

EDUC 231D

Advanced Quantitative Methods: Multilevel Analysis

Winter 2025

Multilevel Models and Critical Quantitative Analysis

Lecture 15 Presentation Slides

February 27, 2025

Today's Topics

- Critical Quantitative Literacy
- Where do multilevel models come in?

Critical Quantitative Literacy

What is Critical Quantitative Literacy (CQL)?

- CQL is “the ability to read and produce quantitative research with a critical eye toward remediating the ways in which quantitative methods continue to perpetuate an oppressive status quo.” (Frisby, 2024)
- Supported by two frameworks
 - CritQuant: applying critical approaches to quantitative inquiry (quantitative criticalism)
 - QuantCrit: applying critical race theory to quantitative data and quantitative methodology

What is CritQuant?

- CritQuant stems from conflict theory in sociology that centers class struggle (Boveda, 2023)
- Also influenced by traditions of equity-oriented or social justice-aligned approaches to quantitative methodology (Diemer et al., 2024)
- Social transformation is central to CritQuant, and social transformation must be toward equity, but the type of equity focused on is left to the researcher (Frisby, 2024)

CritQuant: Three overarching commitments

(Stage, 2007; Stage & Wells, 2014)

1. Use data to represent educational processes and outcomes on a large scale to reveal inequities and to identify social or institutional perpetuation of systemic inequities in such processes and outcomes
2. Question the models, measure, and analytic processes of quantitative research in order to offer competing models, measures, and analytic practices that better describe the experiences of those who have not been adequately represented
3. Conduct culturally relevant research by studying institutions and people in context

CritQuant: Five guiding principles

(Diemer et al., 2024)

1. **Foundation.** Grounded in both critical theories and quantitative methods throughout the research process
2. **Goals.** Advance and reformulate critical theories and quantitative methodologies
3. **Parity.** Quantitative methods do not have more inherent truth or rigor than qualitative methods
4. **Subjectivity.** The research enterprise and quantitative methods are political and subjective
5. **Self-reflexivity.** Structured researcher self-reflexivity is necessary

CritQuant: Five guiding principles

Table 1. Five principles guiding critical quantitative methods.

Principle	Definitions	Considerations
Foundation	CritQuant scholarship should be thoroughly grounded in both critical theories and quantitative methods, throughout the research process	Is the work grounded in specific critical theories, that are rigorously reviewed and frame the study? Is a specific quantitative approach being implemented? Is CQ thoroughly incorporated in the research, from the planning to the interpretation phases?
Goals	CritQuant scholarship aims to advance and reformulate critical theories and quantitative methodologies	Is the work socially just and aiming to advance equity? How does this research advance critical theory? How does this research advance quantitative methods? Do the goals advocate for future applications of quantitative methods in socially just ways? <i>Note: Not every research project needs to equally address quantitative methodology and critical theory</i>
Parity	Quantitative methods do not have more inherent truth or rigor than qualitative methods	Are quantitative methods appropriate for the research question? Is this research question better answered with qualitative or mixed-methods research? Has the potential contribution of qualitative research in subsequent research been articulated? Has qualitative research been included in the literature review?
Subjectivity	Research enterprise and quantitative methods are political and subjective	Is the context of the research and findings addressed? Have limitations to the generalizability of the data been considered?
Self-reflexivity	Structured researcher self-reflexivity, such as in positionality statements, is necessary across the research enterprise	How has the author(s) indicated how positionality(ies) relates to the research? Has the author considered how the research could be enhanced by incorporating insights from other positionalities?

Table from
Diemer et al., 2024

CritQuant: Eight research activities in quantitative criticalism

(Rios-Aguilar, 2014)

1. Ask relevant questions (about equity and power)
2. Choose relevant data
3. Apply appropriate, rigorous, and sophisticated analyses
4. Disaggregate analyses on gender, race/ethnicity, language proficiency, socioeconomic status, and conduct research on several groups of marginalized students
5. Know how to interpret results
6. Employ challenging and enriching theories in multiple disciplines
7. Inform and challenge existing institutional practices and decisions
8. Inform and challenge existing educational policies

What is QuantCrit? Five tenets

Five tenets of QuantCrit (Castillo & Strunk, 2025; Gillborn et al., 2018)

1. Centrality of racism in data, research, and society
2. Numbers are not neutral
3. Categories, like racial groups, are neither “natural” nor given
4. Data cannot “speak for themselves”
5. Social justice/equity orientation

■ See [How to “QuantCrit”](#) (Castillo & Gillborn, 2023) for guidance

CQL in Relation to CritQuant and QuantCrit

Figure from [Frisby \(2024\)](#)

