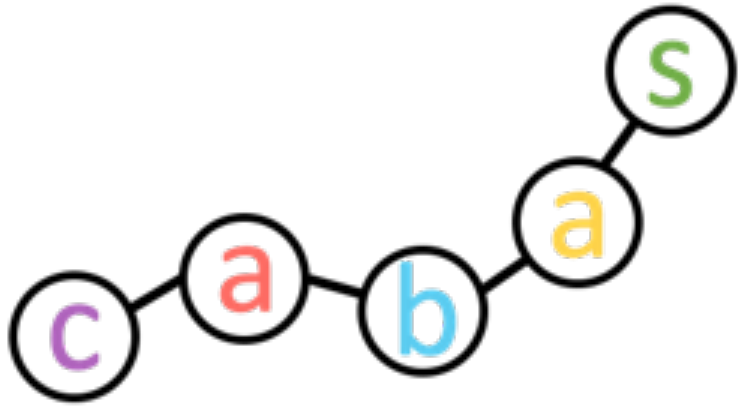
Scientific Designs

touchstone
applied behavior analysis

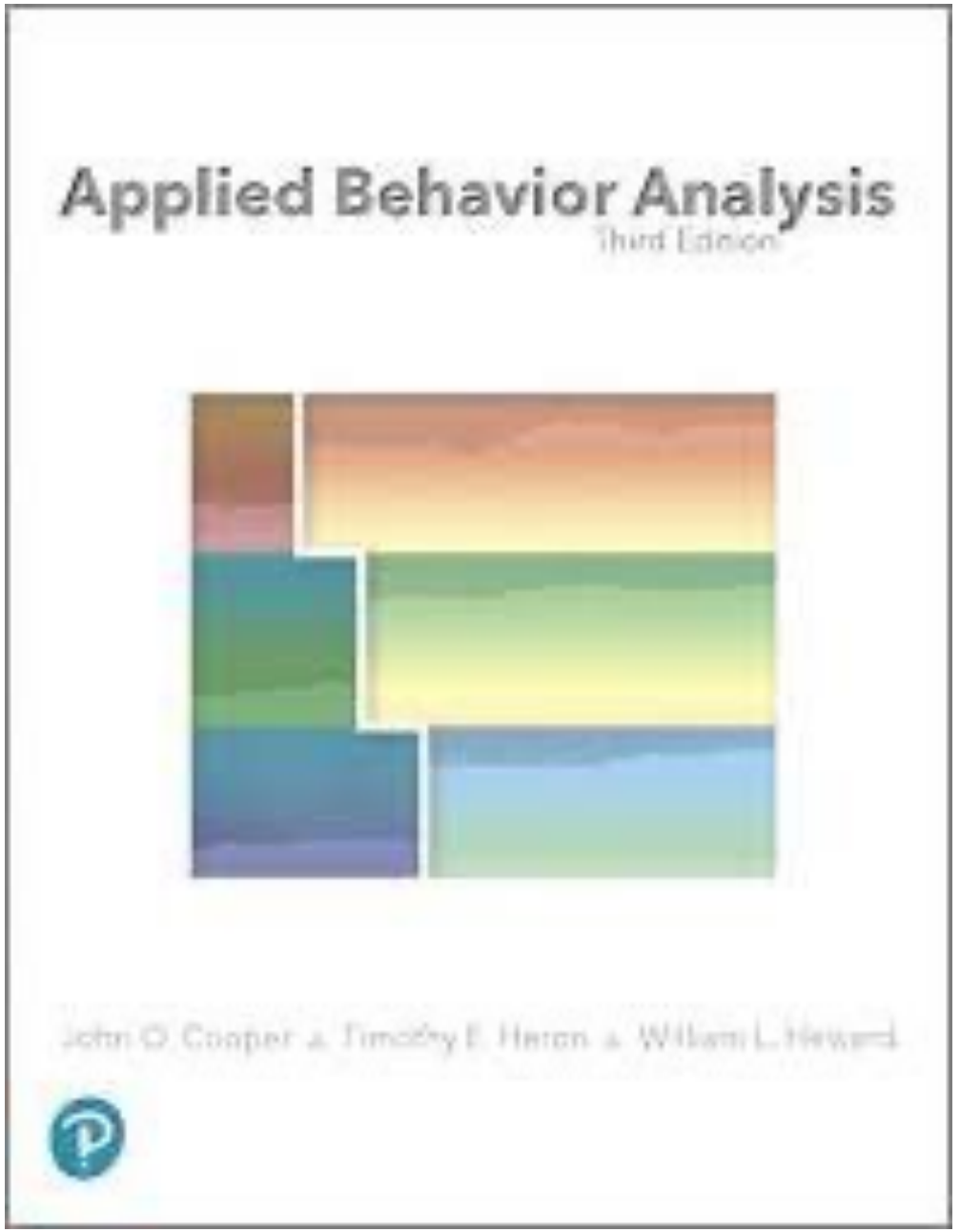
Teacher I: Module 4

Verbal Behavior About the Science (Content Expertise)
Scientific Designs (or alternative) quiz to 90% mastery criterion from the list of acceptable readings attached to this rank. Supervisor specify alternative unit: _____



Chapter 8- Reversal and Alternating Treatment Designs

Chapter 9- Multiple Baseline and Changing Criterion Designs



Chapter 8:
Reversal and Alternating Treatments Designs

Reversal Design

- Repeated measures of behavior in given setting
- Requires at least 3 consecutive phases:
  - Initial baseline (A)
  - Intervention (B)
  - Return to baseline (A)

A-B-A-B Reversal

- A-B-A-B preferred over A-B-A as stronger demonstration
- Most powerful within-subject design for demonstrating a functional relation between an environmental manipulation and a behavior

Operation and Logic of Reversal Design

- Involves prediction, verification, and replication
- Independent variable is responsible for behavior change if repetition of baseline and treatment phases approximate the original phases

Variations of the A-B-A-B Design

- Repeated reversals
- B-A-B reversal design
- Multiple treatment reversal designs
- NCR reversal technique
- DRO reversal technique
- DRI/DRA reversal technique

Repeated Reversals

- A-B-A-B-A-B
- Replications present more convincing demonstration of functional relation
- Possible, however, to become redundant

B-A-B Reversal Design

- Doesn’t enable assessment of effects on preintervention level
- Possible sequence effects
- May be appropriate with dangerous behaviors
- Ethics of withholding effective treatment

Multiple Treatment Reversal Designs

- To compare effects of two or more experimental conditions with each other or baseline
- Can make design decisions based on on-going assessment of data
