Differential Reinforcement & Antecedent Control
(Using Prompting and Shaping to Teach Behaviors)

SPCD 519

Stimulus Control

What is it?
What role does it play in teaching academic and social (behavioral) skills?

Stimulus Control

Learning to pay attention to and respond differentially to things in the environment (stimuli) that

• give us info about what behavior is probably going to work in this situation (i.e., get our needs met),
• the context under which it will be effective (i.e., when the behavior will "work"), and
• what we will likely get for it (reinforcement).

(CSJSJU.edu)
Stimulus control

• “Bringing responses a learner already knows under the control of the appropriate cue or signal” (Alberto & Troutman, 2013, p. 294).

• Much of teaching both academic and social skills involves establishing stimulus control.
  – We want students to perform academically and socially without constant prompting.

Discriminative Stimulus ($S^D$)

• Is an antecedent stimulus that occasions a behavior. It:
  – Comes before a response
  – Signals that a response will probably be reinforced—occasions the behavior

Operant behavior: the relationship between the antecedent and the behavior is learned

Stimulus control example

- Antecedent: Phone rings
- Behavior: Pick up phone and answer it
- Consequence: Talk to person who called
**S-delta (S^\(\Delta\))**

- Any antecedent stimulus present when the behavior is NOT reinforced

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<tr>
<th>Antecedent</th>
<th>Behavior</th>
<th>Consequence</th>
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<tbody>
<tr>
<td>Knock on door.</td>
<td>Pick up phone and answer it.</td>
<td>No one talks to you.</td>
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An S-delta signals that reinforcement is NOT available.

- A large part of teaching is teaching students to discriminate between Sds and S-Deltas.

**Stimulus Discrimination** - Ability to tell the difference between two events or stimuli and change your response accordingly
- E.g., See red light, I stop the car.
  See green light, I accelerate.

**Simple discrimination training** – teaching a student to differentiate one thing from another and respond accordingly
- \( A = A; A \neq B \)

Use **Differential Reinforcement** to bring a behavior under stimulus control (to teach stimulus discrimination)

1. Reinforce the target behavior when it occurs in the presence of the \( S^D \) **AND**
2. Don't reinforce the target behavior when it occurs in the absence of the \( S^D \) or in the presence of the S-delta.
Discrimination training using differential reinforcement

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<td>(S⁰)</td>
<td>Student says, “dog.”</td>
<td>Teacher says, “Yes! Good talking”</td>
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<tr>
<td>(S⁻)</td>
<td>Student says, “dog.”</td>
<td>Teacher says, “No – try again.”</td>
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Prompts: How to *initially* get an individual to exhibit the desired behavior in the presence of the S⁰

Prompts – behavior of another person OR a type of stimulus that “increases the likelihood that a person will engage in a correct behavior at the correct time” – delivered with or after presentation of the S⁰ – are used to reduce errors when individuals are acquiring new skills, but are then faded as the new skill becomes more fluent.
Types of prompts:

- **Verbal Prompt**

- **Response prompts**
  - assistance by another person to increase likelihood that correct behavior will occur in the presence of the SD

- **Gesture Model**
  - Partial Physical
  - Full Physical

**Another Type of Prompt**

- **Stimulus prompts** – a change in some aspect of the SD that makes a correct discrimination more likely
  - Also must fade these prompts

```
cat   rat   bat   sat
```

**Prompting Process**

- **Target stimulus present (Sd)**
  - Behavior does not occur
  - Do not reinforce

If behavior does not occur, then
- there is no behavior to reinforce
- no stimulus control can be established
- no learning of the target behavior can occur

**Prompting Process**

- **Target stimulus present (Sd)**
  - Use prompt
  - Stimulus control
  - Behavior occurs
  - Reinforce

The prompt is used to get the behavior to occur.
Behavior is reinforced when the target stimulus is present.
This allows target stimulus to get control of behavior.
Prompting Process

Target stimulus present (Sd) → Behavior occurs → Reinforce

Antecedent Behavior Consequences
Prompt

Prompting & reinforcing the behavior only when the target stimulus is present gives the stimulus the control that the prompt has. Prompting once usually is not enough!!

