Welcome!

Take a moment to introduce yourself.

AIR®
American Institutes for Research®

Motivate Lab

Objectives for Today's Webinar

During today's webinar, the presenter will:

1. Elaborate a five-step procedure for systematically assessing fidelity in the context of program evaluation
2. Describe the advantages of assessing fidelity with this approach when conducting evaluations of educational programs
3. Use examples to illustrate how this procedure may be applied

Orientation to the Adobe Connect Platform

Today's Webinar

- Webinar will last approximately 75 minutes and is being recorded.
- Recording will be available soon on the CADRE website.
- We will ask you to fill out a feedback survey following the webinar.

Today's Webinar

- Listen-only mode
- Use Q&A/Chat Pod to submit content and technical questions at any time
- Q&A session at end of presentation

Today's Webinar

- To see this most clearly, you may want to use the "Full Screen" button in the upper right of the presentation pod.
- In order to submit a question, you will need to click the "Full Screen" button again to resume normal view.

Background on This Webinar Series

- Funded by the National Science Foundation
- We offered 1 webinar in March 2019
- This webinar is the first in a two-part series we are offering this month
- Will offer an additional 4 webinars in 2020
- Goal is to increase rigor of research methods within the DKR-12 program
- Hosted by American Institutes for Research with a variety of internal and external experts

Meet the Presenter

Chris Hulleman

Director and Associate Professor

Motivate Lab

University of Virginia

chris.hulleman@virginia.edu

Evaluating Program Implementation

Dr. Chris Hulleman

10/1/2019

UVA CURRY SCHOOL of EDUCATION

Agenda

1. Objectives and introductions
2. What is fidelity?
3. Dimensions of intervention fidelity
4. How to assess fidelity
5. Logic models

WHAT IS FIDELITY AND WHY SHOULD YOU CARE?

Binge Drinking*

**** ≥ 5 drinks in 2 hours (male), or ≥ 4 drinks in 2 hours (female)***

44%

91%

Binge Drinking*

**** ≥ 5 drinks in 2 hours (male), or ≥ 4 drinks in 2 hours (female)***

44%

of college students binge-drink

91%

Binge Drinking*

**** ≥ 5 drinks in 2 hours (male), or ≥ 4 drinks in 2 hours (female)***

44%

of college students binge-drink

These students consume

91%

of all alcohol reported by college students

Binge Drinking*

**** ≥ 5 drinks in 2 hours (male), or ≥ 4 drinks in 2 hours (female)***

30,000

75%

Binge Drinking*

**** ≥ 5 drinks in 2 hours (male), or ≥ 4 drinks in 2 hours (female)***

30,000

students receive medical care due to alcohol overdose

75%

Binge Drinking*

**** ≥ 5 drinks in 2 hours (male), or ≥ 4 drinks in 2 hours (female)***

30,000

students receive medical care due to alcohol overdose

75%

of females who reported sexual assault were under influence of alcohol

“A Matter of Degree”

(*Weitzman, Nelson, Lee, & Wechsler, 2004*)

Availability

Legal Sanction

Physical Context

Ads & Promotion

Key Influencers

Sociocultural Contexts

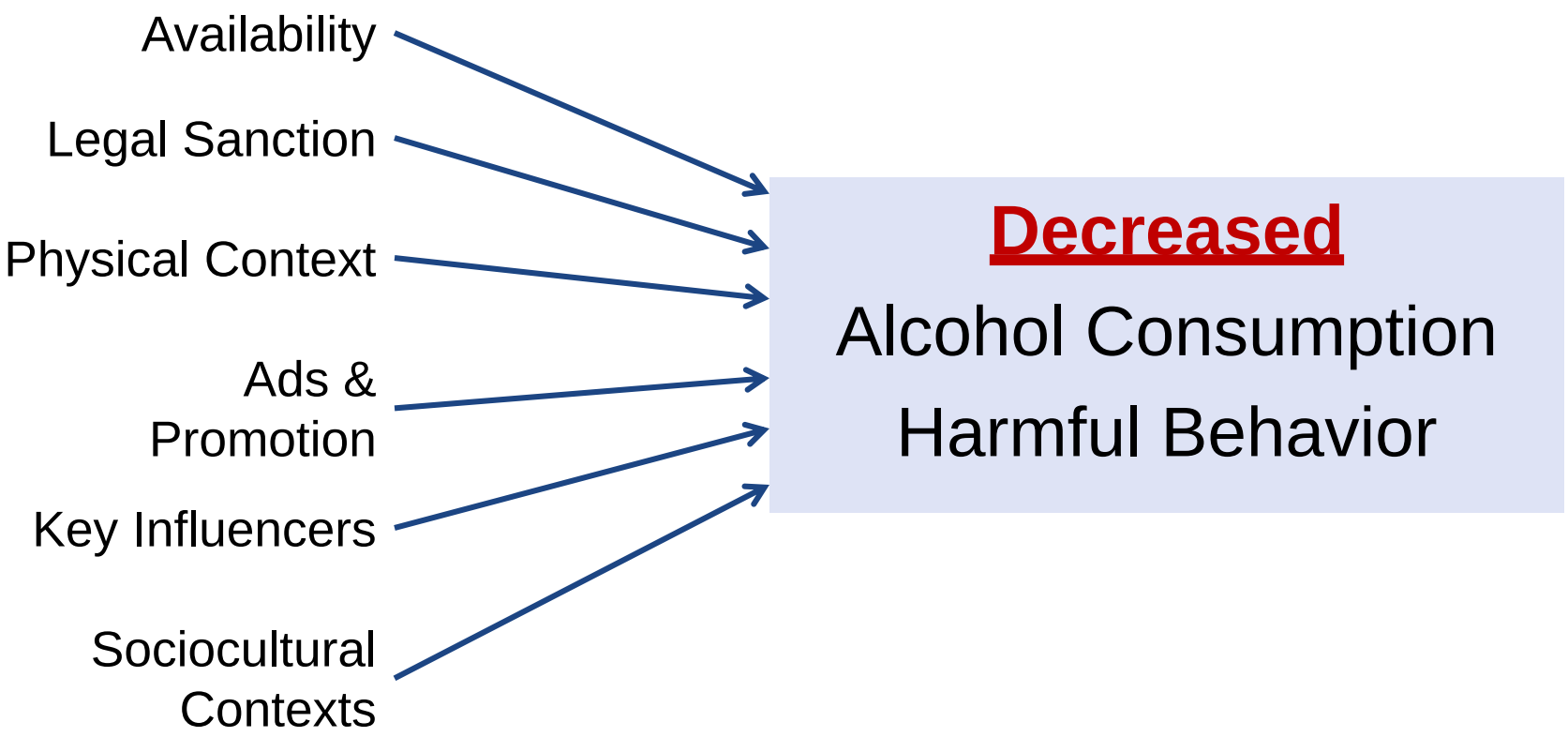
Decreased

Alcohol Consumption

Harmful Behavior

“A Matter of Degree”

(*Weitzman, Nelson, Lee, & Wechsler, 2004*)



“A Matter of Degree”

(*Weitzman, Nelson, Lee, & Wechsler, 2004*)

Program Component	Example Elements
Availability	Keg registration
Legal sanction	Harsh sanctions and policies
Physical context	Substance-free residence halls
Advertising and promotion	Ban on alcohol ads in student newspaper
Key influencers	Faculty outreach Parental notification
Sociocultural contexts	Alcohol-free programming

"A Matter of Degree"

(*Weitzman, Nelson, Lee, & Wechsler, 2004*)