- Vulnerable to sequence effects
- i.e., A-B-A-B-C-B-C, A-B-C-B-C-B-C

NCR Reversal Technique

- Noncontingent reversal
- Demonstrates effects of contingent reinforcement
- Useful when not possible to eliminate activity used as contingent reinforcement
- Deliver NCR on fixed or variable schedule independent of the behavior

DRO/DRI/DRA Reversals

- DRO: Deliver reinforcement following any behavior other than the target behavior
- DRI: Reinforcement following behavior that's incompatible with target behavior
- DRA: Following an alternative behavior other than the target behavior
- Shows effectiveness of contingent reinforcement

The Appropriateness of the Reversal Design

- Advantages:
  - Clear demonstration of functional relationship
  - Quantifies amount of behavior change
  - Shows need to program for maintenance
- Disadvantages:
  - Irreversibility
  - Social, educational, and ethical concerns

Irreversibility

- Reversal design not appropriate when independent variable cannot be withdrawn
- Level of behavior from earlier phase cannot be reproduced again under the same conditions
- If suspected, consider DRO or DRI/DRA as controls or multiple baseline designs

Withdrawing Effective Interventions

- Social concerns
  - Get full support of everyone involved
- Educational and clinical issues
  - Reversal phases can be very short
  - For ethical reasons, withdrawal of intervention may not be appropriate in harmful situations

Alternating Treatments Design

- Efficient for comparing effects of 2 or more treatments
- Also known as:
  - Multi-element baseline design
  - Multiple schedule design
  - Concurrent schedule design
  - Simultaneous treatment design

Operation and Logic of Alternating Treatments Design

- Alternated in a variety of ways
- A distinct stimulus is often associated with each treatment
- Involves prediction, verification, and replication

