

Data-Driven Decision Making



**Quantitative
Data**



**Qualitative
Data**



Quantitative Data

Before conducting the data collection,

- Identify and define the variable(s) of interest.
- Identify the scale(s)/instrument(s).
- Know how to analyze the data.

Literature plays a very important role.



Quantitative Data - what to collect?

- Observable data
 - E.g., Classroom observation - asking questions, taking notes, responding to questions.
- Unobservable data
 - Use a scale/instrument to quantify the variable

Steps for measuring student classroom engagement

1. Using Google Scholar to identify relevant studies published in good journals.
2. Understand the variable of interest (e.g., classroom engagement).
 - a. Conceptual definition
 - b. Single-dimensional or multi-dimensional
3. Borrow the scale(s) for measuring the variable.
4. Analyze the scores collected by the scale(s) and quantify the variable.



<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1053.8697&rep=rep1&type=pdf>

Students' Classroom Engagement Produces Longitudinal Changes in Classroom Motivation

Using Google Scholar to identify relevant studies published in good journals.

Johnmarshall Reeve and Woogul Lee
Korea University

Changes in motivation anticipate changes in engagement, but the present study tested the reciprocal relation that changes in students' classroom engagement lead to corresponding longitudinal changes in their classroom motivation. Achievement scores and multiple measures of students' course-specific motivation (psychological need satisfaction, self-efficacy, and mastery goals) and engagement (behavioral, emotional, cognitive, and agentic aspects) were collected from 313 (213 females, 100 males) Korean high school students using a 3-wave longitudinal research design. Two key findings emerged from a multilevel structural equation modeling analysis: (a) Students' initial classroom engagement predicted corresponding longitudinal changes in all 3 midsemester motivations, and (b) early semester changes in engagement predicted corresponding longitudinal changes in end-of-semester psychological need satisfaction and self-efficacy, but not mastery goals. Changes in engagement also predicted course achievement. These findings reveal the underappreciated benefits that high-quality classroom engagement contributes to the understanding, prediction, and potential facilitation of constructive changes in students' in-course motivation.

2. Understand the variable of interest (e.g., classroom engagement).

- Conceptual definition
- Single-dimensional or multi-dimensional

- ★ *Behavioral* Engagement
- ★ *Emotional* Involvement
- ★ *Cognitive* Engagement
- ★ *Agentic* Engagement

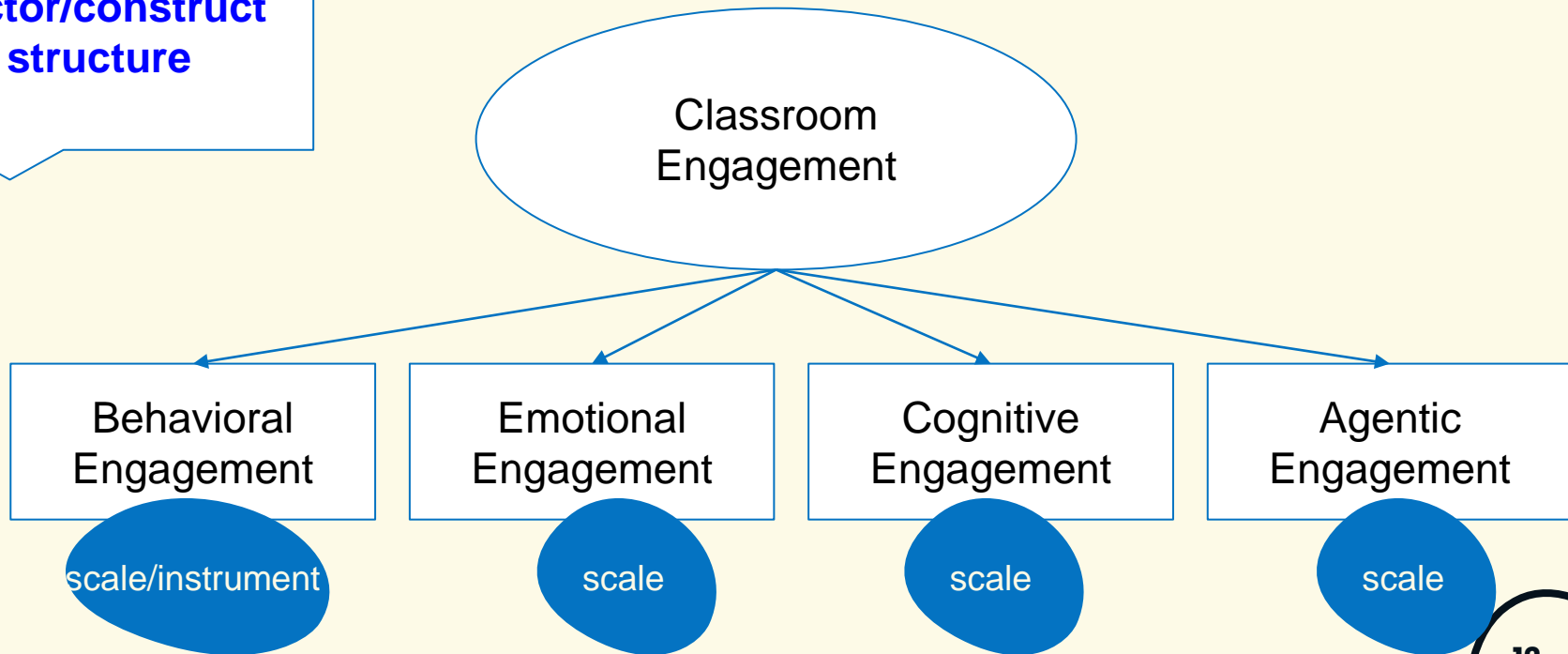
Nature and Function of Classroom Engagement