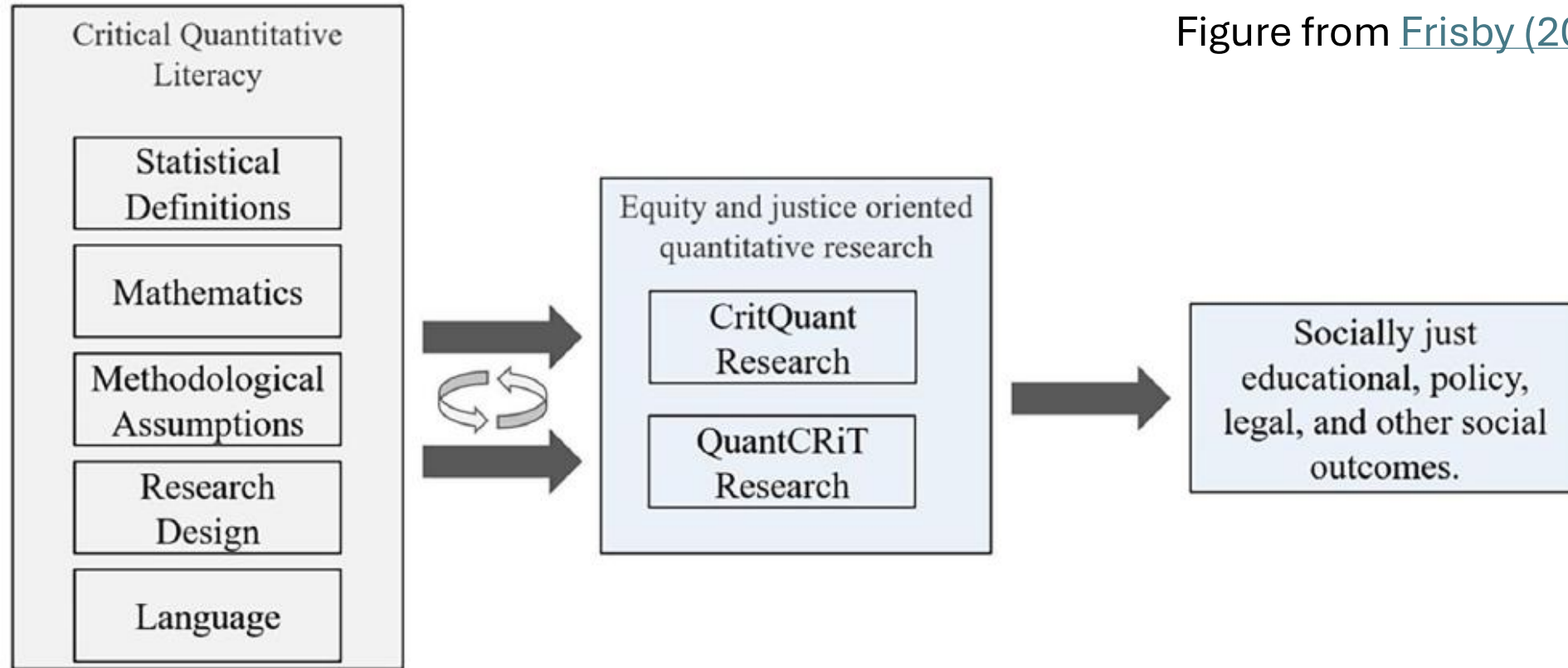


FIGURE 1 *CQL in relation to CritQuant, QuantCrit, and outcomes.*

Note. Critical quantitative literacy (CQL) is proposed as a supplemental paradigm for the CritQuant and QuantCrit frameworks via its critical consideration of statistical definitions, mathematics, methodological assumptions, research design, and language. Symbiotically, research using CritQuant and QuantCrit frameworks may reveal new ways to strengthen CQL. All of these approaches are argued to help produce more socially just outcomes.

Common Strategies Used in CritQuant and QuantCrit Work (Tabron & Thomas, 2023)

1. ***For us by us.*** Voices that have been historically situated in the margins are centered
2. ***Present strength narratives of historically marginalized communities.*** Construct strength-based narratives of historically marginalized communities to refute racialized statistics, disrupt deficit narratives, and racial generalizations
3. ***Ground truthing the data.*** The expertise of the communities informs the entire research process and gives the data its meaning
4. ***Critique social categorizations.*** Critique the causal interpretations of social categories and outcomes in surveys
5. ***Reject the oversimplification of aggregate data.*** Single group sampling and analysis to avoid homogenizing racial groups
6. ***Build multidimensional statistical models.*** Complex constructs warrant the use of dynamic and multidimensional statistical models and finer analyses for various subpopulations

Common Strategies Used in CritQuant and QuantCrit Work (Tabron & Thomas, 2023)

7. ***Critically interrogate measure validation.*** Enact cultural and equity-minded approaches to validating surveys and not norming or validating their instruments among predominantly white male student populations
8. ***Ending the checkbox culture in survey design and administration.*** Develop strategies to overcome grouping students' identities under monolithic categories and excluding LGBTQIA+ and students with immigrant backgrounds
9. ***Presenting a numerically broad picture.*** Use a variety of statistical analyses to produce multiple lines of evidence
10. ***Advanced heterogeneity of variance.*** Develop novel ways of modeling the contextual, structural, situational, and historical variability connected to students' lived experiences
11. ***Model specification and estimation.*** Build models to deconstruct individual and interaction effects to estimate student outcomes

Where Do Multilevel Models
Come in?