Transferring Stimulus Control

- **Transfer of stimulus control from prompt to Sd**:
  - eliminating the prompt (fading) to get the behavior under the stimulus control of the natural (relevant) S
  - used to get the behavior to occur in the presence of the S without prompts
  - helps avoid prompt dependency
- **How do you eventually remove prompts?**
  - By using prompting hierarchies or some form of Time delay

Least-to-most prompting Hierarchy

- Verbal Prompt
- Gesture
- Model
- Partial Physical
- Full Physical
Verbal Prompt  
Gesture  
Model  
Partial Physical  
Full Physical  

Most-to-least Prompting Hierarchy

Graduated Guidance

Reduce prompt (gradually) from full physical guidance to “shadowing”

Time Delay is a procedure to fade prompts

- **Constant** (fixed) Time Delay

- **Gradual/Progressive/Increasing** Time Delay

Stimulus fading: changing one or more dimensions of the stimulus prompt
Stimulus shaping: distractor stimuli initially very different from the natural stimulus on one or more dimensions; over time, are changed to be more like the natural stimulus, requiring the student to make increasingly fine discriminations between the two.

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### How to Teach with Prompts

1. Choose the prompt most appropriate for the student and the task.
2. Get the student’s attention.
3. Always start the learning situation by presenting the $S^D$ (natural cue).
4. Prompt the correct response.
5. Reinforce the correct behavior.
6. Fade prompts as soon as possible (transfer stimulus control).
7. Continue to reinforce unprompted correct responses.

### Factors that affect the $S^D$’s Control Over a Behavior:

- The potency of the $S^D$ and/or $S^{R+}$
- The reliability of the $S^D$ in predicting $S^{R+}$
- The immediacy of the $S^{R+}$ that the $S^D$ predicts
- The cost of attaining the $S^{R+}$ that the $S^D$ predicts

### Stimulus Overselectivity

is focusing on one aspect of an object or environment while ignoring other aspects (not seeing the stimulus as a whole)

Looks like:

- Doesn’t know which characteristic to focus on
- Learns to pay attention to irrelevant stimuli (e.g., background color of word card) or to only one aspect of the stimulus (e.g., first letter of a word)

- To correct for this consider how can you make the $S^D$ more salient so that student will be more likely to make correct response.
Teaching Concepts
(stimulus classes)

- Teach examples and nonexamples using differential reinforcement
  - Some individuals require systematic, explicit instruction and using examples/nonexamples is helpful for them
- Use descriptions/rules to teach concepts
  - Requires some level of verbal skills
- Teach using stimulus equivalence
  - A=B, B=C, A=C

Teaching Complex Behaviors: Chaining

Chain - A complex behavior consisting of two or more component behaviors that occur together in a sequence; sometimes called stimulus-response chains

Link – each component behavior or subskill within a behavioral or instructional sequence

TASK ANALYSIS
Stimulus-Response Chain

- **Backward Chaining** - Last component of chain is taught/reinforced first, then next-to-last, and so on, until entire chain is learned (e.g., learning to use computer to access the internet, JABA, 40(1) pp. 185-189)

- **Forward Chaining** – First component of chain is taught first; then next step and so on until entire chain is learned
Total Task (Concurrent) Presentation

- Trainer **prompts** the learner through *all* steps in the chain, then gradually fades prompts, until individual completes entire chain independently.

**Shaping:** Differential reinforcement of successive approximations of a target behavior (that is not currently in the individual's behavioral repertoire), until the target behavior is exhibited.

Reinforce slight changes in some dimension of the behavior until the behavior gradually approaches the target.

**Example of Shaping**

(Cooper et al., 2007)

- **Putting glasses up to his face**
- **Picking up glasses**
- **Touching glasses**

1st day — Last day
• FADING
  – Used to bring an already learned behavior under control of a different stimulus
  – Target behavior doesn’t change – antecedent stimulus varies
  – Teacher manipulates the antecedent stimulus
  – Is a stimulus control procedure

• SHAPING
  – Used to teach a new behavior
  – Target behavior does change
  – Teacher manipulates the consequences
  – Is not a stimulus control procedure

How to Use Shaping

• Define target behavior (end behavior) precisely
• Identify an appropriate starting point/behavior
• Choose proper size and duration of time on steps (pace)
• Choose a reinforcer
• Combine use of discriminative stimuli with shaping
• Differentially reinforce successive approximations

Shaping Practice
Work in pairs to
• Determine a target behavior for one of your students and identify an appropriate starting point
• Decide on the size and duration of time on steps (pace)
• Specify the discriminative stimulus
• Choose a reinforcer and decide how you will use differential reinforcement during the shaping process

Coming up: Week 8
• Learning strategies that use consequences to INCREASE behaviors
• Read Chapter 8 in your text
• Turn in Take-home Quiz 1
  – Download from the class website, complete, and turn in a hard copy.