Engagement refers to a student's active involvement in a learning activity (Christenson, Reschly, & Wylie, 2012). It is a multi-dimensional construct that has been conceptualized as consisting of three, and sometimes of four distinct, yet intercorrelated and mutually supportive aspects of behavior, emotion, cognition, and agency (Christenson et al., 2012; Fredricks, Blumenfeld, & Paris, 2004; Reeve, 2013; Reeve & Tseng, 2011; Skinner, Kindermann, Connell, & Wellborn, 2009). *Behavioral engagement* refers to how effortfully involved the student is in the learning activity in terms of attention, effort, and persistence (Skinner, Kindermann, & Furrer, 2009). *Emotional involvement* refers to the presence of positive emotions during task involvement, such as interest, and to the absence of negative emotions, such as anxiety (Skinner, Kindermann, & Furrer, 2009). *Cognitive engagement* refers to how strategically the student attempts to learn in terms of using sophisticated rather than superficial learning strategies, such as elaboration rather than memorization (C. O. Walker, Greene, & Mansell, 2006). *Agentic engagement* is a fourth and newly proposed aspect of student engagement that refers to the extent of the student's constructive contribution into the flow of the instruction they receive in terms of asking questions, expressing preferences, and letting the teacher know what one wants and needs (Reeve, 2013).

Literature says classroom engagement is a *multi-dimensional construct*.






Factor/construct structure



3. Borrow the scale(s) for measuring the variable.

Classroom engagement. We assessed four interrelated aspects of students' classroom engagement—behavioral, emotional, cognitive, and agentic. For both behavioral and emotional engagement, we used the **Behavioral Engagement and Emotional Engagement scales** from Skinner, Kindermann, and Furrer's (2009) **Engagement vs. Disaffection with Learning** measure. **The Behavioral Engagement scale** includes the following three items ($\alpha = .82$ at T1, and $\alpha = .80$ at T2): "I try hard to do well in this class"; "In this class, I work as hard as I can"; and "I pay attention in class." **The Emotional Engagement scale** includes the following three items (α s = .88 and .88): "When I am in this class, I feel good"; "When we work on something in this class, I feel interested"; and "I enjoy learning new things in this class." Scores from both scales have been shown to correlate with constructive motivations (e.g., psychological needs) and to predict course grades (Jang et al., 2009; Miserandino, 1996; Skinner, Kindermann, Connell, & Wellborn, 2009; Skinner, Kindermann, & Furrer, 2009).



