

Motivational Assessments of the Effectiveness of LC-DLMs

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Learning Objectives

- **At the end of this presentation, attendees will be able to**
 - ▣ Describe research designs
 - ▣ Describe different forms of assessment
 - ▣ Describe the need for motivational assessment
 - ▣ Describe motivational assessments in LC-DLM experiments

RESEARCH DESIGNS

Research Designs

- Researchers are designers, much like architects, creating different types of designs in their blueprints
- **Experimental Research Designs**
- Intervention or treatment known as a manipulation
 - *True experimental*
 - **Quasi-experimental**
 - *Single-subject*

Quasi Experimental Designs

Examples of Quasi Experimental Research Design

- **Quasi-experimental design**
- **Matched Comparison Group**
- Time Series design

Quasi-Experimental Design for LC-DLMs

- Represented as:
 - **Pre T Post**
 - where P = pretest; T = treatment or experimental (LC-DLM) intervention; Post = posttest
- Could be a desirable research design for LC-DLM because of ethical issues
- A whole class is first given a pretest, then given the LC-DLMs to work with and finally offered a posttest
- Students scores on the pretest is then compared with their posttest scores.
- In addition, posttest scores could be compared with posttest scores of other topics taught with lectures within the same semester – with the same students.

Assessment

Assessment/Evaluation

“...systematic investigation of the worth or merit of an object.”

Joint Committee on Standards for Education Evaluation (1994)

Assessment

- provides information to help improve the project.

