

Advanced Enrichment Design and Evaluation



ASAG AVIAN WELFARE WORKSHOP AZA MID-YEAR

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Environmental Enrichment



- **Enrichment's Identity Crisis**
 - Explosion of interest and application of enrichment
 - Focus of Environmental Enrichment shifted to Objects
 - Emphasis on frequency and diversity of objects
- **Goals of Environmental Enrichment tied to Behavior**
 - Increase performance of desired behaviors
 - Decrease performance of abnormal behaviors
 - Support diverse and species-typical behavior time budget
- **Enrichment as a mechanism to improve welfare must address behavior.....and feelings.**

Parrot Enrichment and Welfare

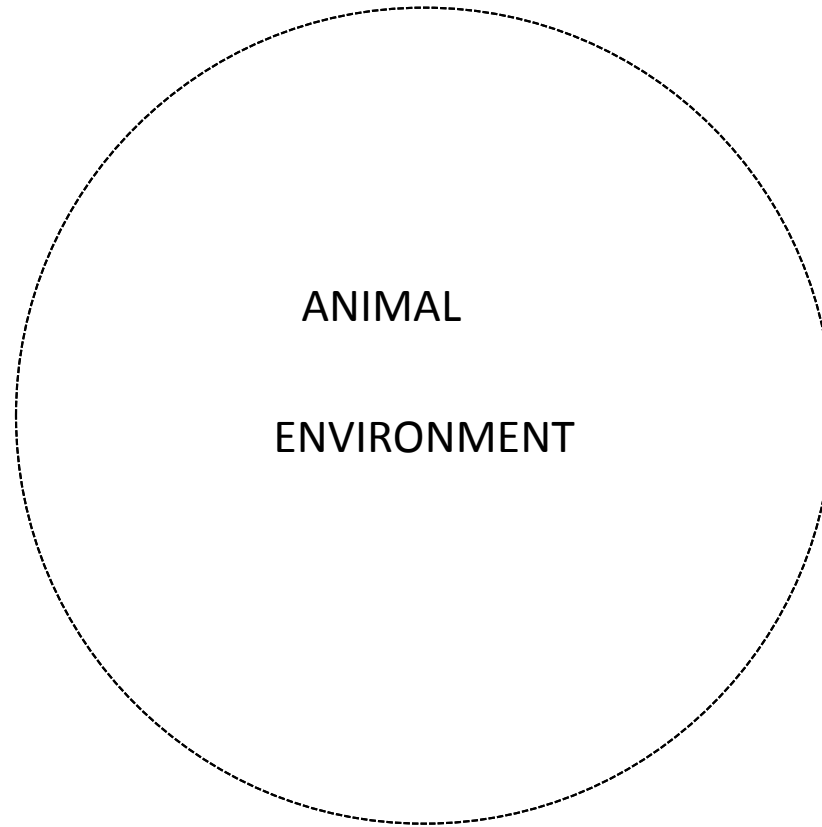


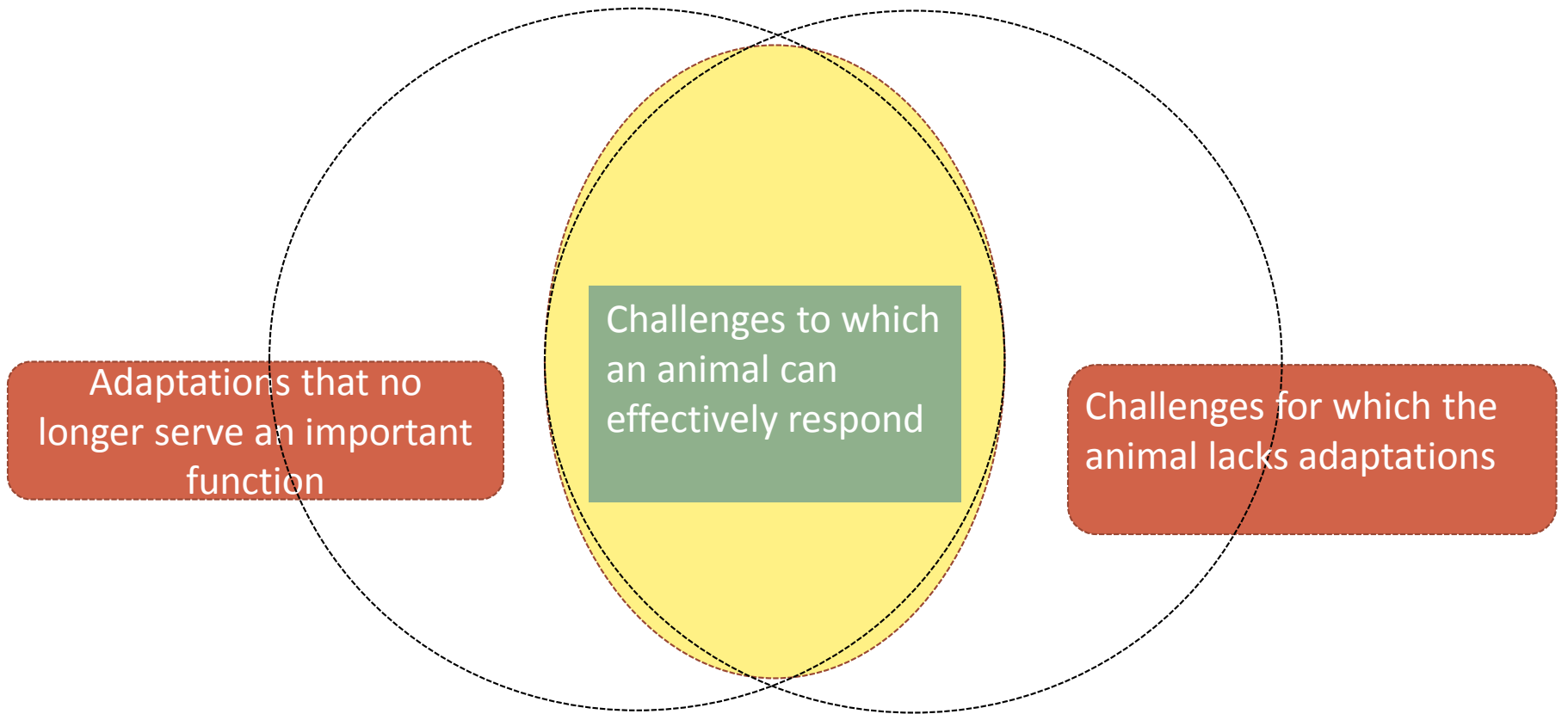
Integrating Challenge into Enrichment Design