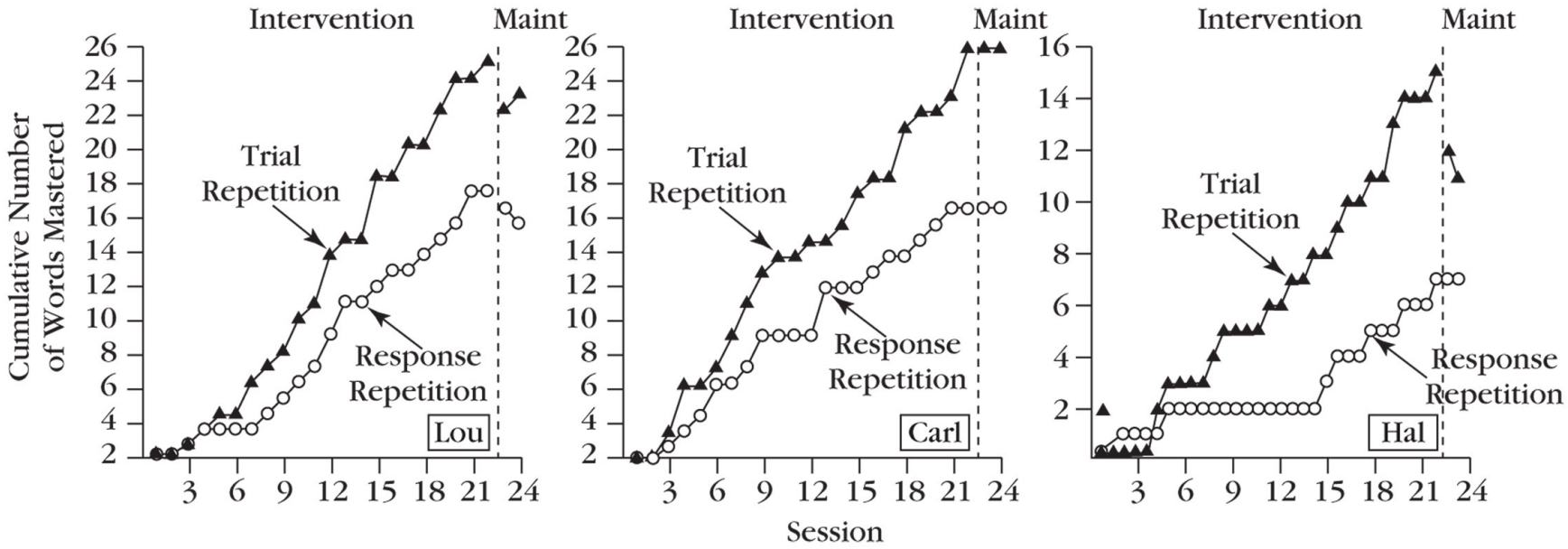
Operation and Logic of Alternating Treatments Design

- Experimental control demonstrated with different levels of response in different treatments
- Allows for quick comparison
- Stress importance of evaluating individualized treatments