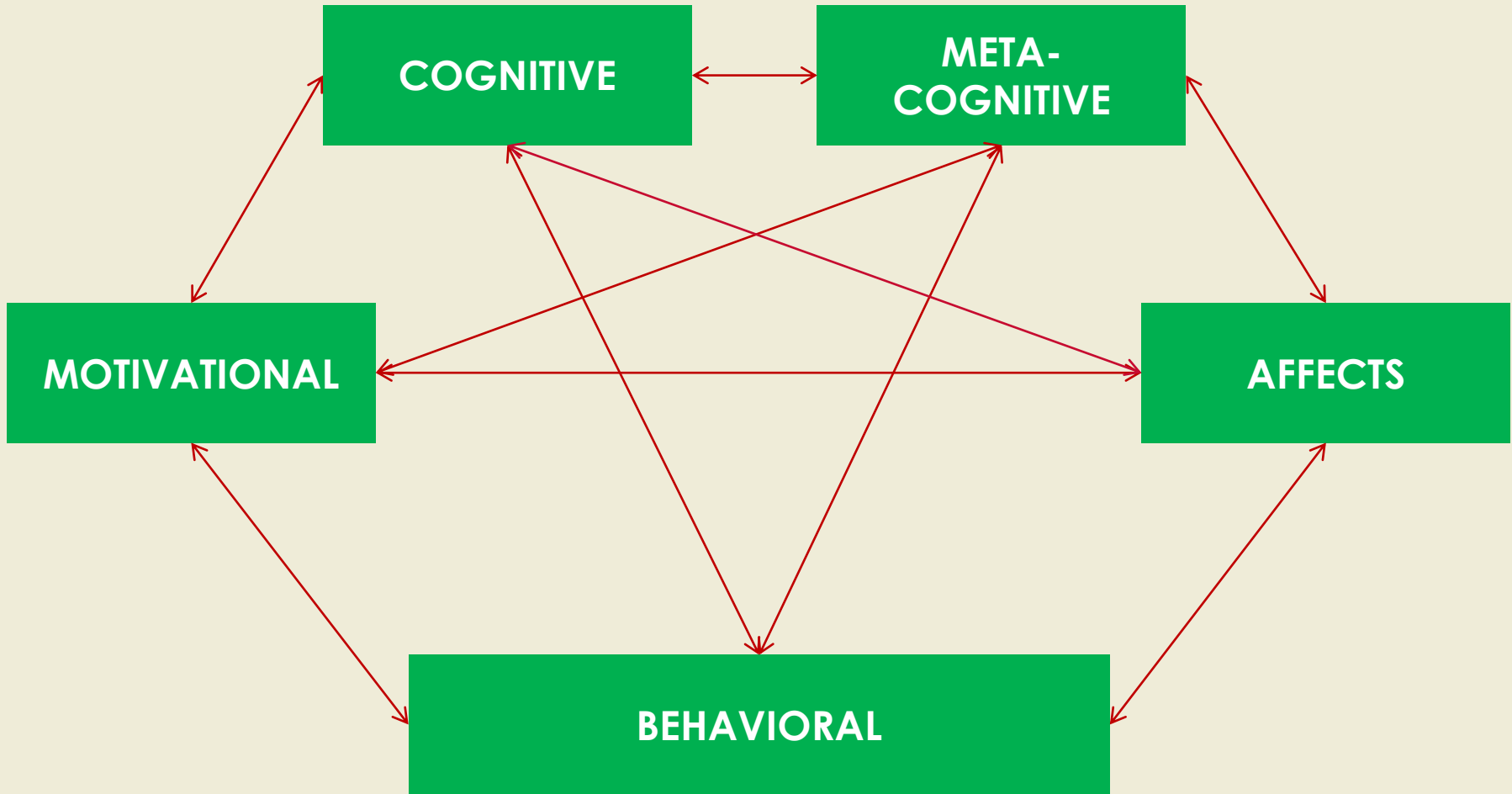


- provides new insights or new information that was not anticipated.

- Integral part of the research and development process.
- Continuous process that begins during planning.
- It is not just something that comes at the end of the project.
- regularly and iteratively performed during the project and completed when project ends.