- Animals all have sets of skills for which their proficiency level is high.
- By modifying the challenge presented in the captive environment we can provide opportunities for animals to utilize and strengthen these skills.
- Appropriate challenge has the capacity to enhance brain development.
- Appropriate allows animals to express extrinsically and intrinsically motivated behaviors.
- Appropriate challenge can impact emotional experience.

Product of Evolution and Experience





From Fraser et al., 1997

Design Framework



1. Identification of the skill set we wish to challenge.
2. Outlining clear goals related to the execution of the skills of interest.
3. Incorporating direct feedback to animals.
4. Planning for incremental increases in challenge.
5. Assessment of performance: when it is working and when not?

Step 1: Identification of Skills to Challenge



- **Categories of Challenge**

- **Cognitive Challenge**

- ✦ Requires the application of problem solving skills.

- **Physical Challenge**

- ✦ Requires the application of physical abilities.

- **Temporal Challenge**

- ✦ Requires action within time boundaries.

- **Competitive Challenge**

- ✦ Requires observing others, modifying behavior, adopting alternative strategies.

Step 2: Identifying Goals for Skill Execution



- Linking skills to actions through enrichment
 - Review cognition literature
 - Review field studies
 - Think about the appropriateness of competition given the group of animals of interest.
 - Place in the context of your setting and resources.











Means-Means-End Problem Solving



- Goffin's Cockatoos perform a 5-step Problem Solving Sequence.
 - Intense Interaction
 - Haptic Exploration
 - ✦ Bill, Beak and Feet
 - Incremental Learning
 - Social Learning
 - No Shaping

Auersperg AMI, Kacelnik A, von Bayern AMP (2013)

Actions required for removing each individual lock (L1-L5).

Lock	Motor Action	Imagery
<p>L5. Pin</p> 	<p>Grab at the top ring; pull up or push lower end with beak tip from below through the pierced screw.</p>	
<p>L4. Screw</p> 	<p>25-30 consecutive up and down movements at the distal end (circular motor action) with beak or claw.</p>	
<p>L3. Bolt</p> 	<p>Insert beak underneath lower end; lever up through fixation ring.</p>	
<p>L2. Wheel</p> 	<p>Twist 90°, pull towards own body through T-bar with beak or claw.</p>	
<p>L1. Bar</p> 	<p>pull lever laterally with beak or claw or push proximal bar end through the fixation.</p>	

Auersperg AMI, Kacelnik A, von Bayern AMP (2013) Explorative Learning and Functional Inferences on a Five-Step Means-Means-End Problem in Goffin's Cockatoos (*Cacatua goffini*). PLoS ONE 8(7): e68979. doi:10.1371/journal.pone.0068979
<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0068979>

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Auersperg AMI, Kacelnik A, von Bayern AMP (2013)

- New Caledonian Crows perform Sequential Tool Use

- Multiple inaccessible tools, which differed in functionality.
- Position of food and/or tools determined what sequence of behavior was required for success.
- Mixed results depending in part on previous experience.