Percent (%) change from 1997 to 2001

Alcohol-Related Outcome	Treatment	Control
Binge drinking		
Drunk ≥3 times in past 30 days		
Drank ≥10 times last 30 days		
Missed a class		
Got in trouble w/Police		
>5 alcohol-related problems		
Assaulted		
Study/Sleep disrupted		

N = 10 Treatment Campuses and 32 Control Campuses

"A Matter of Degree"

(*Weitzman, Nelson, Lee, & Wechsler, 2004*)

Percent (%) change from 1997 to 2001

Alcohol-Related Outcome	Treatment	Control
Binge drinking		+19**
Drunk ≥3 times in past 30 days		+17*
Drank ≥10 times last 30 days		+20*
Missed a class		+9
Got in trouble w/Police		+14
>5 alcohol-related problems		0
Assaulted		-9
Study/Sleep disrupted		-16

N = 10 Treatment Campuses and 32 Control Campuses

"A Matter of Degree"

(*Weitzman, Nelson, Lee, & Wechsler, 2004*)

Percent (%) change from 1997 to 2001

Alcohol-Related Outcome	Treatment	Control
Binge drinking	-13	+19**
Drunk ≥3 times in past 30 days	-18	+17*
Drank ≥10 times last 30 days	-18	+20*
Missed a class	-37	+9
Got in trouble w/Police	-17	+14
>5 alcohol-related problems	-21	0
Assaulted	-7	-9
Study/Sleep disrupted	-12	-16

** $p < .001$. * $p < .05$.

N = 10 Treatment Campuses and 32 Control Campuses

Quantity or Quality?

A Matter of Degree:

Percent (%) change from 1997 to 2001

	Implementation Status		
Alcohol-Related Outcome	**High**	**Low**	**Control**
Binge drinking			+19**
Drunk ≥3 times in past 30 days			+17*
Drunk ≥10 times last 30 days			+20*
Missed a class			+9
Got in trouble with police			+14
>5 alcohol-related problems			0
Assaulted			-9
Study/Sleep disrupted			-16

** $p < .001$. * $p < .05$.

N = 10 Treatment Campuses and 32 Control Campuses

Quantity or Quality?

A Matter of Degree:

Percent (%) change from 1997 to 2001

	Implementation Status		
Alcohol-Related Outcome	**High**	**Low**	**Control**
Binge drinking	-19**	-7	+19**
Drunk ≥3 times in past 30 days	-32*	-3	+17*
Drunk ≥10 times last 30 days	-31**	-4	+20*
Missed a class	-43**	-31**	+9
Got in trouble with police	-25**	-8	+14
>5 alcohol-related problems	-30**	-12	0
Assaulted	-25**	+11	-9
Study/Sleep disrupted	-33**	+9	-16

** $p < .001$. * $p < .05$.

N = 10 Treatment Campuses and 32 Control Campuses

What Is Intervention Fidelity?

The extent to which the program has been implemented as expected

(Dane & Schneider, 1998)

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Fidelity to what?

What Is Intervention Fidelity?

The extent to which the program has been implemented as expected

(Dane & Schneider, 1998)

Fidelity to what?

Fidelity to the Intervention model.

A Note on Terminology

Intervention	Implementation
The program model of interest; designed to create change in the environment • Comprised of core **intervention** components	Activities designed to put into practice core ***intervention*** components (also known as implementation drivers) • Trainer-teacher ratio • Quality of school leadership

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FIDELITY

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Intervention Fidelity

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Intervention Fidelity

Implementation Fidelity

FIDELITY

“A Matter of Degree”

(*Weitzman, Nelson, Lee, & Wechsler, 2004*)

Program Component	Interventions Implemented		Example Elements
	High (n = 5)	Low (n = 5)	
Availability	26	5	Keg registration
Legal sanction	21	4	Harsh sanctions and policies
Physical context	8	2	Substance-free residence halls
Advertising and promotion	7	4	Ban on alcohol ads in student newspaper
Key influencers	16	8	Faculty outreach Parental notification
Sociocultural contexts	79	23	Alcohol-free programming

N = 10 Treatment Campuses and 32 Control Campuses

DIMENSIONS OF INTERVENTION FIDELITY

Dimensions of Intervention Fidelity

1. **Exposure:** How much of the program content was delivered?

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Dimensions of Intervention Fidelity

1. **Exposure:** How much of the program content was delivered?
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Dimensions of Intervention Fidelity

1. **Exposure:** How much of the program content was delivered?
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3. **Quality of the delivery:** How close to the ideal was the quality of the delivery?
4. **Participant responsiveness:** How engaged were the participants during delivery?
5. **Program differentiation:** Are the unique features of the delivered program different from business as usual?

Poll

Dimensions of Intervention Fidelity

(Dane & Schneider, 1998)

Core component: Harsh sanctions

Dimension	Fidelity Measure
Exposure	1. Code (Y/N) whether sanctions were assigned for alcohol violations
Adherence	2. Rate sanction severity before and after new policies put in place, or do comparison with other programs
Quality	3. Rate severity of sanctions for alcohol violations
Responsiveness	4. Record student engagement during educational sessions
Differentiation	5. Rate how well sanction was delivered to students

Dimensions of Intervention Fidelity

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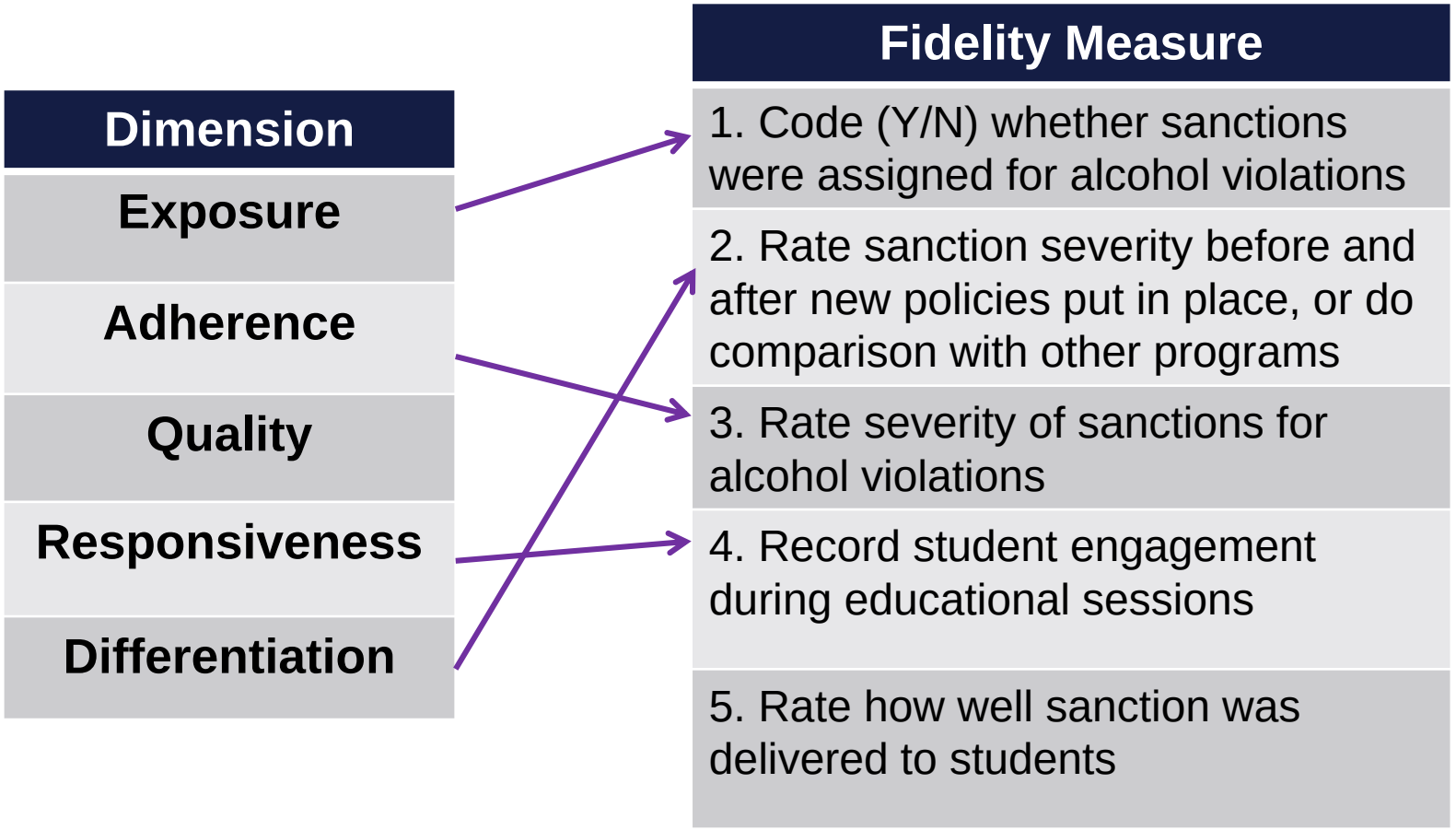