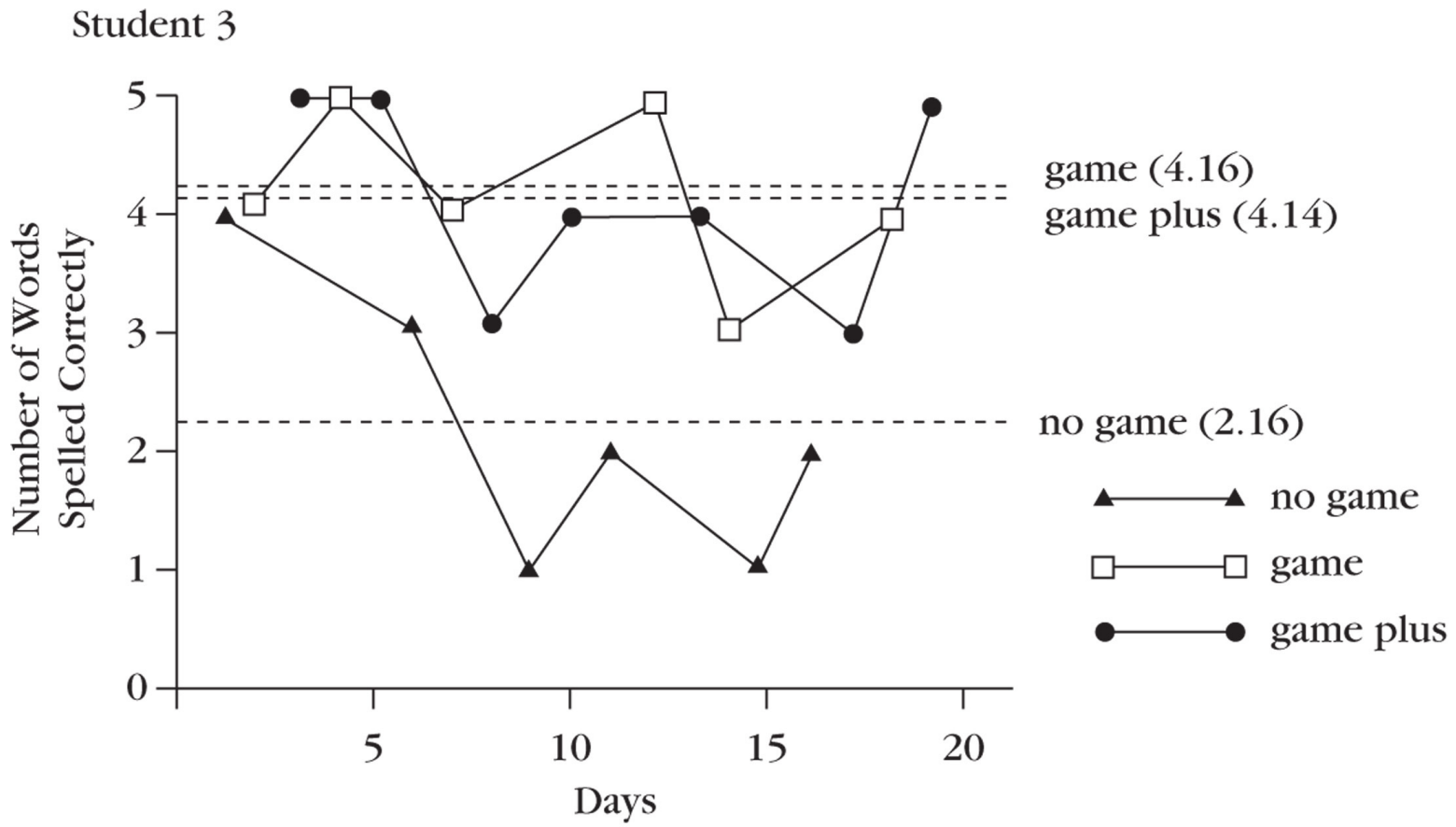
Variations of Alternating Treatments Design

- Single phase without no-treatment control condition
- Single phase with one no-treatment control condition
- Two phase with initial baseline
- Three phase with baseline and final best treatment phase