Wimpenny JH, Weir AAS, Clayton L, Rutz C, et al. (2009)

Discrimination Learning



- Abyssinian and Von der Decken's Hornbills solve discrimination tasks
 - Learned combinations of symbols
 - Made associations
 - Worked through physical barriers



Step 3: Incorporating Direct Feedback to Animals

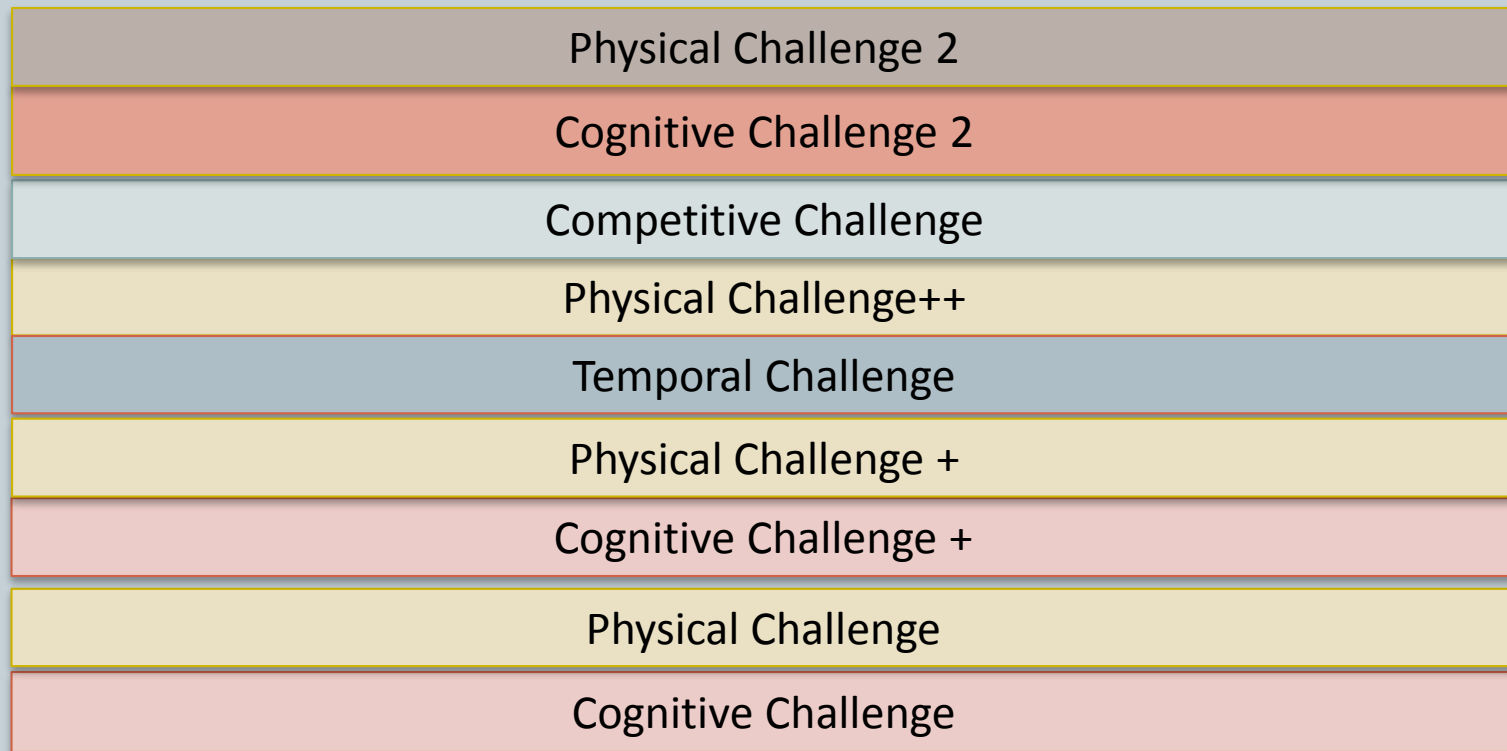


- How do animals know if they are meeting the challenge?
- Reward
 - Food
 - Novel objects / Toys
 - Bedding / Nest materials
 - Access to valued events: showers, caretaker interaction, etc.
 - Tokens
- Rewards may be in addition to, or in lieu of freely available versions of these items.

Step 4: Planning for Incremental Increases in Challenge



Layering Challenge



Example: Parrot Enrichment



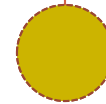
Step 1: Identify Skills

- Cognitive Skills
 - Means-end problem solving
 - Visual association
- Physical Skills
 - Balance
 - Beak-foot dexterity
- Temporal Challenge
 - Cued time constraints
- Competitive Challenge
 - Multi-bird devices