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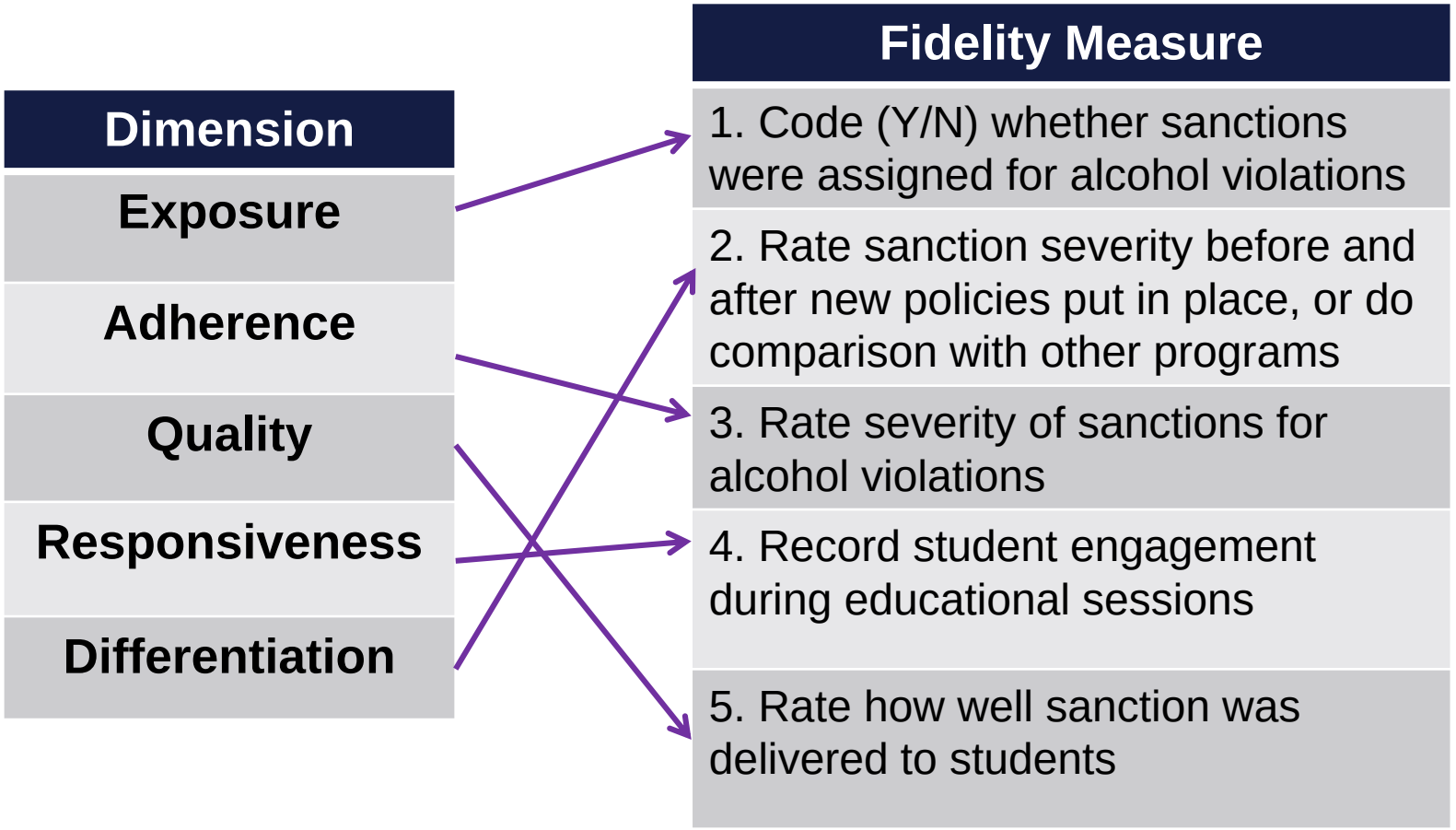
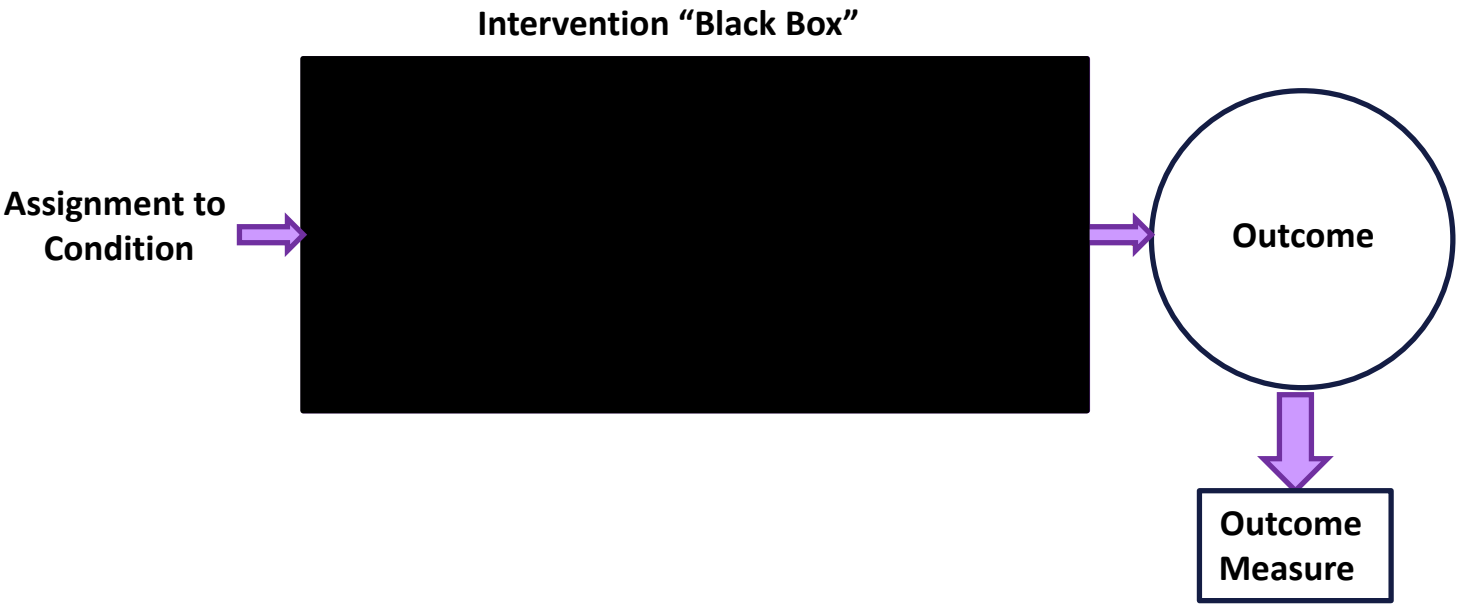
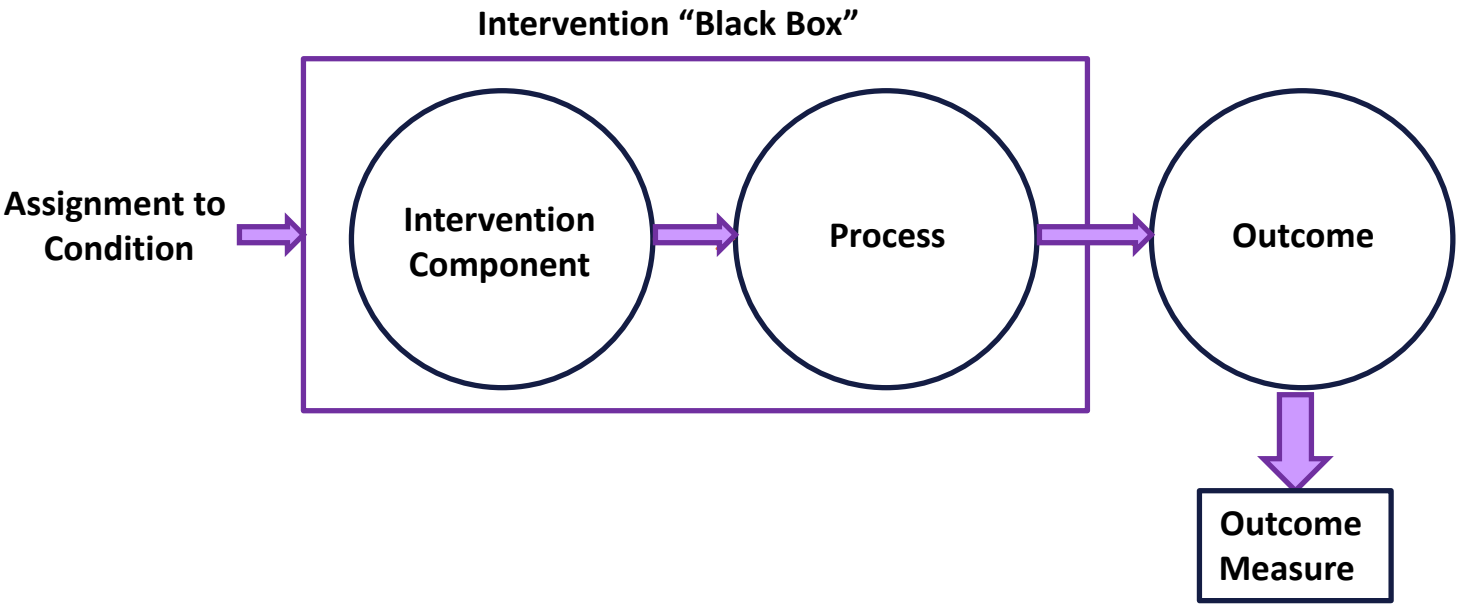