For **cognitive engagement**, we used Wolters' (2004) Metacognitive Strategies questionnaire (adopted from Pintrich, Smith, Garcia, & McKeachie's, 1993, Motivated Strategies for Learning Questionnaire). The Metacognitive Strategies scale includes the following three items (α s = .77 and .80): "Before starting an assignment for this class, I try to figure out the best way to do it"; "In this class, I keep track of how much I understand the work, not just if I am getting the right answers"; and "If what I am working on in this class is difficult for me to understand, I figure out how to change the way I learn the material." Scores from this measure have been shown to correlate with constructive motivations (e.g., mastery goals) and to predict outcomes such as course grades (Reeve & Tseng, 2011; Wolters, 2004).



For **agentic engagement**, we used the Agentic Engagement Scale (Reeve, 2013). The Agentic Engagement Scale includes the following three items (α s = .80 and .84): “During this class, I ask questions to help me learn”; “I let the teacher know what I am interested in”; and “During this class, I express my preferences and opinions”). Scores from this scale have been shown to correlate with constructive motivations (e.g., self-efficacy) and to predict outcomes such as course grades (Reeve & Tseng, 2011).



Some considerations

- Can I measure one or some of dimensions of classroom engagement?
- Evaluate the scale (e.g., psychometrics properties, appropriateness).
- What kind of data analysis should be done? (Look for collaboration)
 - Factor analysis: To confirm whether the data support the factor structure.
 - Reliability analysis: To determine the score reliability, e.g., Cronbach's alpha.
- Can I compute and use the total scores?



Qualitative Methods



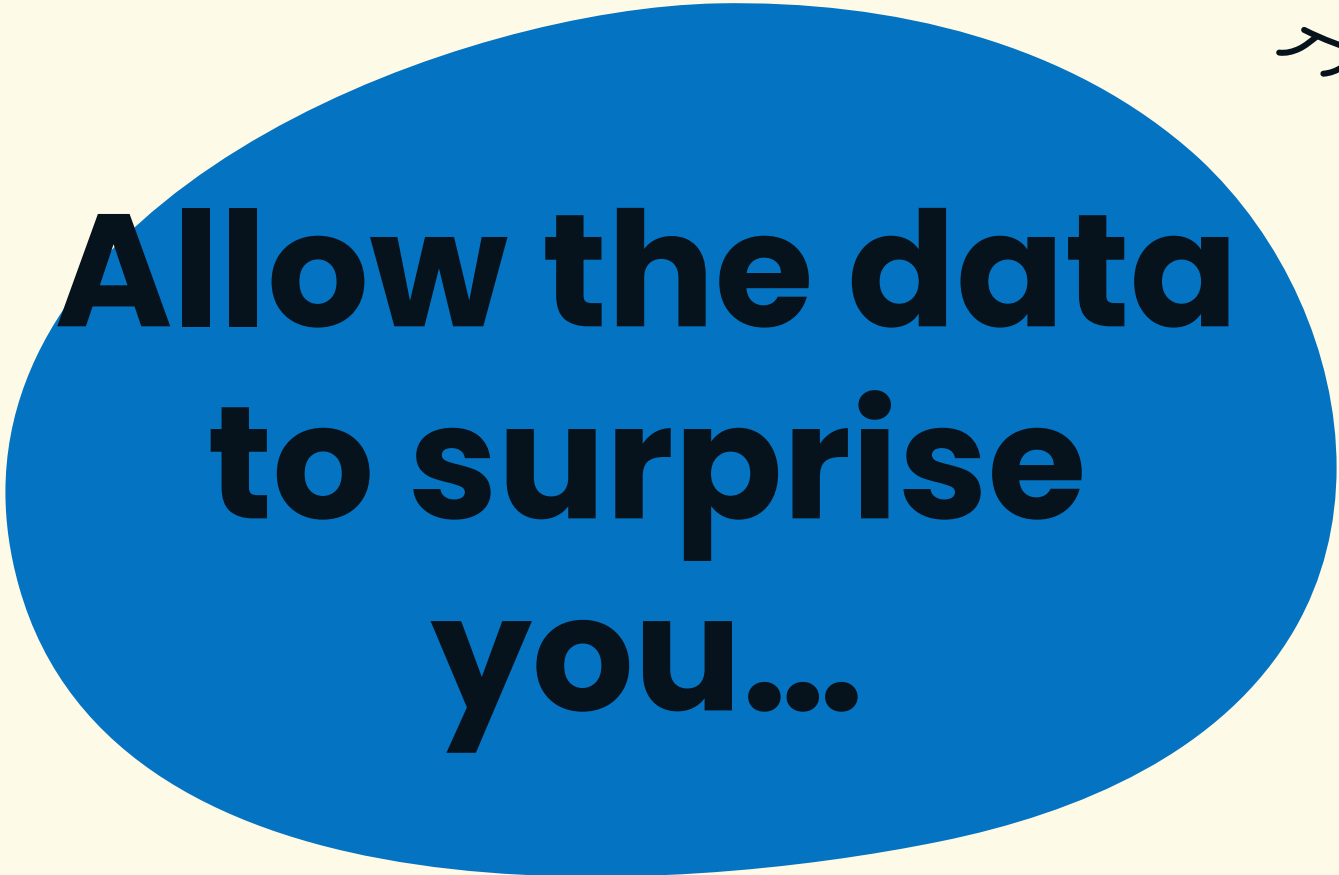
Qualitative methods attempt to collect information about the social world that cannot be readily converted to numeric form.

