**Definition of a Behavior Chain**
- A specific sequence of discrete responses that are associated with a particular stimulus condition. When components are linked together, they form a chain that produces a terminal outcome.

**Components Serve Dual Functions**
- Each response serves as a conditioned reinforcer for the response that produced it.
- Each response serves as a discriminative stimulus for the next response in the chain.
- (Exceptions: the first and last responses in the chain)

**Diagram of Response Chain**

**Behavior Chains and Limited Hold**
- A sequence of behaviors that must be performed correctly and within a specified time to produce reinforcement.
- Emphasizes both accuracy and proficiency.

**Rationale for Chaining**
- Teaches complex skills that allow individuals to function more independently.
- A way to add new behaviors to an existing behavioral repertoire.
- Can easily be combined with other procedures (prompting, instructions, reinforcement).
### Techniques and Guidelines
- Conduct a Task Analysis
- Assess Mastery Level

### Task Analysis
- Breaking a complex skill or series of behaviors into smaller, teachable units
- The output of a task analysis is a series of sequentially ordered steps

### Points to Note:
- Sequence one individual may use to perform skill may not be the same as another individual
- Must be individualized according to Age, Skill level, Disability, Prior experience
- Some task analyses have a limited number of steps, May be broken down into subtasks

### Constructing a Task Analysis
- Methods
  - Observe a competent individual perform the task
  - Consult with experts or persons skilled in performing the task
  - Perform the task yourself
  - You can refine it if necessary

### Assessing Mastery Levels
- Single-opportunity Method
  - Give cue to begin task
  - Record learner performance with + or - for each step
  - Assessment stops as soon as a step is performed incorrectly
  - Remaining steps are scored with a -

### Assessing Mastery Levels
- Multiple-opportunity Method
  - Give cue to begin task
  - Record learner performance with + or - for each step
  - If a step is performed incorrectly, the trainer completes that step for the learner
  - learner continues to next step
  - Do NOT co-mingle teaching with assessment
Advantages / Disadvantages of Each

- Single-opportunity Method
  - More conservative
  - Gives less information
  - Quicker to conduct
  - Reduces likelihood of learning taking place during assessment
- Multiple
  - Takes more time to complete
  - Provides trainer with more information
  - May make training more efficient by allowing trainer to eliminate instruction on already-learned steps

Behavior Chaining Procedures

- Forward Chaining
  - Training begins the link with the first behavior in the sequence
  - Training only occurs on the steps previously mastered and current step (no training on steps after that)
  - Advantages
    - Can be used to link smaller chains to larger ones
    - Relatively easy

Behavior Chaining Procedures

- Total-task Chaining
  - Training is provided for every behavior in the sequence during every training session
  - Trainer assistance (prompting) is provided on every step

Backward Chaining

- Similar to backward shaping
  - Training begins the link with the last behavior in the sequence
  - Trainer performs all by last step until learner masters last step
  - Then trainer performs all but last two steps until learner masters last two steps, and so on...
  - Advantages
    - Natural reinforcement is produced immediately upon the learner’s response
    - Learner contacts these natural contingencies of reinforcement on every learning trial

Backward Chaining with Leap Aheads

- Follows same procedures as backward chaining, but not every step in the task analysis is trained
- Other steps are probed
- If some steps are in learner’s repertoire, they are not taught
- The learner is still required to perform those steps, however

Which procedure to use?

- No data to indicate one is more effective than another
- Choose total-task chaining if:
  - Learner knows many of the tasks but needs to learn how to do them in sequence
  - Has an imitative repertoire
  - Has moderate to severe disabilities
  - Task is not long or complex
Behavior Chain Interruption Strategy (BCIS)

- Chain is interrupted at a predetermined step so that another behavior can be emitted
- Interruption may cause some distress
  - It momentarily blocks access to reinforcement
- Creates motivation to learn the new behavior in the chain
  - As long as it is not so distressful that it causes emotional responding or self-injurious behavior

Behavior Chain Interruption Strategy (BCIS)

- Collect baseline data
- Direct person to start chain
- At predetermined point, restrict learner’s ability to complete next step
- Prompt learner to engage in new targeted step
- Then allow the individual to proceed with the chain
- Monitor behavior

Breaking Inappropriate Chains

- Determine initial S^D
- Substitute an alternative or
- Extend chain and build in time delays within the chain

Potential Sources of Difficulty in the Chain

- Re-examine S^D's and responses
  - Is the sequence arbitrary? Would rearranging help?
  - Determine whether similar S^D's cue different responses
    - If so, can the sequence be rearranged to separate the two similar S^D's?

Other Sources of Difficulty

- Analyze the job setting to identify relevant and irrelevant S^D's
- Should be done on the front end
  - Do you need to implement discrimination training so that the learner can discriminate the relevant from irrelevant S^D's?
- Determine whether S^D's in the job setting differ from training S^D's
  - May need to conduct some training in job settings

More Sources of Difficulty

- Identify presence of novel stimuli in the environment
- Discrimination training might be necessary to teach the learner to ignore novel, irrelevant stimuli
Factors Affecting Performance
• Completeness of the task analysis
  • More complete, detailed task analyses tend to produce better learning
  • Do on the front end
    • Spend lots of time doing this well
    • Be ready/willing to modify analysis after it is constructed
  • Monitor the behavior
• Length/complexity of chain
  • Longer chains take more time to learn

Factors Affecting Performance
• Schedule of reinforcement
  • Must use appropriate
  • Consider number of responses in chain when determining the schedule
• Extinction
  • Responses performed further from the reinforcer may become less likely
  • This interrupts the S-R relation and can result in withering performance of the chain
  • Lesson: adjust reinforcement schedule accordingly (use intermittent schedules)

Factors Affecting Performance
• Stimulus variation
  • Introduce all variations of the stimulus items to be encountered later to increase generalization of the chain

• Response variation
  • Varied responses may be needed to deal with stimulus variation
  • This may require some retraining of responses

Summary
• Is a good tool to use
• Can be used in a wide variety of settings
• Make sure you take your time in identifying all the variables you need to address
• Monitoring of behavior is essential