The Intervention Black Box



The Intervention Black Box

Fidelity assessment “opens up” the black box to explain the effects of causes.



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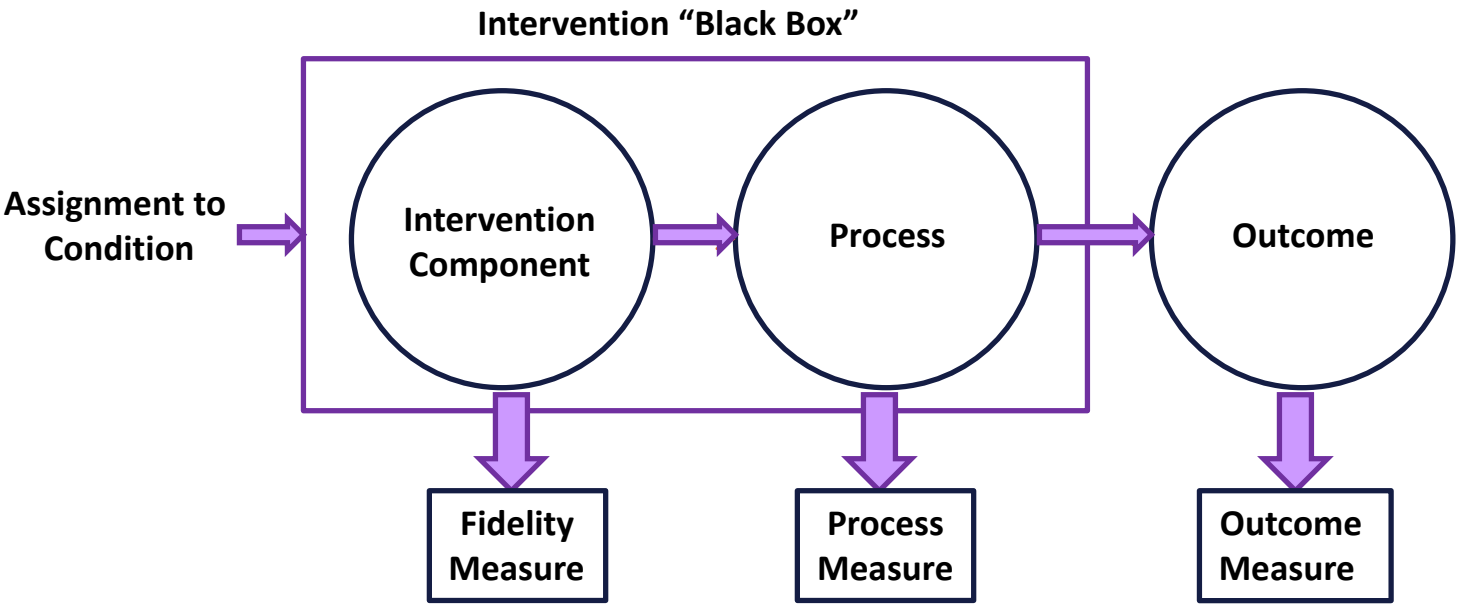

Cause and Effect

- The intervention is the “cause” of a cause-effect relationship.
  - The “what” of “what works?” claims.
- In other words, how valid is our inference about cause and effect (or lack thereof)?
  - Campbell et al.’s Validity Framework
  - Intervention fidelity fits nicely in this framework

Threats to Validity

Four classes of threats to validity of causal inference

Based on Campbell & Stanley (1966); Cook and Campbell (1979); Shadish, Cook, & Campbell (2002).

1. **Construct Validity:**

2. **Internal Validity:**

3. **Statistical Conclusion Validity:**

4. **External Validity:**

For more in-depth discussions see: Hulleman & Cordray (2009); Nelson et al. (2012); Murrah et al. (2017)

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3. **Statistical Conclusion Validity:**
   Is there a correlation (covariation) between the intervention (or the cause) and the outcome?
4. **External Validity:**
   Does the cause-effect relationship hold up over variations in persons, settings, treatment variables, and measured variables?