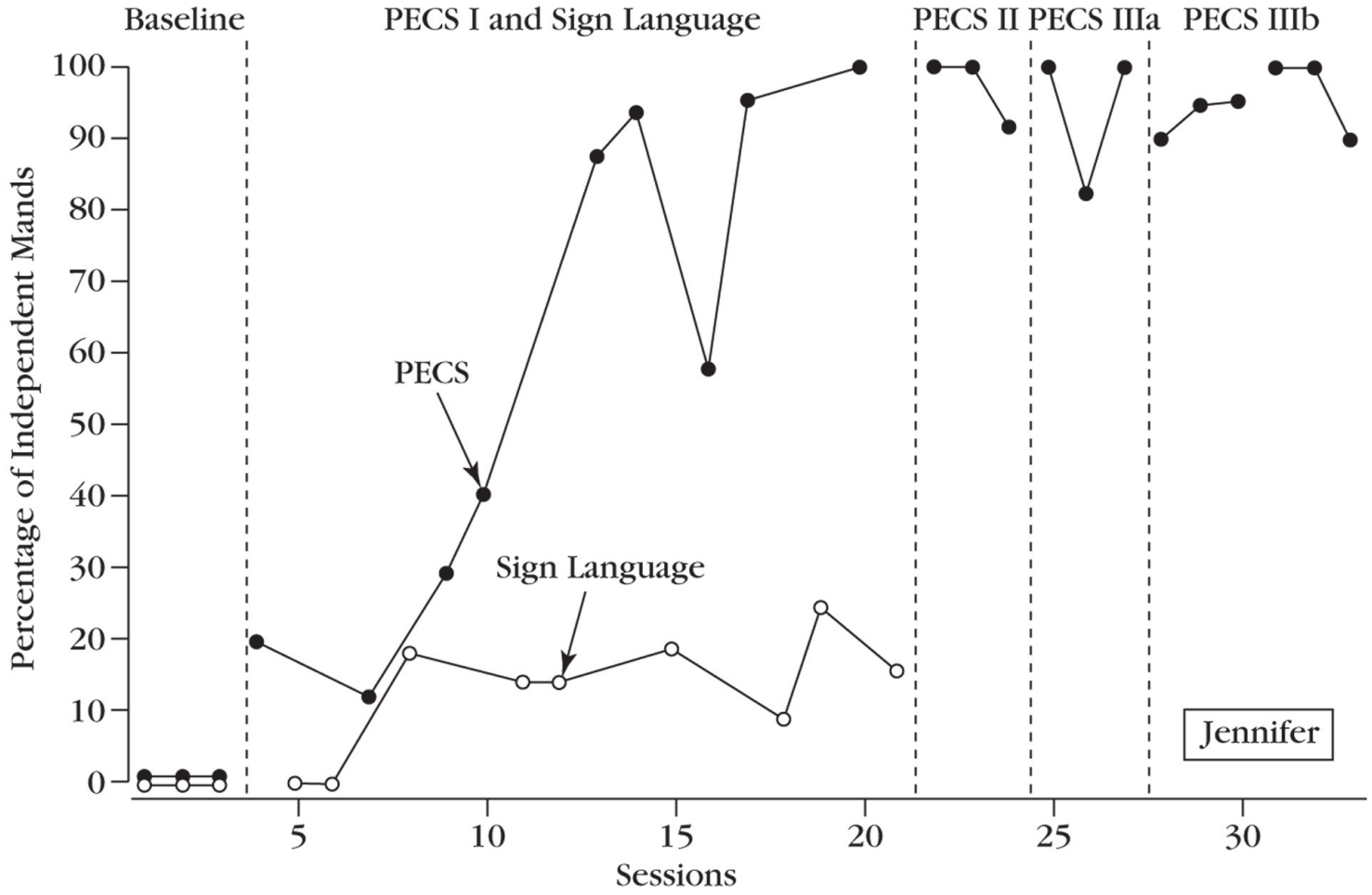
Without No-Treatment Control Condition



With No-Treatment Control Condition



With Baseline and Final Best Treatment Phase



Cooper, Heron, and Heward
Applied Behavior Analysis, Second Edition

Advantages of Alternating Treatments Design

- Does not require treatment withdrawal
- Speed of comparison
- Minimizes irreversibility problem
- Minimizes sequence effects
- Can be used with unstable data
- Can be used to assess generalization of effects
- Intervention can begin immediately

Disadvantages of Alternating Treatments Design

- Multiple treatment interference
- Unnatural nature of rapidly alternating treatments
- Limited capacity (max. of 4 conditions)
- Selection of treatments – should be significantly different from one another

Chapter 9:
Multiple Baseline and Changing Criterion Designs

Multiple Baseline Design

- Most widely used for evaluating treatment effects in ABA
- Highly flexible
- Do not have to withdraw treatment variable

Operation and Logic

- Alternative to reversal design when target behavior is likely to be irreversible or when impractical or unethical to reverse conditions
- 3 basic forms:
  - Multiple baseline across behaviors
  - Multiple baseline across settings
  - Multiple baseline across subjects

Prediction, Verification, and Replication

- Apply independent variable to Behavior 1 when you can confidently predict that the behavior would remain the same in constant conditions
- If Behaviors 2 and 3 remain unchanged after the application of the IV to Behavior 1, this verifies the prediction
- If the IV changes Behavior 2 like it did Behavior 1, the effect of the IV has been replicated
- The more replications, the more convincing the demonstration; most commonly 3-5 tiers