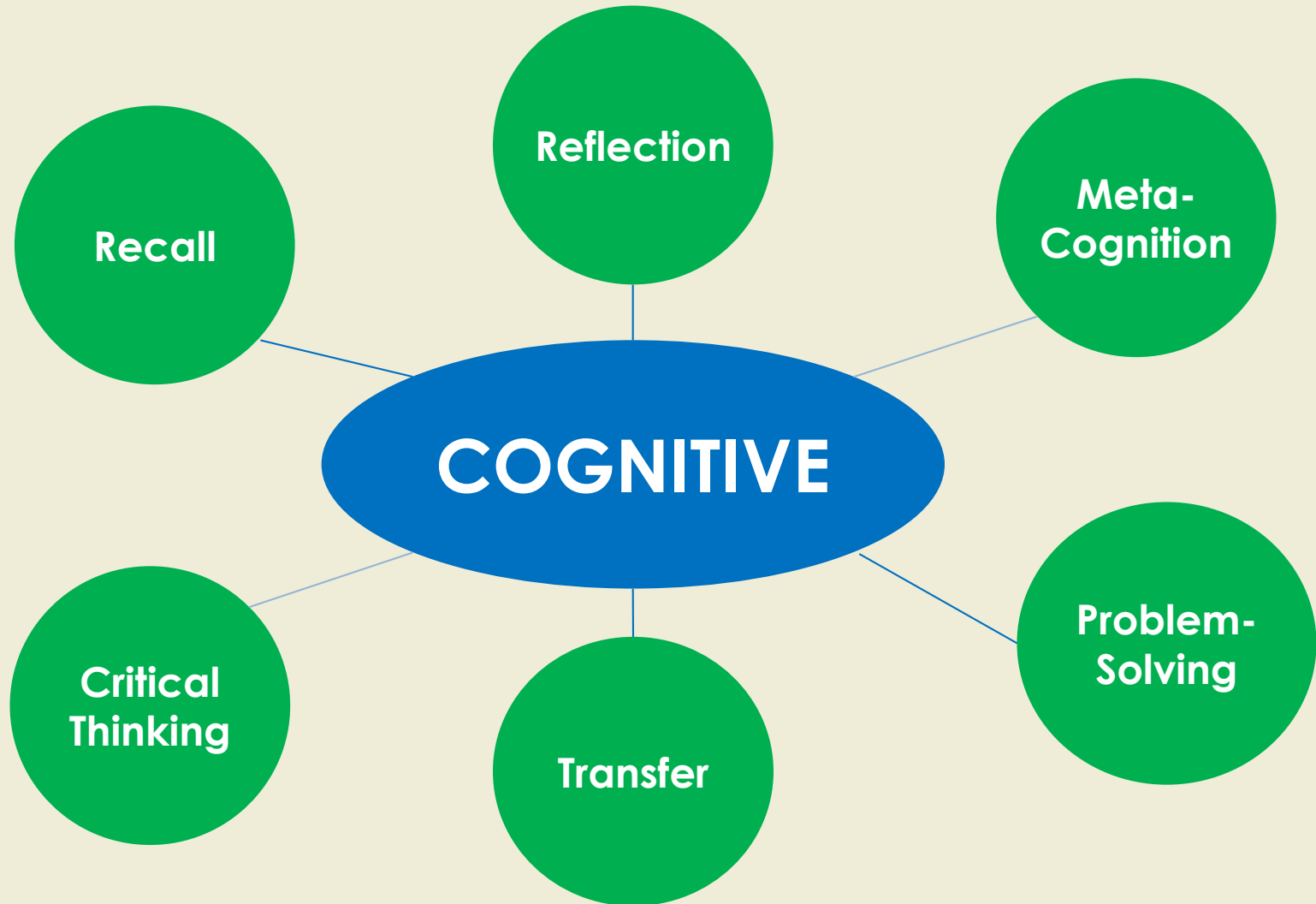
**NEED FOR
MOTIVATIONAL
ASSESSMENT**

Data Collection



- Indicators of successful intervention go beyond only cognitive measures
- Researchers can obtain data about many other factors as control or dependent measures
- These factors are also interrelated, and their relationships can be multi-directional

Cognitive Assessment



- What do you think is missing from these measures of cognitive assessment?

Example of Motivational Measures



Motivational Assessments In LC-DLMS

Motivational Assessments in LC-DLMs

- Cognitive measures (e.g., multiple choice, true/false, short answer, etc.) used in the project
- We use different motivational measures to complement cognitive measures.
- Motivational measures include **a new instrument developed to measure engagement**

Assessments done online – in Qualtrics

Motivational Assessments in LC-DLMs

- Engagement measures include the degree to which LC-DLM activities fostered interactive, constructive, active and passive forms of engagement

Adapted ICAP Questions for DLM Group

Interactive

- Compared with other topics in this course that were offered through only lectures:
 - ▣ The use of the LC-DLMs helped me ask and answer questions better than lectures
 - ▣ The use of LC-DLMs helped me discuss with a peer about the concepts more than I could with a lecture
 - ▣ The use of LC-DLMs encouraged me to clarify my understanding of the concept with my peers
 - ▣ The use of LC-DLMs encouraged me to explain the material to a classmate or friend

Adapted ICAP Questions for DLM Group

- Compared with other topics in this course that were offered through only lectures:

Constructive

- The use of the LC-DLMs helped me ask questions better than lectures.
- The use of the LC-DLMs can help me to reflect-out loud about my understanding of the concepts better than lectures.
- The use of the LC-DLMs can help me to self-explain the concepts to myself better than lectures.
- The use of the LC-DLMs helped me have a deeper understanding of the concepts than if the topics had been taught only with lectures.

Adapted ICAP Questions for DLM Group

- Compared with other topics in this course that were offered through only lectures:
 - The use of the LC-DLMs helped me copy solution steps better than lectures
 - The use of the LC-DLMs helped me apply current solution steps with previous course contents better than lectures
 - The use of the LC-DLMs helped me take good notes about the concepts better than lectures
 - The use of the LC-DLMs helped me see the concepts better than lectures

Active

Adapted ICAP Questions for DLM Group

Passive

- ❑ Compared with other topics in this course that were offered through only lectures:
 - ❑ The use of the LC-DLMs did not allow me to do anything that lectures would have allowed me to do
 - ❑ The use of the LC-DLMs did not allow me to be engaged with the concepts in a way that lecture would
 - ❑ The use of the LC-DLMs only allowed me to be disengaged but lectures would have engaged me more about the concepts.
 - ❑ The use of the LC-DLMs made me idle