For more in-depth discussions see: Hulleman & Cordray (2009); Nelson et al. (2012); Murrah et al. (2017)

Check for Learning

In the chat pod, please share:

In 140 characters or less, what is fidelity and why should you care?

HOW TO ASSESS FIDELITY

Five-Step Model of Fidelity Assessment

1. Define the Intervention Logic Models
2. Identify Fidelity Measures
3. Conduct Psychometric Analyses of Fidelity Indices
4. Conduct Within-Group and Between-Group Fidelity Analyses
5. Link Fidelity to Outcomes

Murrah, Kosovich, & Hulleman, 2017; Nelson et al., 2012

Five-Step Model of Fidelity Assessment

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For more information on the 5-Step Model see the handout titled:

Five-Step Model of Fidelity Assessment

DEFINE THE INTERVENTION LOGIC MODEL

Step #1: Specify the Intervention Logic Models

- The conceptual logic model specifies the underlying constructs that should be changed by the intervention, and how they should be changed.
- Acts as the basis for everything else.
- Provides a deep and thorough understanding of the intervention prior to conducting the study.
- Graphical depictions are recommended.

Conceptual Model

Specify each core component, mediating variables, outcomes, and how they should affect each other.

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Example: Mastery quizzes are designed to increase students math self-efficacy, which should then increase their statistics skills.

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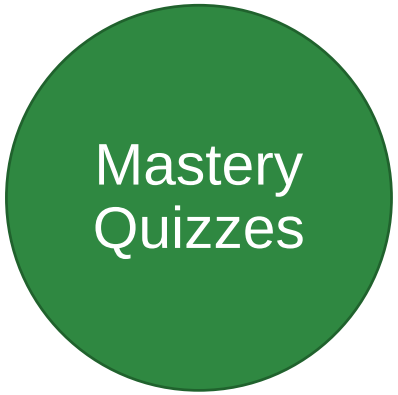

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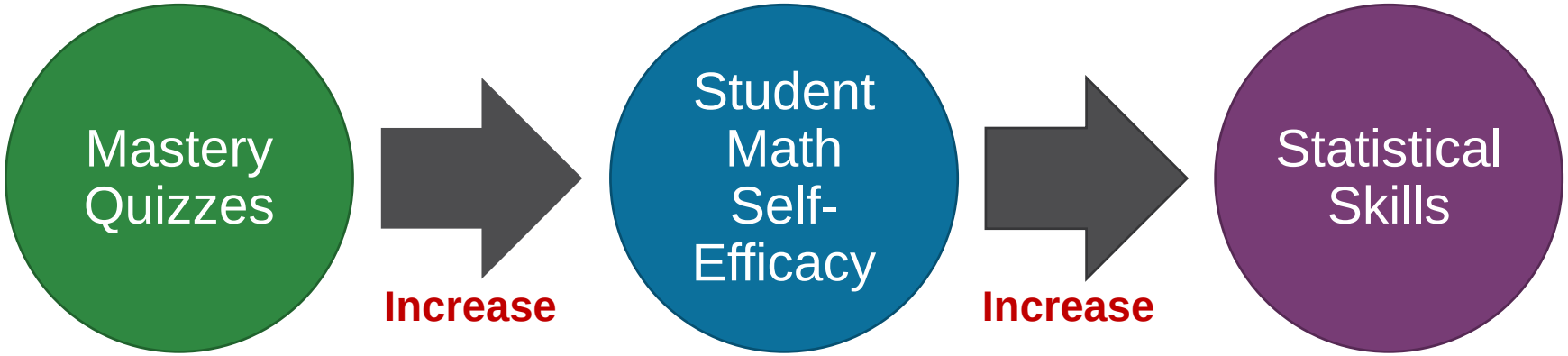
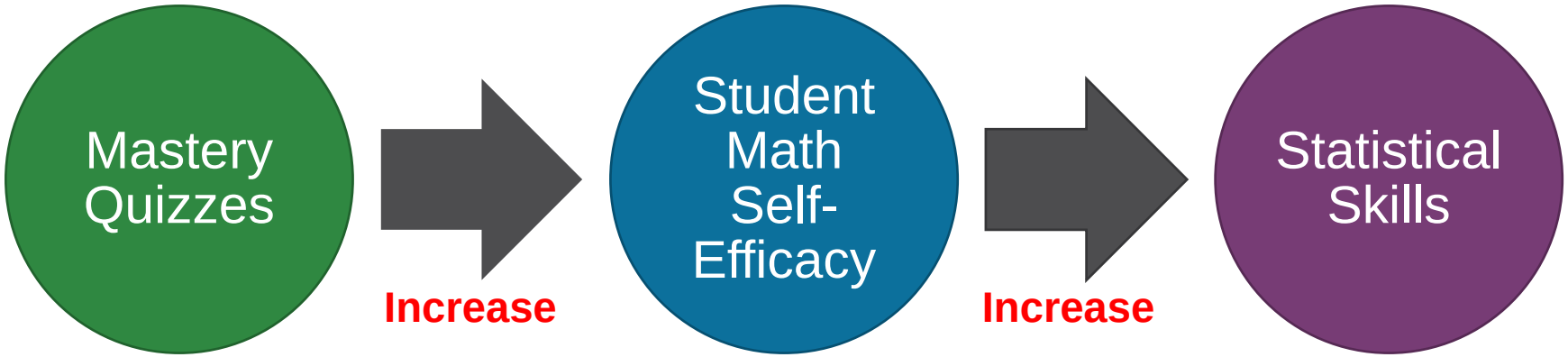


Step #1:

Specify the Intervention Model

- The ***operational logic model*** serves as an operationalization of the components of the change model.
- Serves as a roadmap for implementation – lays out exactly when and how the intervention will be implemented.
- Also serves as the basis for fidelity assessment – each piece should be measured.

Operational Logic Model



20 min at beginning of each class

12 class periods

Will consist of…

As measured by _____ Math Self-Efficacy Scale

As measured by students' final exam scores

Step #1: Specifying Logic Models

Logic models are graphic displays that describe planned action and expected results.

(Knowlton & Phillips, 2009)

Conceptual Logic Models

- General representation of how you believe change will occur
- Outlines major constructs

Operational Logic Models

- Specific representation of change
- Details resources, planned activities, their outputs, and intended outcomes over time

Logic Models 101:

A CASE STUDY OF THE RESPONSIVE CLASSROOM® (RC) APPROACH

Logic Model:

The Responsive Classroom

Inputs	Outputs

Logic Model:

The Responsive Classroom

Inputs		Outputs	
Activities	Implementation	Mediators	Outcomes

Logic Model:

The Responsive Classroom

Inputs		Outputs	
Activities	**Implementation**	**Mediators**	**Outcomes**
RC training and coaching			

Conceptual Model

Conceptual Model

Logic Model:

The Responsive Classroom

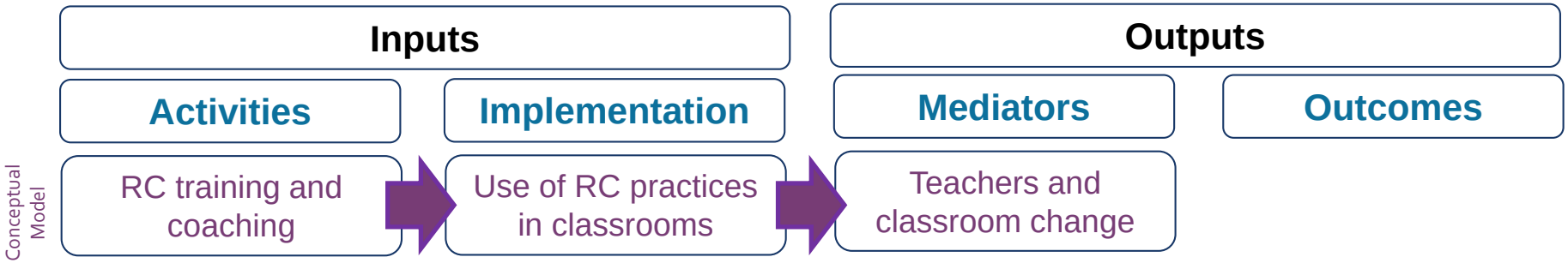
Inputs		Outputs	
Activities	**Implementation**	**Mediators**	**Outcomes**
RC training and coaching	Use of RC practices in classrooms		

Conceptual Model

Conceptual Model

Logic Model:

The Responsive Classroom



Conceptual Model

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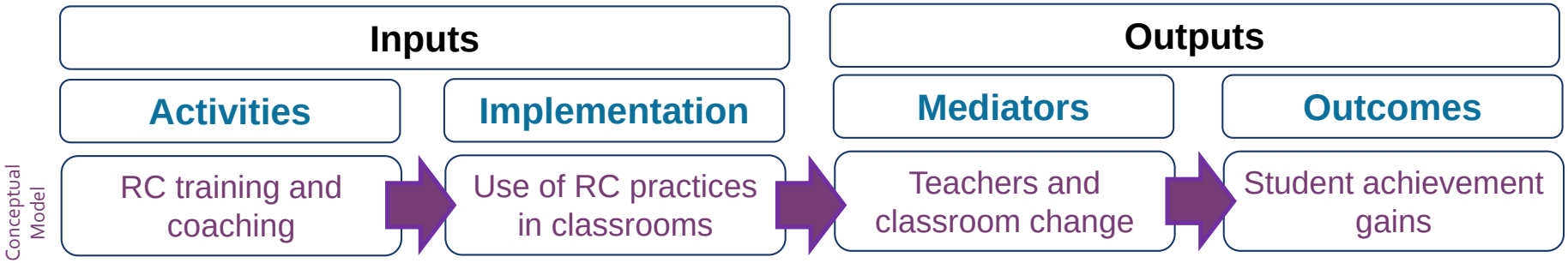

Conceptual Model

Logic Model:

The Responsive Classroom

Conceptual Model

Inputs		Outputs	
Activities	**Implementation**	**Mediators**	**Outcomes**
RC training and coaching	Use of RC practices in classrooms	Teachers and classroom change	Student achievement gains

Operational Model

- Two week-long training sessions
- Three coaching consultations throughout the year
- RC manuals, books and newsletters

Conceptual Model

Operational Model

Logic Model:

The Responsive Classroom

Conceptual Model

Inputs		Outputs	
Activities	**Implementation**	**Mediators**	**Outcomes**
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Operational Model

• Two week-long training sessions • Three coaching consultations throughout the year • RC manuals, books and newsletters	• Morning meetings • Classroom organization • Interactive modeling • Academic choice • Working with families • Collaborative problem solving • Logical consequences • Guided discovery

Conceptual Model

Operational Model

Logic Model:

The Responsive Classroom

Conceptual Model

Inputs		Outputs	
Activities	**Implementation**	**Mediators**	**Outcomes**
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Operational Model

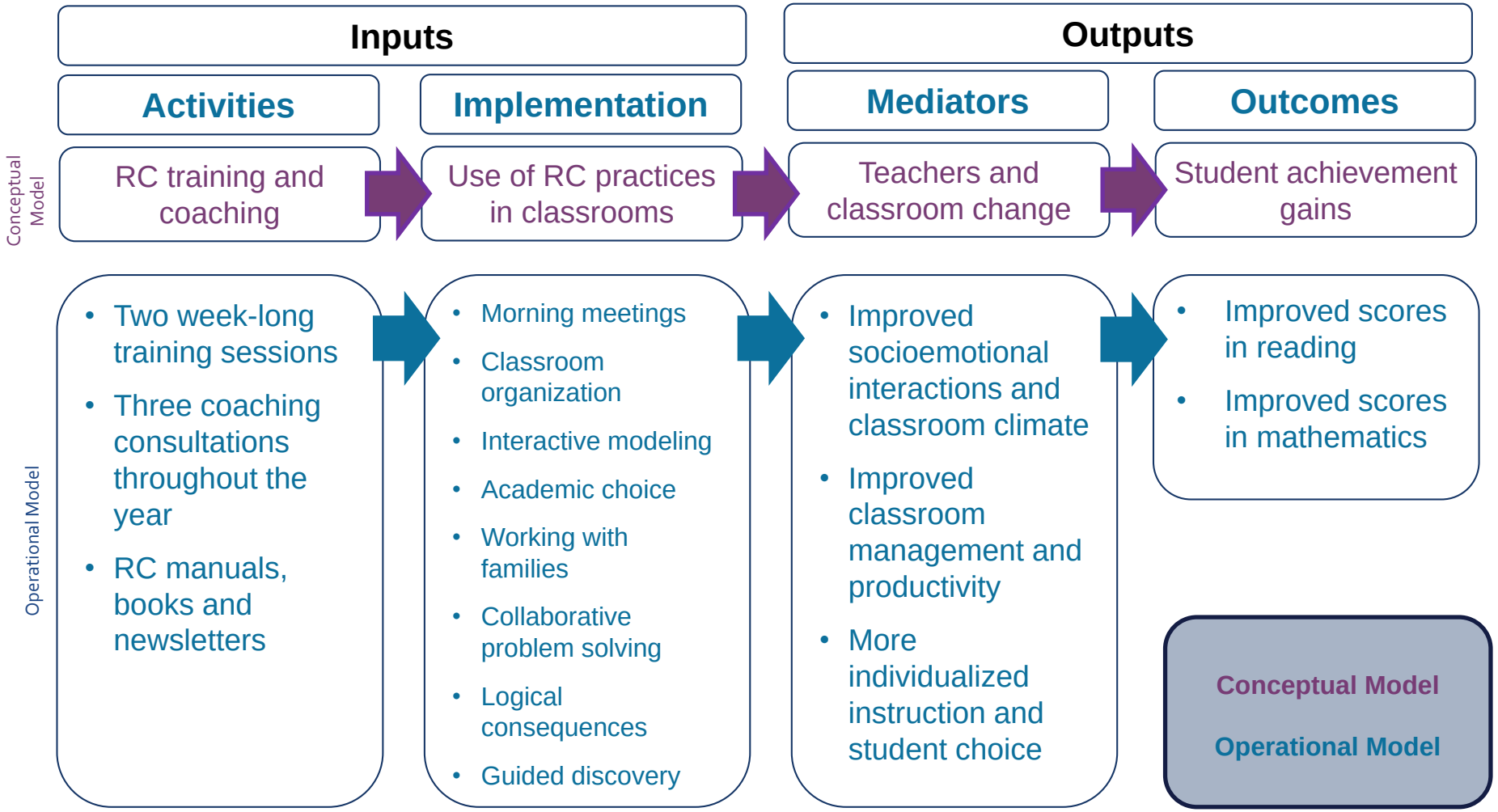
• Two week-long training sessions • Three coaching consultations throughout the year • RC manuals, books and newsletters	• Morning meetings • Classroom organization • Interactive modeling • Academic choice • Working with families • Collaborative problem solving • Logical consequences • Guided discovery	• Improved socioemotional interactions and classroom climate • Improved classroom management and productivity • More individualized instruction and student choice	

Conceptual Model

Operational Model

Logic Model:

The Responsive Classroom



Poll

Logic Model Activity

Step #1: Specifying Logic Models

The Motivation in STEM (M-STEM) program focuses on training teachers to implement an interactive, inquiry-based, and integrated science and math curriculum to enhance student motivation and learning in middle and high school STEM courses. The primary outcomes of the program include STEM GPA and advanced STEM course-taking in high school. Training includes two weeks in the summer plus ongoing coaching during the school-year, and emphasizes teacher collaboration in integrating science and math learning.