To ensure a rich data set, sociologists rely on data triangulation using multiple methods (these can be quantitative, qualitative, or a mix of the two).



Qualitative Data

- Observable data
 - Collected using observations
- Unobservable data
 - Collected using in-depth interviews, long-form surveys with open-ended questions and short answer questions, focus groups, and oral histories





**Allow the data
to surprise
you...**





Facts in observation

- There is no *true* social reality. Rather what we see, hear, and experience is open to interpretation.
- Two or three people may observe the same phenomenon and notice very different things. And all three will be correct in their description
- One should not try to "reveal the truth" but instead try to understand how people live their lives and make meaning



Meaning-making

- Within qualitative research, we search for how people make meaning and how they understand social phenomenon.
- This is not only about definitions, stories, or opinions, but rather when, where, and how people use these definitions, stories, and opinions.
- This requires the researcher to put aside preconceived notions and ideas about how they think people will act or what they think is important to others.



Stance

- One's stance is related to one's identity, life experiences, and affiliations
 - Prior experience, training, and commitments influence one's stance
 - This stance can create barriers to understanding what one is observing, feeling, and hearing and how they prioritize this information
- To address one's stance requires that they think through how who they are and what they've experienced color or frame how they view the world

How to measure classroom engagement?



Using qualitative methods to develop a survey measure of math and science engagement



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ABSTRACT

Student engagement in math and science is vital to students' academic achievement and long-term participation in science, technology, engineering, and mathematic (STEM) courses and careers. In this study, we conducted in-depth interviews with 106 students from sixth to twelfth grade and 34 middle and high school teachers about how they conceptualized math and science engagement and disengagement. Our qualitative analysis of student and teacher interviews supported the multidimensional construct of engagement outlined in the academic literature. Our analysis also revealed additional indicators that have been included in prior measures of engagement less frequently. We then described how we used this qualitative information from students and teachers to develop and validate a new student self-report measure of math and science engagement.

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Activity



Use the marshmallow challenge to teach students collaboration skills. You also expect to see students are more engaged in the class.

How would you assess/evaluate this new activity in your class? When would you conduct the evaluation? Where would you conduct it? How would you collect quantitative and qualitative data to define and measure collaboration skills and engagement? What other variables do you think are important to include in this evaluation? What challenges do you think you will run into?