Features that fostered learning

Double Pipe

- The measuring of temperatures and flow rates helped me understand energy balances in the double pipe heat exchanger
- The measuring of temperatures and flow rates helped me understand system boundaries in the double pipe heat exchanger
- The double pipe heat exchanger LC-DLM helped me understand log mean temperature difference
- The LC-DLMs helped me to understand the flow patterns in a double pipe heat exchanger
- The LC-DLMs helped me to understand the effect of temperature difference of two fluid streams on heat transfer rate.
- The see-thru plastic helped me understand the area for heat transfer in a double pipe heat exchanger

Features that fostered learning

Hydraulic Loss

- The standpipe manometers in the Hydraulic Loss LC-DLM helped me understand head loss (pressure loss) in a pipe
- The see-through plastic in the Hydraulic Loss LC-DLM helped me understand the physical phenomena in pipe flow
- The LC-DLM helped me to understand the concept of mass continuity/conservation i.e. velocity is constant in the constant diameter pipe

Features that fostered learning

Shell & Tube

- The measuring of temperatures and flow rates helped me understand energy balances in the Shell & Tube Heat Exchanger
- The measuring of temperatures and flow rates helped me understand system boundaries in the Shell & Tube Heat Exchanger
- The LC-DLMs helped me to understand the effect of temperature difference of two fluid streams on heat transfer rate
- Seeing the Shell & Tube geometry & baffles helped me understand the need for a temperature difference correction factor.
- The see-through plastic helped me understand the area for heat transfer in a shell & tube heat exchanger.
- The see-through plastic helped me understand the flow patterns for the two fluids in a shell & tube heat exchanger

Features that fostered learning

- The 5 standpipe manometers in the Venturi LC-DLM helped me understand pressure changes in a venturi
- The see-through plastic in the Venturi LC-DLM helped me understand the physical phenomena in the venturi
- The ability to see the changing diameters in the Venturi LC-DLM helped me understand velocity changes
- The ability to see the changing diameters in the Venturi LC-DLM helped me understand energy transformations
- The ability to see the changing diameters in the Venturi LC-DLM helped me understand pressure changes in the venturi

Additional Questions asked

- ❑ What features of the LC-DLM were helpful in learning?
- ❑ How would you improve the experiment with the LC-DLM?
- ❑ What did you find to be most fulfilling about your learning experiences with the LC-DLM sessions?
- ❑ Overall, in what ways did the LC-DLM session hinder and/or enhance your learning

Research Design For LC-DLMs

**Within-subjects & Between-
subjects designs**

Suggested Research Design

- We suggest using this research design

□ Year	Experimental	Control	Course
□ 1	Hydraulic Loss or Double Pipe	Venturi Meter or Shell & Tube	FM HT
□ 2	Venturi Meter or Shell & Tube	Hydraulic Loss or Double Pipe	FM HT
□ 3	Hydraulic Loss & VM Double Pipe and S & T	Year 1 Control Data	
□ 4	Hydraulic Loss & VM Double Pipe and S & T	Year 2 Control Data	

- *FM = Fluid Mechanics; HT = Heat Transfer; VM = Venturi Meter; S & T = Shell & Tube

Thank You!