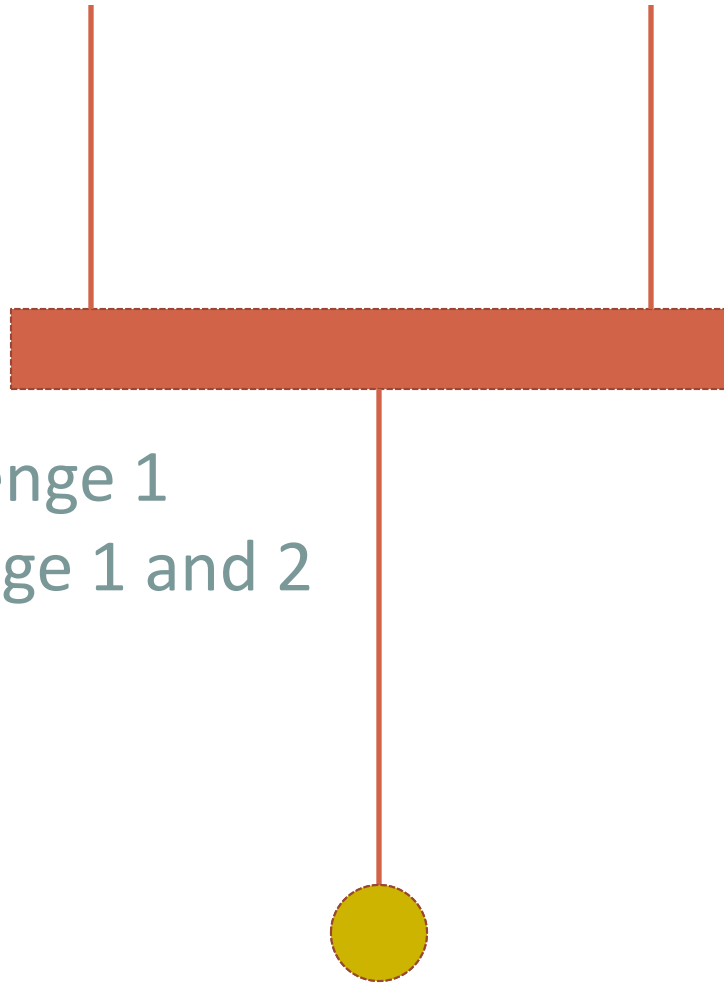
Step 2: Goals for Skill Execution

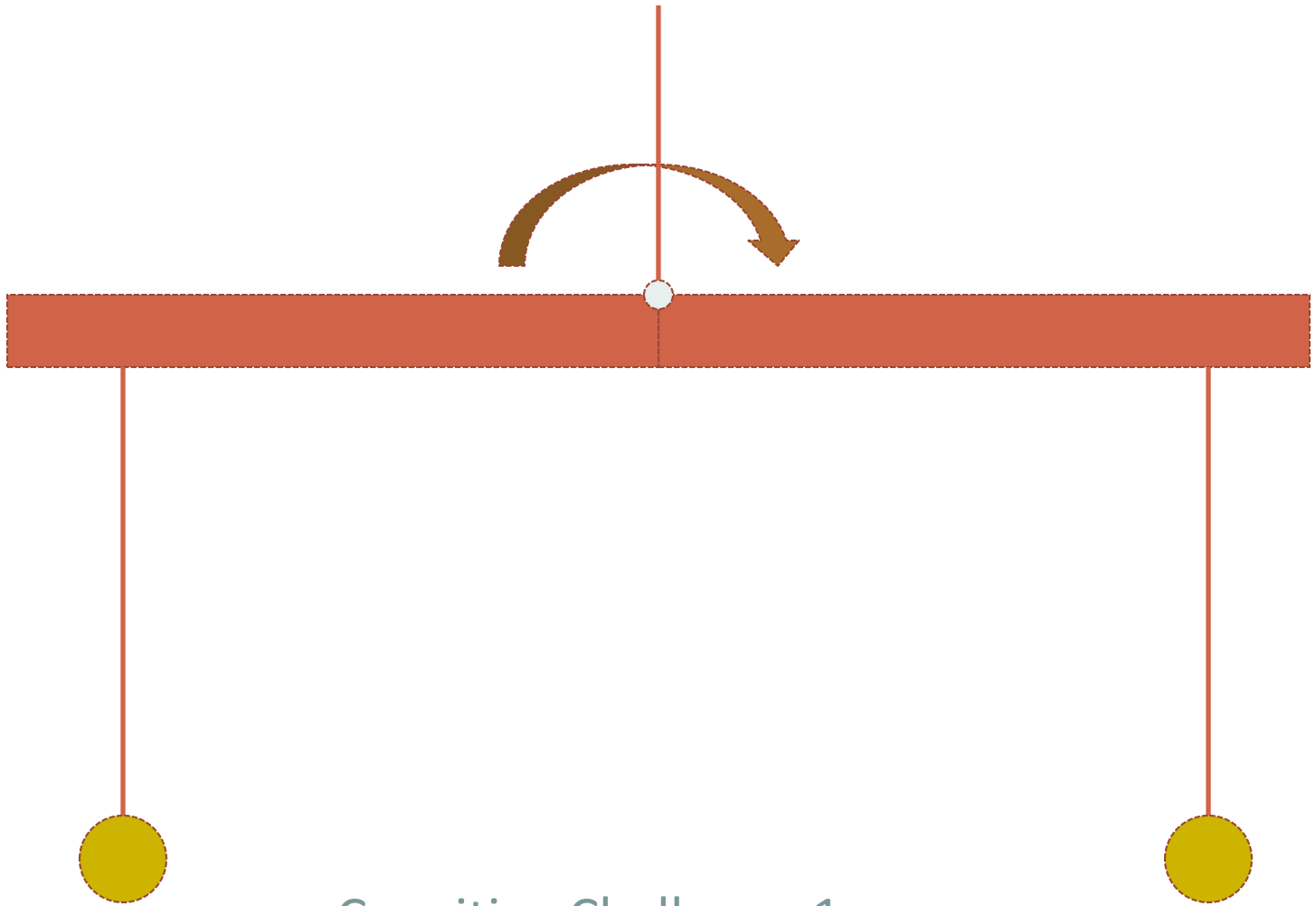
- Suspended reward task
- Unstable perching substrate
- Inedible barrier substrate
- Multi-bird design
- Colors predict time constraints