	Inputs		Outputs	
	Activities	Implementation	Mediators	Outcomes
Conceptual Model				
Operational Model				

Question & Answer Session

Closing

Preview Webinar #2
Next Steps
Resources

Preview of Webinar 2 (October 10)

STEP #2 OF FIDELITY ASSESSMENT – IDENTIFYING MEASURES

Step #2: Identify Appropriate Fidelity Indices

- The conceptual and operational logic models allow the researcher to plan a thorough fidelity assessment of each component
- Fidelity indices should be identified for each core component
  - Observations
  - Logs
  - Interviews
  - Surveys
- Measures of mediating variables are also helpful in understanding results

Homework for Webinar #2

1. **Do your own logic model.** We will ask for 1-2 volunteers to share their logic models and get feedback from the group and from Chris during Webinar #2.

Email Gurjeet (Sonica) Dhillon
gdhillon@air.org

2. **Bring a list of 3-5 fidelity measures** that you currently use in your work, that you would like to use in your work, or that you've seen others use in their work.

Resources

- Fidelity Resources and References
- Five-Step Model of Fidelity Assessment
- Logic Model Activity

Thank you for joining us!

Chris Hulleman

chris.hulleman@virginia.edu

AIR®
AMERICAN INSTITUTES FOR RESEARCH®

Motivate Lab

The Relevance Intervention

Utility Value

1. Select a topic that is currently being covered in class.
2. Write a one-paragraph essay that applies the topic to your life or to the life of someone you know.

Control

1. Select a topic that is currently being covered in class.
2. Write a one-paragraph summary of what you are learning.

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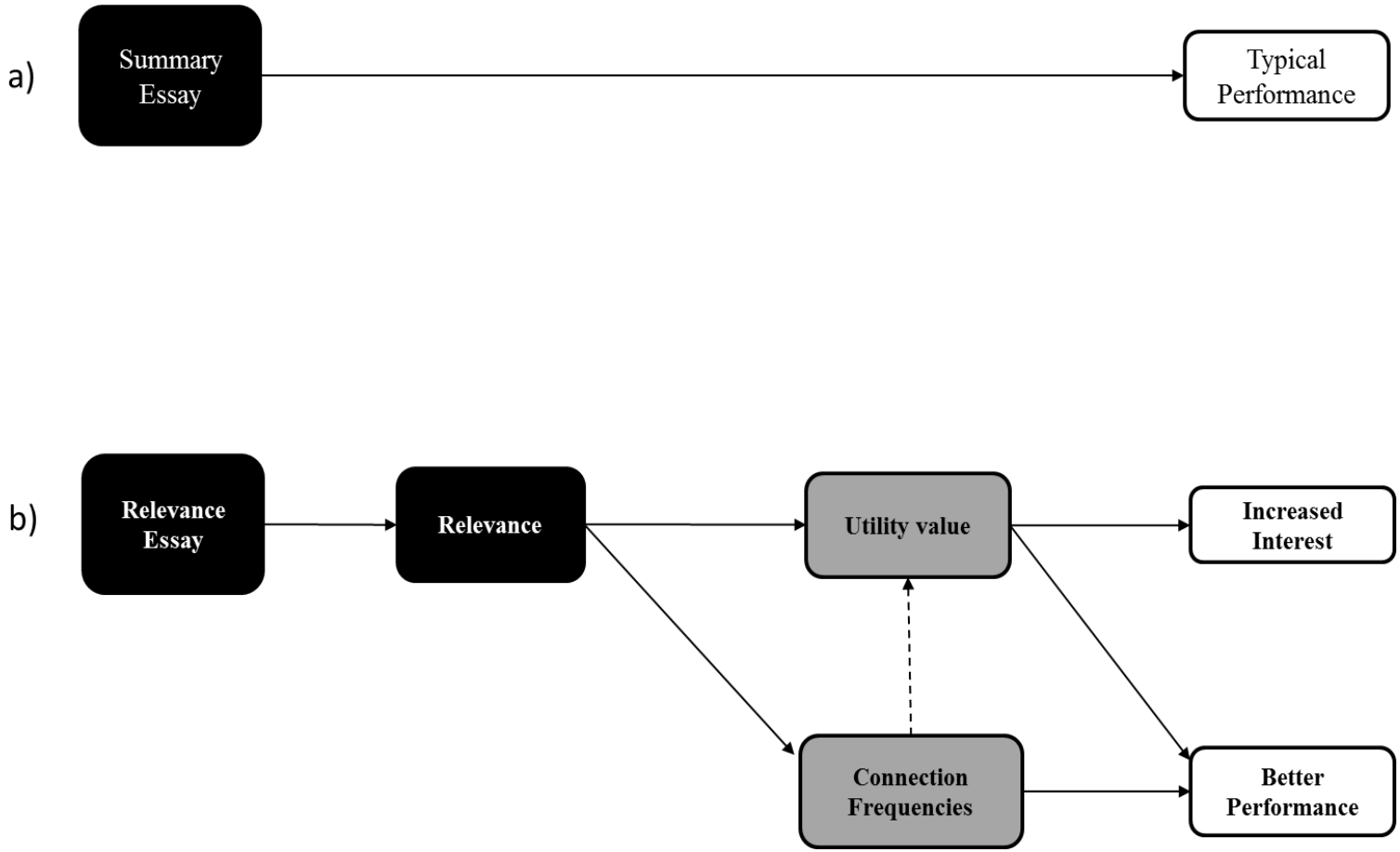
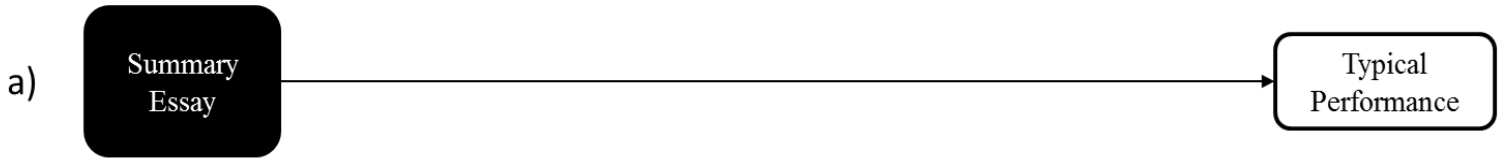
- Specific representation of change
- Details resources, planned activities, their outputs, and intended outcomes over time