Multilevel Models and Critical Quantitative Literacy

- Multilevel models are an explicit and efficient way to address the role of contextual and structural factors
- Multilevel models facilitate exploration of heterogeneity
- Multilevel models facilitate exploration of intersectionality, particularly the intersection between individual characteristics and social context

Multilevel Models and Critical Quantitative Literacy

VISUAL MATRIX OF DOMINATION (Collins 2009)

Part 1: Intersecting Systems of Oppression

-Colonization-Patriarchy-Sexism-Structural Racism-Nativism-Ableism-

Part 2: Arrangements of Power

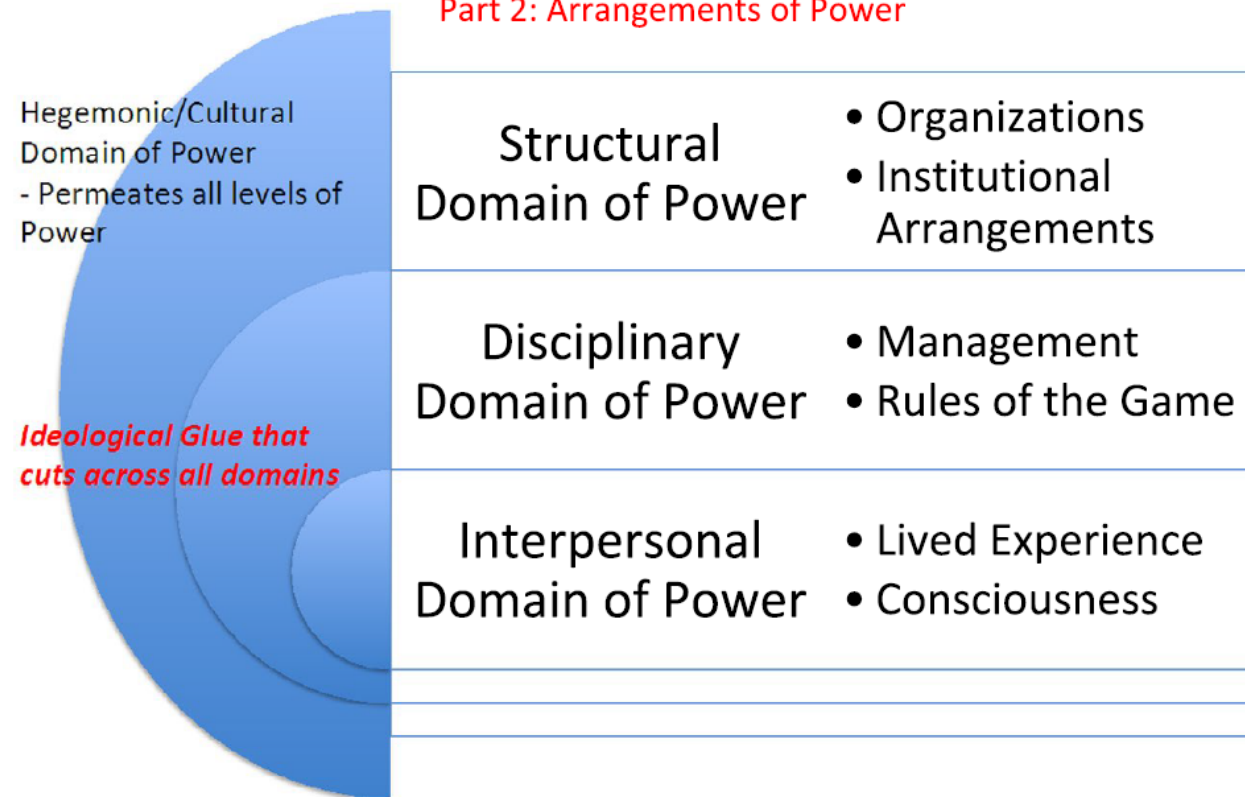


Figure from [Lopez et al. \(2017\)](#)

Figure 1. Visualizing the matrix of domination.

Multilevel Models and Critical Quantitative Literacy

“By incorporating context directly into the regression model as a higher-order level of analysis, multi level regression offers the most sophisticated, and analytically elaborate, means of addressing context.” (Scott & Siltanen, 2017)