Cognitive
Challenge 1
Physical
Challenge 1



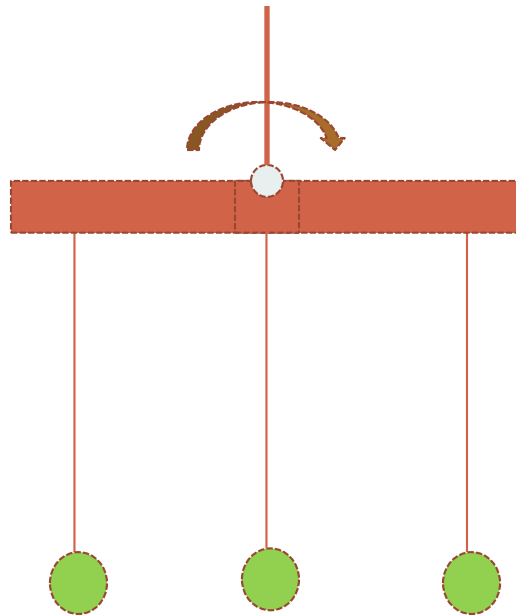
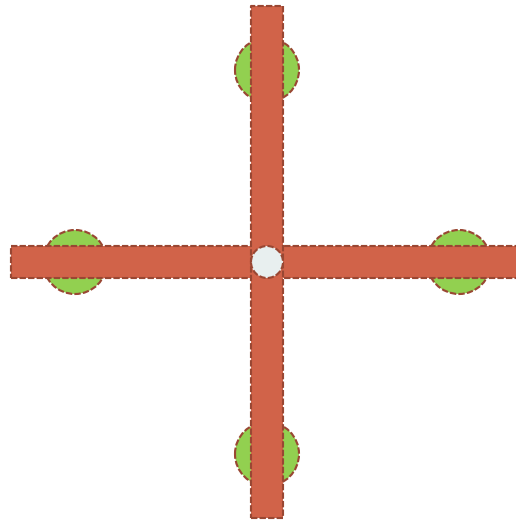
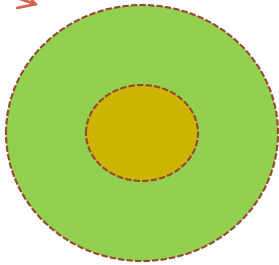
Cognitive Challenge 1
Physical Challenge 1 and 2