Experimental Research Design

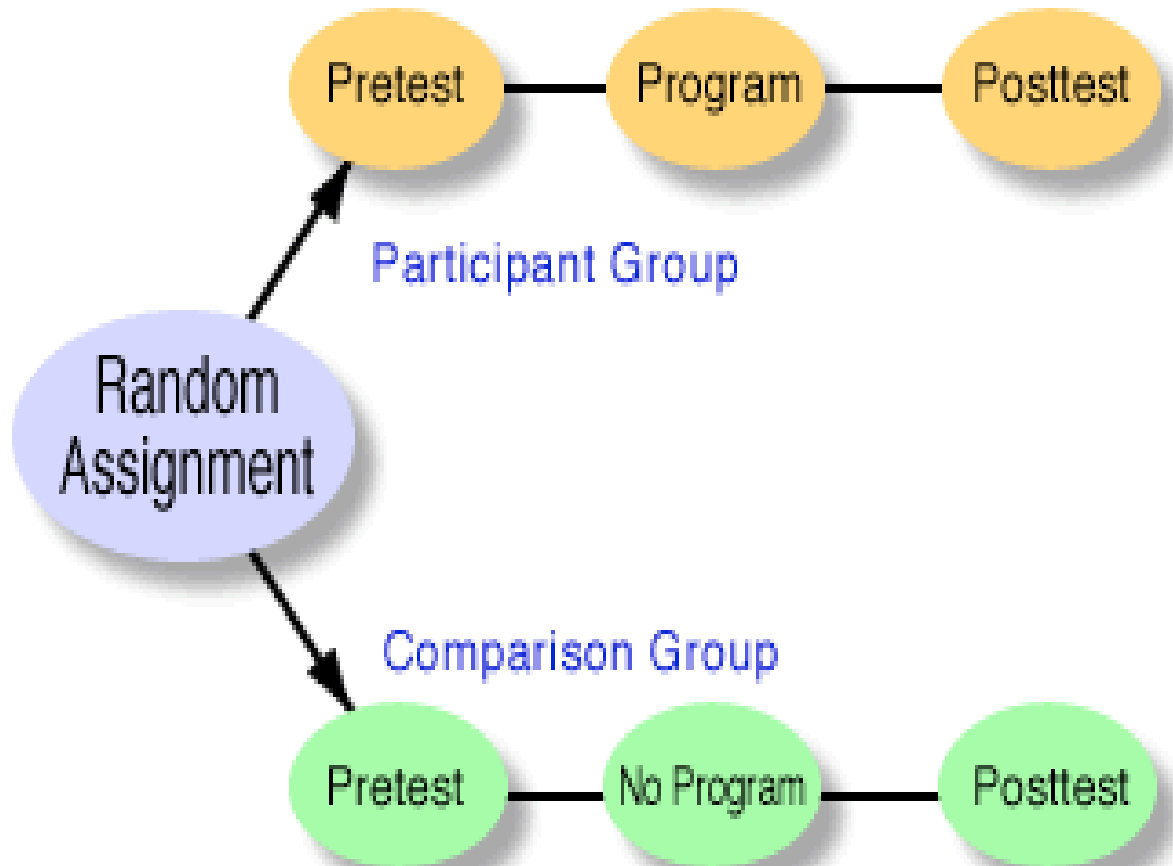
- Involve independent variables
 - Manipulation: Treatment group vs Control group
- Random Assignment?
 - **Yes** – True Experiments
 - **No** – Quasi Experiments
- Uncover cause-and-effect relationship

Examples of True Experimental Research Design

- **Randomized pretest-posttest control group design**
- **Randomized posttest control group design**
- Randomized matched control group design
- Randomized factorial design

Randomized Pretest-Posttest Control Group Designs

Randomized Pretest- Posttest Control Group



Randomized Pretest- Posttest Control Group

□ Represented as:

□ **R Pre T Post**

□ **R Pre C Post**

□ where R = random assignment; Pre = Pretest

T = treatment or experimental intervention (LC-DLMs); C = control or comparison group (Lecture or any other explicitly-delineated strategy) and Post = Posttest

Randomized Pretest- Posttest Control Group

- Participants or students are first randomized into either a LC-DLM group or Lecture group.
- Then SAME pretest is offered to both groups
- The treatment group is given the LC-DLM intervention to work with while the control group is offered lectures [or any business as usual strategy]
- Then the SAME posttest is given at the end of the LC-DLM session or lecture session
- It is advisable for the posttest to contain some questions from the pretest.
- A delayed posttest may also be given the following week or two. The delayed posttest can contain some questions from the posttest and a few additional questions not on the posttest