Marshmallow Challenge





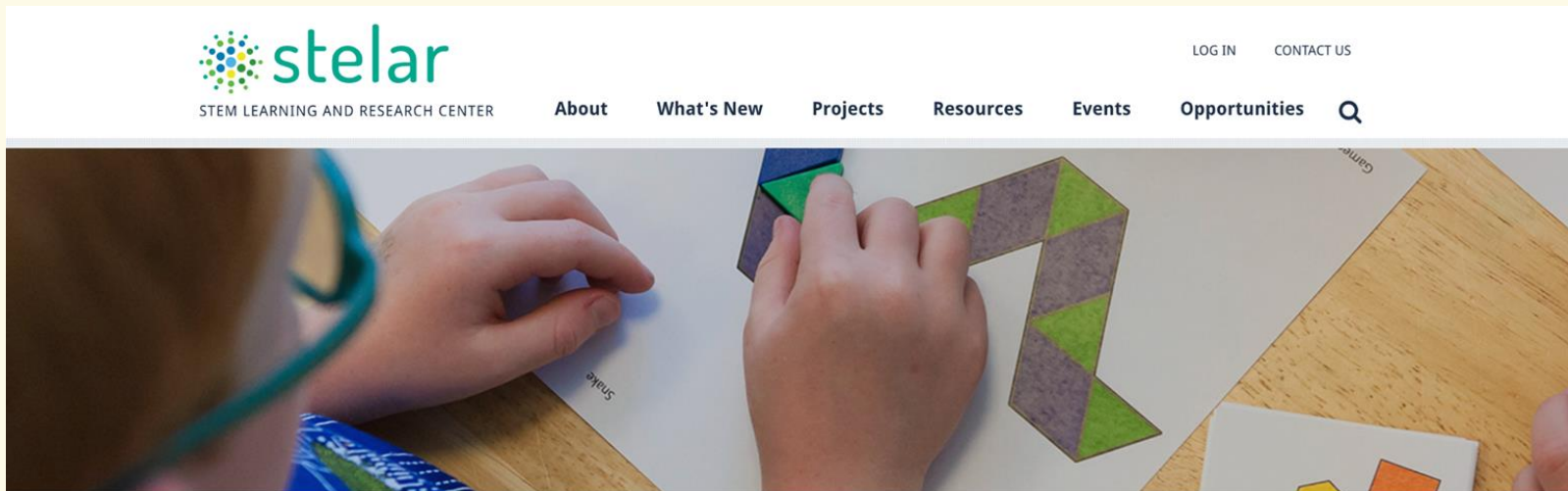
Additional Resources





Resources for finding instruments

<http://stelar.edc.org/resources/instruments>





Resources for finding instruments

<https://csedresearch.org/>

The screenshot displays the website's header and navigation area. At the top left is the logo for **csedresearch.org**. To its right are links for [About](#), [Our Board](#), and [Our Sponsors](#), followed by a red **DONATE** button. Below this is a secondary navigation bar with links for [Evaluation Instruments](#), [Article Summaries](#), [Conducting Research](#), and [Our Research](#). A blue horizontal bar contains the text **Evaluatio** on the left and a search bar on the right with the placeholder text **Find Instruments** and a magnifying glass icon. A dropdown menu is open under **Evaluation Instruments**, listing [Search All](#), [Computing Summary Table](#), and [Submit New](#).

Build a tower, build a team





Additional resources

- Ablá & Fraumeni. (2019). Student Engagement: Evidence-based strategies to boost academic and social-emotional results (<https://files.eric.ed.gov/fulltext/ED600576.pdf>)
- Bae & Kokka. (2016). Student Engagement in Assessments: What Students and Teachers Find Engaging. Stanford, CA. Stanford Center for Opportunity Policy in Education and Stanford Center for Assessment, Learning, and Equity. (<https://edpolicy.stanford.edu/sites/default/files/publications/student-engagement-assessments-final.pdf>)
- Marshmallow Challenge (<https://dschool.stanford.edu/resources/spaghetti-marshmallow-challenge>)
- AAC&U High Impact Practices (<https://www.aacu.org/publication/high-impact-educational-practices-what-they-are-who-has-access-to-them-and-why-they-matter>)
- Lang. (2021). Attention is Achievement: How to help students stay present and focused in class. (<https://www.aacu.org/article/attention-is-an-achievement>)
- Dedman, Ben. 2021. A Spectacular Failure or Something Truly Remarkable: Project-based creative inquiry at Lehigh University (<https://www.aacu.org/article/a-spectacular-failure-or-something-truly-remarkable>)
- Stanford Tomorrow's Professor Postings. "Quantitative and Qualitative and Assessment Methods." (<https://tomprof.stanford.edu/posting/1199>)