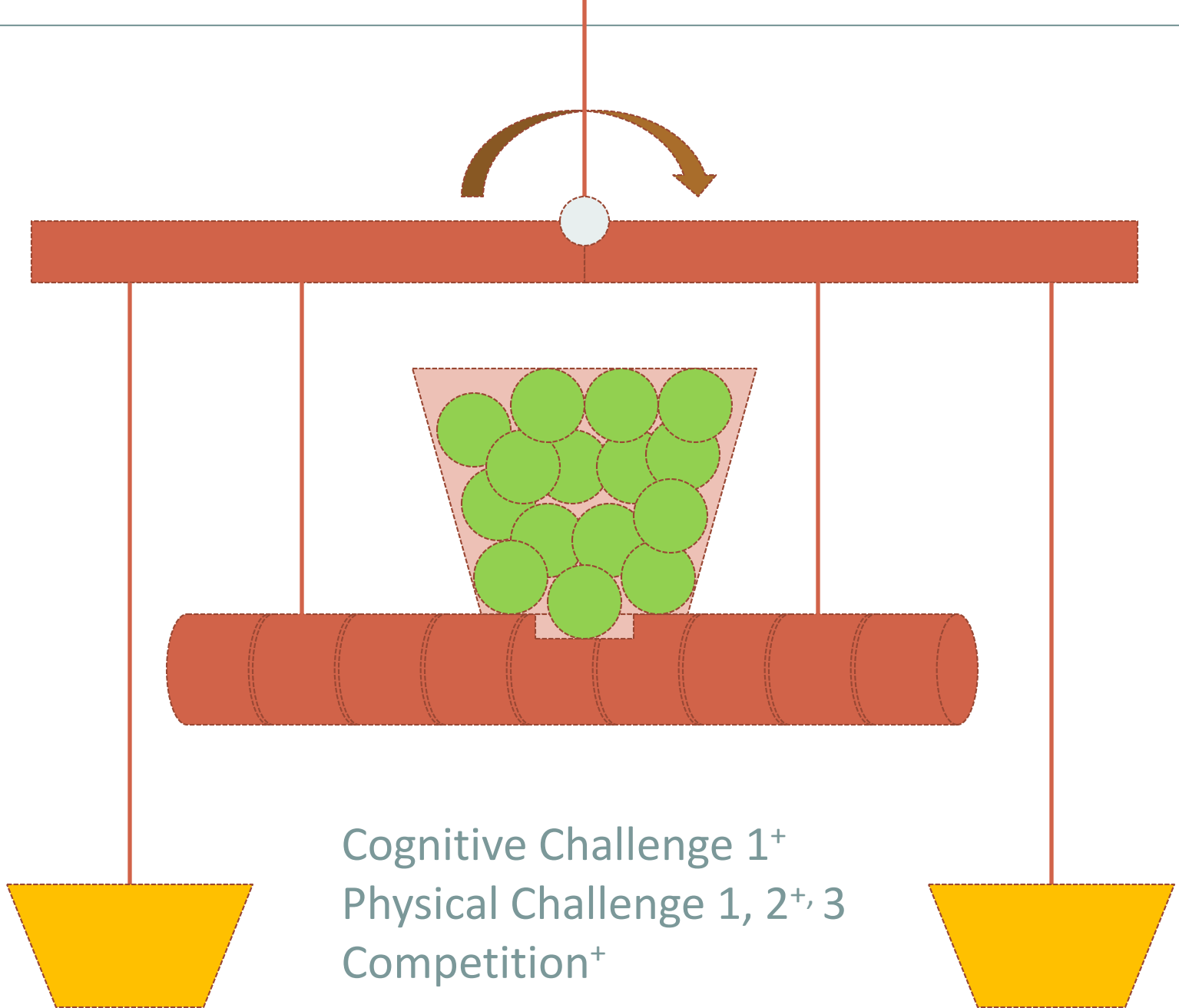


Cognitive Challenge 1
Physical Challenge 1 & 2⁺
Competition

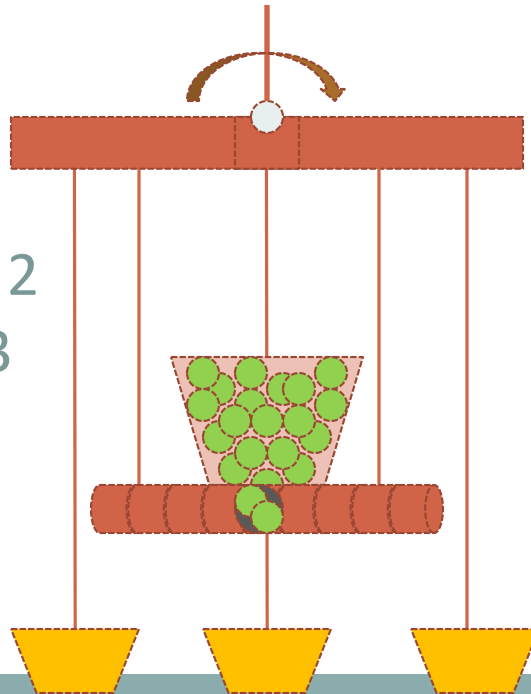
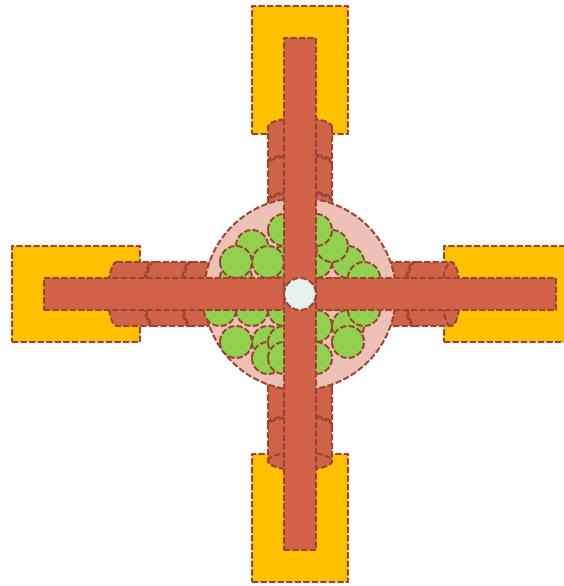
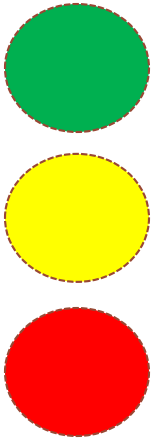
Barrier substrate