Multiple Baseline Across Behaviors

- 2 or more different behaviors of same subject
- Each subject serves as his/her own control
- After steady state baseline responding, independent variable is applied to 1st behavior, while other behaviors are kept in baseline conditions
- When steady state responding is reached for 1st behavior, then IV is applied to next behavior

Multiple Baseline Across Settings

- A single behavior is targeted in two or more different settings or conditions
- After steady state baseline responding, independent variable is applied to 1st setting, while other settings are kept in baseline conditions
- When steady state responding is reached for 1st setting, then IV is applied to next setting

Multiple Baseline Across Subjects

- One target behavior for 2 or more subjects in the same setting
- After steady state baseline responding, independent variable is applied to 1st subject, while other subjects are kept in baseline conditions
- When steady state responding is reached for 1st subject, then IV is applied to next subject
- Most widely used multiple baseline design

Variations of Multiple Baselines

- Alternative tactics for pursuing a multiple baseline analysis:
  - Multiple probe design
  - Delayed multiple baseline design
- When extended baseline measurement is unnecessary, impractical, too costly, or unavailable

Multiple Probe Design

- Analyzes relation between independent variable and acquisition of skill sequences
- Instead of simultaneous baselines, probes provide basis for determining if behavior change has occurred prior to intervention
- Appropriate for analyzing a shaping program

Delayed Multiple Baseline Design

- Initial baseline and intervention begin and subsequent baselines are added in a delayed or staggered fashion
- Effective when reversal design is not possible, limited resources preclude a full-scale design, and when a new behavior, subject, or setting becomes available
- Limitations: shorter baselines and can mask interdependence of dependent variables

Assumptions and Guidelines

1. Select independent, yet functionally similar baselines

- Behaviors are functionally independent of one another
- Behaviors share enough similarity that they will change with the application of the same independent variable

2. Select concurrent and plausibly related multiple baselines

- Behaviors must be measured concurrently
- All relevant variables that influence one behavior must have opportunity to influence other behaviors

Assumptions and Guidelines

3. Do not apply the independent variable to the next behavior too soon
4. Vary significantly the lengths of multiple baselines

- The more baseline phases differ in length, the stronger the design

5. Intervene on most stable baseline first

- If possible, application of independent variable should be made in order of greatest stability

Multiple Baseline Design Advantages

- Does not require withdrawal of an effective treatment
- Ideal for multiple behavior changes sought by many practitioners
- Useful in assessing occurrence of generalization of behavior change
- Relatively easy to conceptualize

Limitations

- Does not demonstrate experimental control
- Provides more information about effectiveness of treatment variable than function of target behavior
- Can require treatment being withheld for some behaviors/settings/subjects for a long time
- Required time and resources

Changing Criterion Design

- Used to evaluate effects of a treatment that is applied in a graduated fashion to a single target behavior
- Initial baseline phase followed by series of treatment phases that serve as baseline for increased criterion of the next phase

Operation and Logic

- Prediction, replication, and verification
- Variation of the multiple baseline design
- Show repeated production of new rates of behavior as function of manipulations of independent variable
- Flexibility of the design

Guidelines for Use

- Requires careful manipulation of 3 design factors:
  - length of phases
  - magnitude of criterion changes
  - number of criterion changes

Length of Phases

- Each phase serves as baseline for next phase, so must be long enough to achieve stable responding
- Slower to change target behaviors, therefore, require longer phases
- Should vary considerably to increase design's validity

Magnitude of Criterion Changes

- Varying size of changes gives more convincing demonstration of experimental control
- Must be large enough to be detectable, but not so large as to be unachievable
- Smaller changes can be used with very stable levels of responding
- Larger changes required to demonstrate behavior change in presence of variability

Number of Criterion Changes

- The more times the behavior changes to meet new criteria, the more convincing the demonstration of experimental control
- Interrelated with phase length and magnitude of criterion changes
- If limited time for study, the greater the number of phases, the shorter each phase can be

Appropriateness of Changing Criterion Design

- Does not require reversal of improved behavior
- Only one target behavior is required
- Only for use with behaviors that are already in student's repertoire and lend themselves to stepwise modification

Appropriateness

- Not appropriate for shaping behaviors
- Best suited for evaluating effect of instructional techniques on stepwise changes in rate, frequency, accuracy, duration, or latency of single target behavior