Randomized Pretest- Posttest Control Group

TABLE 10.1 Treatment and Control Group Results on the Pretest and Posttest

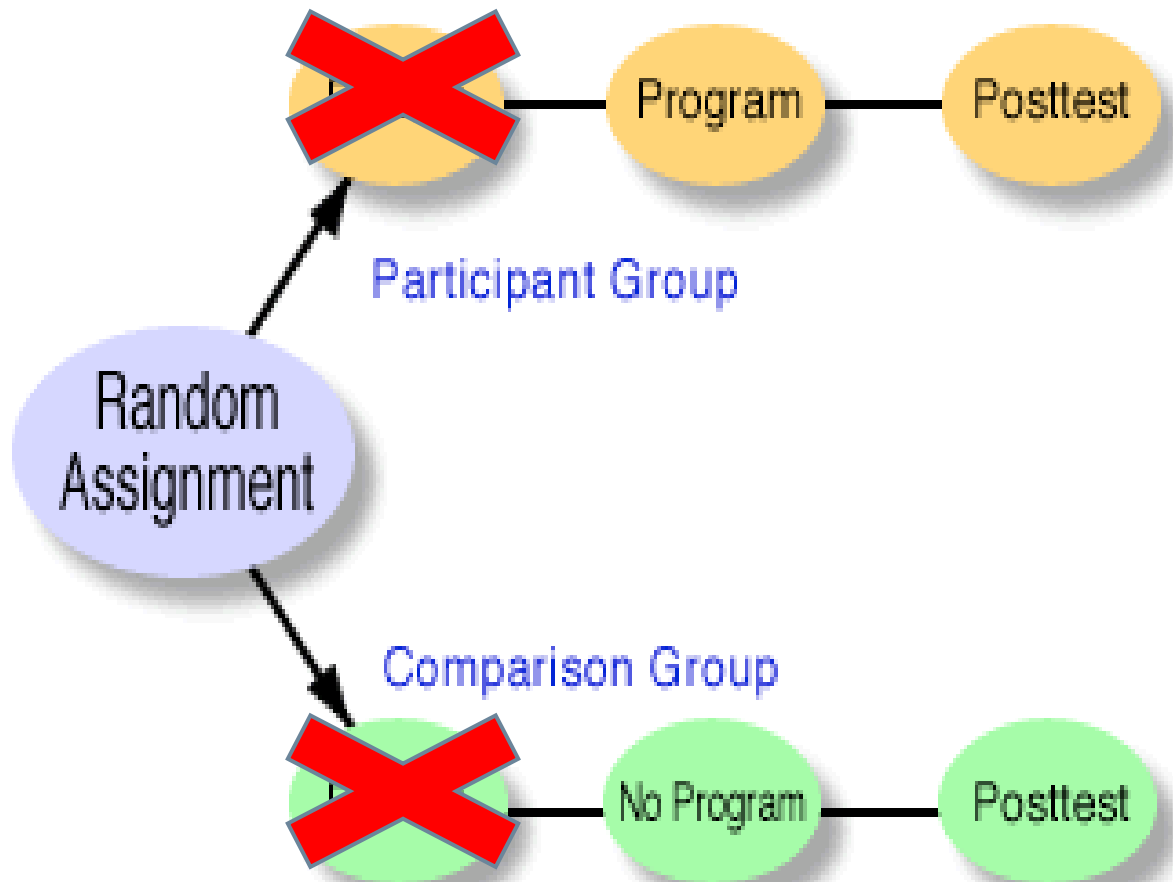
Group	Phase	
	Pretest	Posttest
Treatment	89	42
Control	94	86

Note: The outcome is the average hours of television watched.

- Treatment or intervention was responsible for the decline in watching TV
- We statistically analyze results through ANCOVA

Randomized Posttest Control Group Designs

Randomized Posttest Control Group



Randomized Posttest Control Group

□ Represented as:

□ **R T Post**

□ **R C Post**

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Randomized Posttest Control Group

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Examples of Quasi Experimental Research Design

- **Quasi-experimental design**
- **Matched Comparison Group**
- Counterbalanced design
- Time Series design

Matched Comparison Group Designs

Matched Comparison Group

- Represented as:
 - **M** **T** **Post**
 - **M** **C** **Post**
 - where M = matching; T = treatment or experimental (LC-DLM) intervention; C = baseline comparison group (Lecture) and Post = posttest
- The three most common matching variables in educational research are age, sex and SES, because they are related to many educational outcomes.

Adapted MSLQ Questions for DLM Group

- Compared to lectures alone, if all topics in this course were taught using LC-DLMs:
 - I'm certain I could understand the most difficult material presented in the readings for this course.
 - I'm confident I could learn the basic concepts taught in this course.
 - I'm confident I could understand the most complex material presented by the instructor in this course.
 - I might be able to see how what I learn in this course can be used in other courses.
 - I might be more interested in the content area of this course.

Self
Efficacy

Task
Value