Cognitive Challenge 1
Physical Challenge 1, 2⁺, 3
Competition⁺

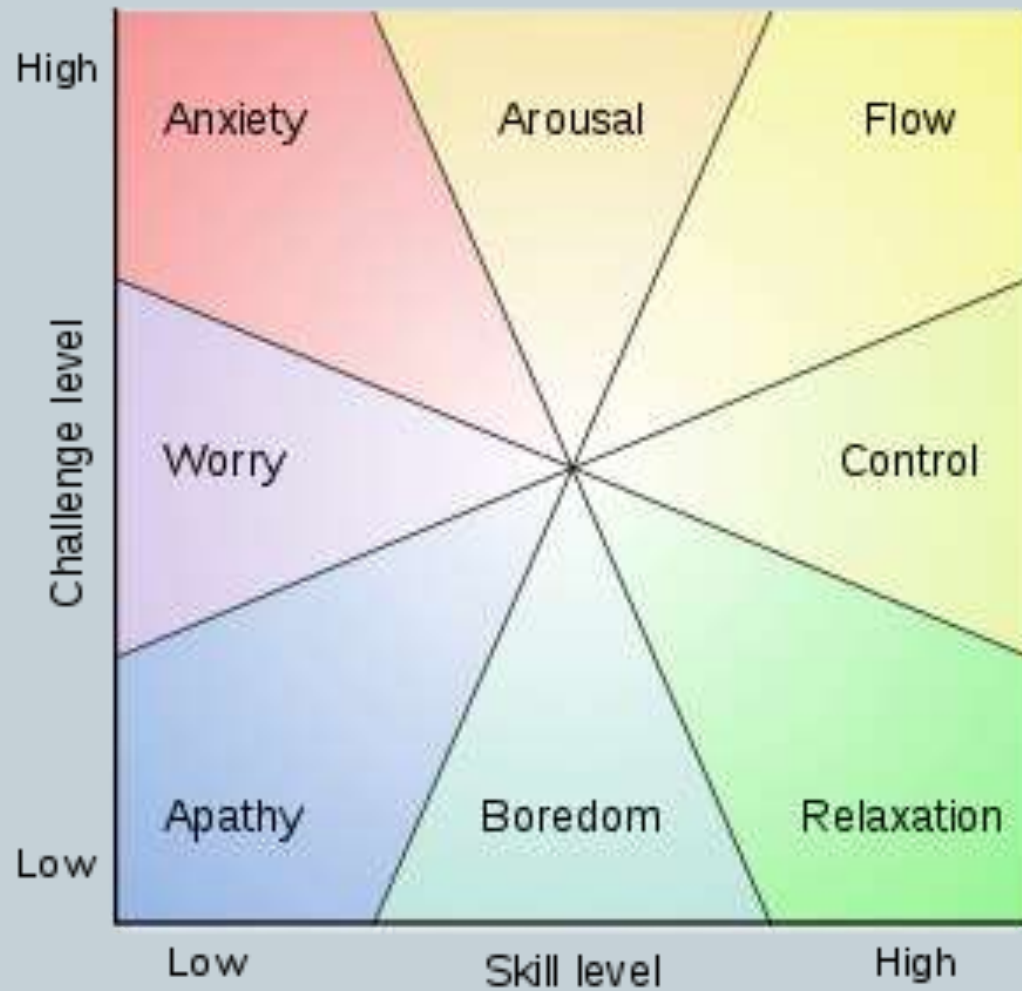


Cognitive Challenge 1⁺
Physical Challenge 1, 2⁺, 3
Competition⁺



Cognitive Challenge 1⁺ & 2
Physical Challenge 1, 2⁺, 3
Competition⁺⁺
Temporal Challenge

Go for Flow



Approaches to Assessment



Measure Behavior

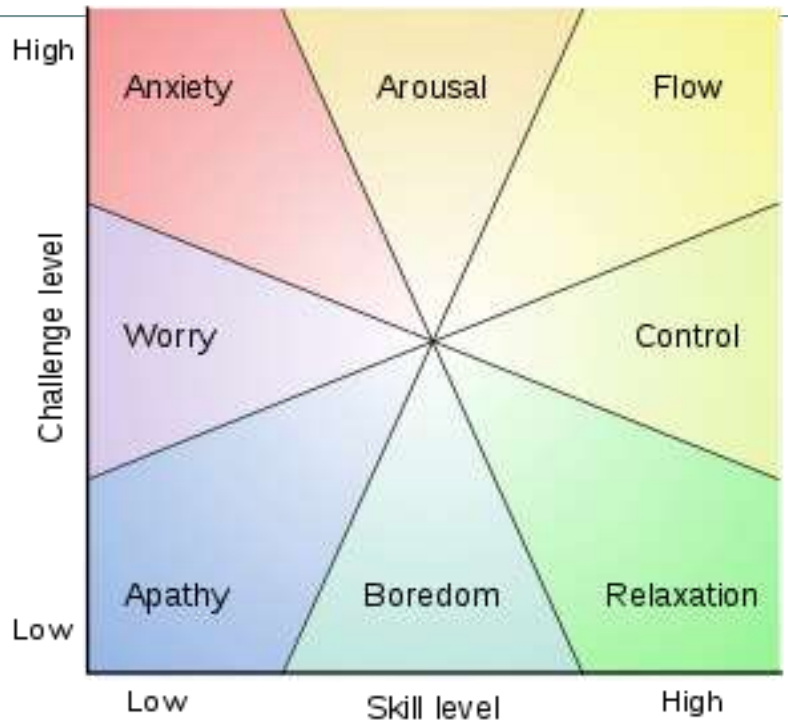
- Frequency and Duration
- Diversity
- Change over time