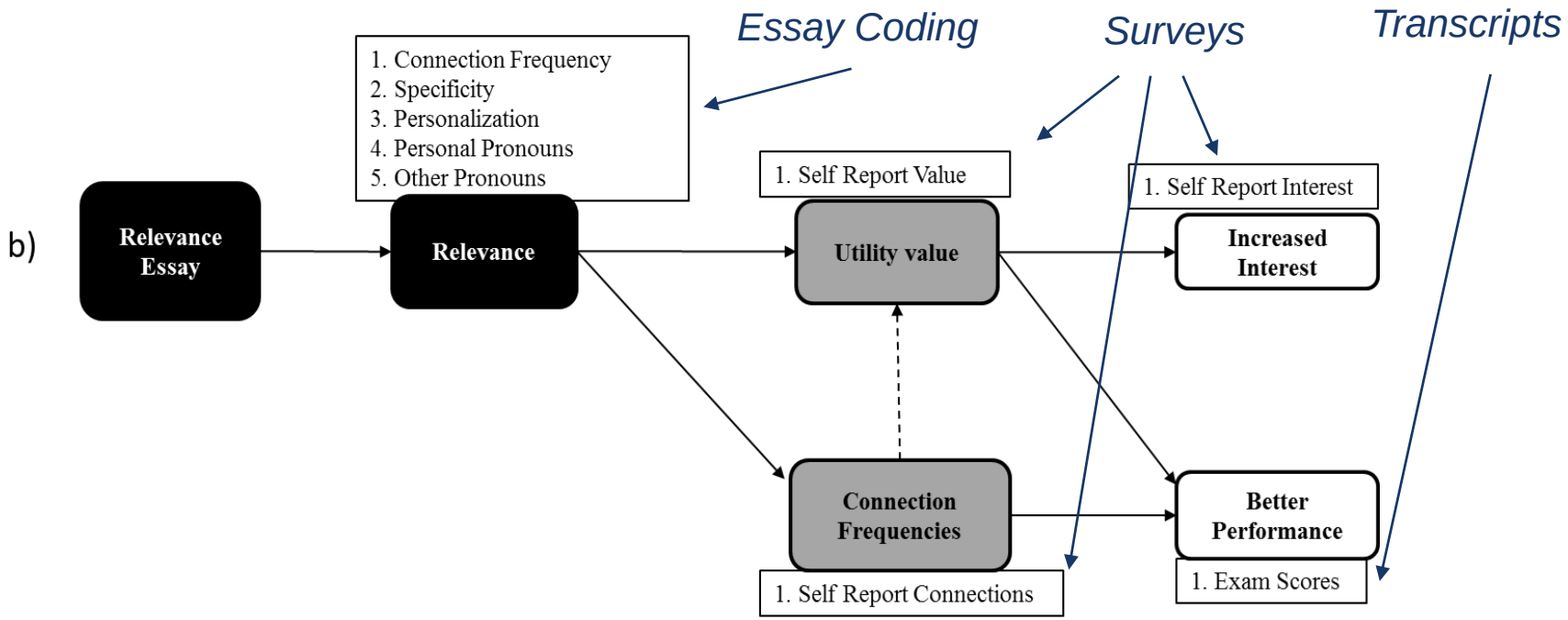
Step #1: The Relevance Intervention Logic Models



Step #1: The Relevance Intervention Logic Models



Step #2: Identify Fidelity Measures



Step #3: Conduct Psychometric Analyses

Reliability

If we measured the same level of fidelity multiple times, would we get the same index scores?

- Are observers consistent with each other? Over time?
- Is enhanced with multiple methods of measurement.

Validity

The extent to which the fidelity index reflects actual fidelity.

- Reliability is necessary, but not sufficient, for validity.
- Is our measure representative of reality?

Step #4: Within- and Between-Group Fidelity Analyses

Within-group analyses

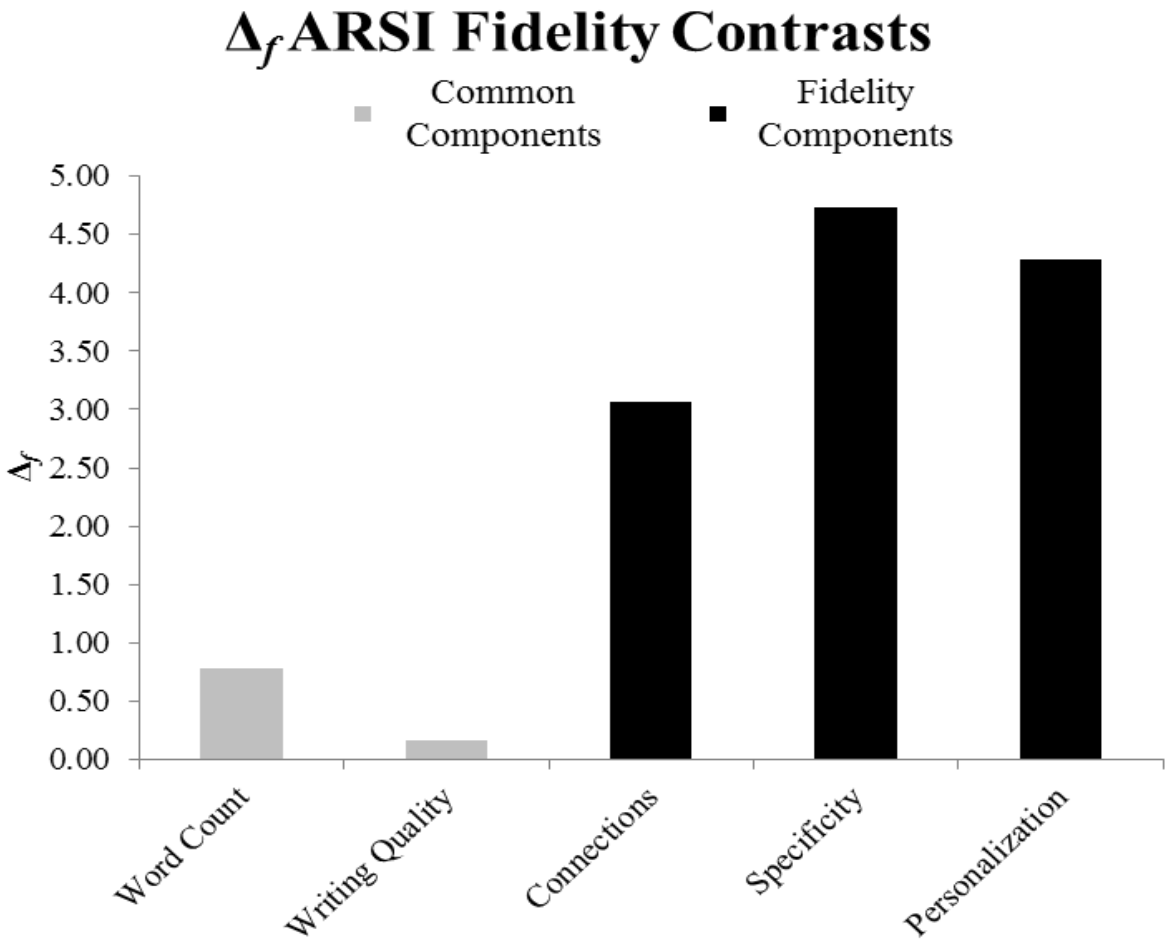
Within the Tx group, relationships between fidelity measures, mediating variables, and outcomes can provide richer information about an intervention than impact analyses

Between-group analyses

- Measure fidelity in both Tx and C conditions
- Can calculate **achieved relative strength** (**ARS**; Hulleman & Cordray, 2009)

$$ARS\ Index = \frac{\mathbf{t}^{Tx} - \mathbf{t}^{C}}{S_T}$$

Step #4: Between-Group Analyses



Step #5: Link Fidelity to Outcomes