Ask the Animals

- Preference Testing
- Strength of motivation

Assess Feelings

- Qualitative Behavior Assessment



Stage	Behavior	Feeling	Strategy
Interest	Approach, Haptic Exploration	Arousal	Observe
Success	Solve problem, access reward	Control, Relaxation	Add Layer
Error	Make mistakes, attempt to adapt response	Arousal, Worry	Observe
Failure	Unable to adapt response	Anxiety	Remove Layer
Proficiency	Novel Approaches and Strategies, TTS decreases, Excitement	Flow	Add Layer, Observe
Plateau	Lack of Interaction	Boredom, Apathy	Add Layer, Recycle

Integrating Challenge into Environmental Enrichment



- Increase behavioral diversity
- Increase affective diversity
- Highlight skills and abilities of birds
- Communicate education messages to visitors
- Add to literature

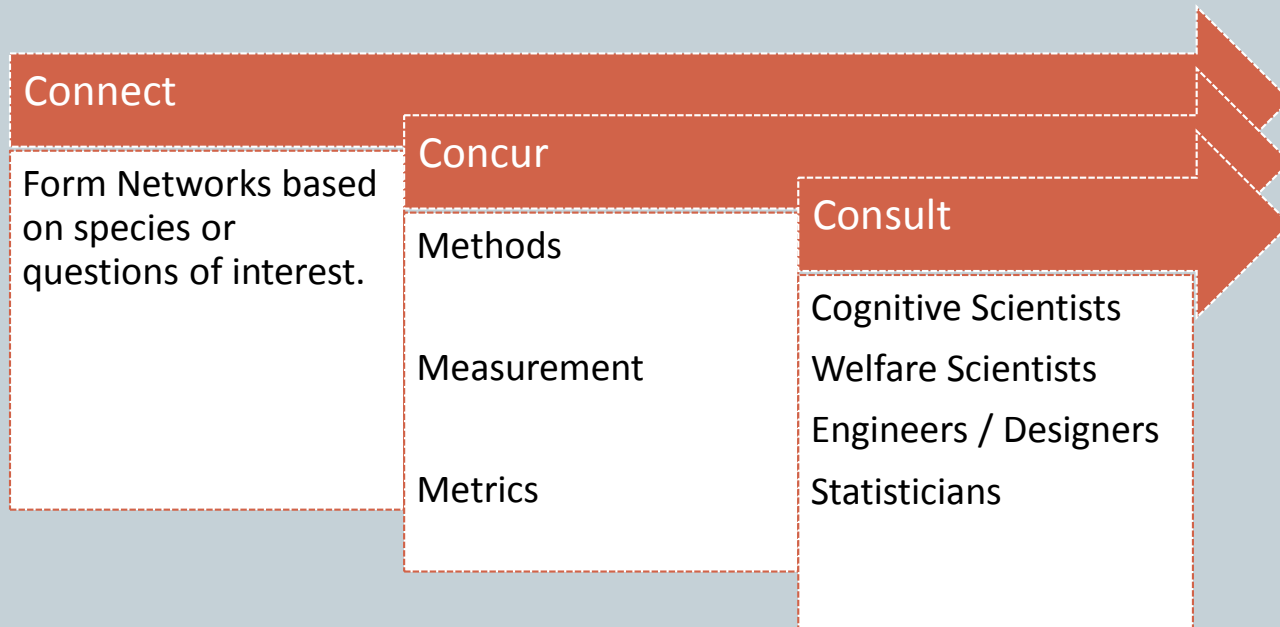


- Significant planning
- Oversight
- Time intensive
- Resource intensive
- Shift from current practice

Collaborative Approach to Advanced Enrichment



Multiple organizations look for innovations through the same lens.



More efficient use of resources and development of common vocabulary. When successful interventions are found adoption spreads rapidly.

Conclusions



- Life may be hard when it is too easy.
- Consider comprehensive emotional experience.
- Reference literature for inspiration.
- Be systematic and intentional.
- Apply rigorous assessment using multiple methods
- Collaborate!

Thank You!

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