

Museum of Science[®]

Productive Struggle Webinar Series

Module 3: Designing for Productive Struggle

August 27, 2020

Current Speaker



Sunewan Paneto
Senior Research & Evaluation Assistant
Museum of Science, Boston
she, her, hers

Who are we?

- Sunewan Paneto, Sr. Research/Evaluation Assistant, Research and Evaluation
- Katharina Marino, Exhibit Content Developer, Exhibit Content Development
- Beth Malandain, Sr. Exhibit Designer, Exhibit Design

Agenda

- Review: What is productive struggle?
- The final Framework
- Case Study: Sneak
- What did we learn?
- How did we learn this?

Case Study: Sneak



Remember

We define productive struggle as an experience with three elements:

1

a learner encounters a challenging task and feels disequilibrium (which might be experienced as emotions like confusion, frustration, surprise, or unease)

2

the learner is supported to engage with and persist in the task

3

the learner achieves a positive resolution (which might be experienced as emotions like satisfaction or pride)



Nervous, disappointed, embarrassed,
frustrated



Persistent, focused, curious



Amused, satisfied, accomplished



Let's Discuss!

What did you notice?

We define productive struggle as an experience with three elements:

1

a learner encounters a challenging task and feels disequilibrium (which might be experienced as emotions like confusion, frustration, surprise, or unease)

2

the learner is supported to engage with and persist in the task

3

the learner achieves a positive resolution (which might be experienced as emotions like satisfaction or pride)



“So I go back over there and... so I walk? I have a question, do I walk forward and go?”



“I’m going to try the harder one!”

CM starts sneaking really slowly.



CM raises his arms up and shouts, “And the crowd goes wild!”

Storyboarding

First I...	Next I...	Finally I...
...and I felt...	...and I felt...	...and I felt...

Example Questions

What part of the exhibit made you feel that way? Why? Can you tell me more?

During your experience, I noticed you were using.... What were you thinking or feeling then?

I heard you say... Can you tell me more about what you were feeling when you said that?

Stimulated Recall



Example Questions

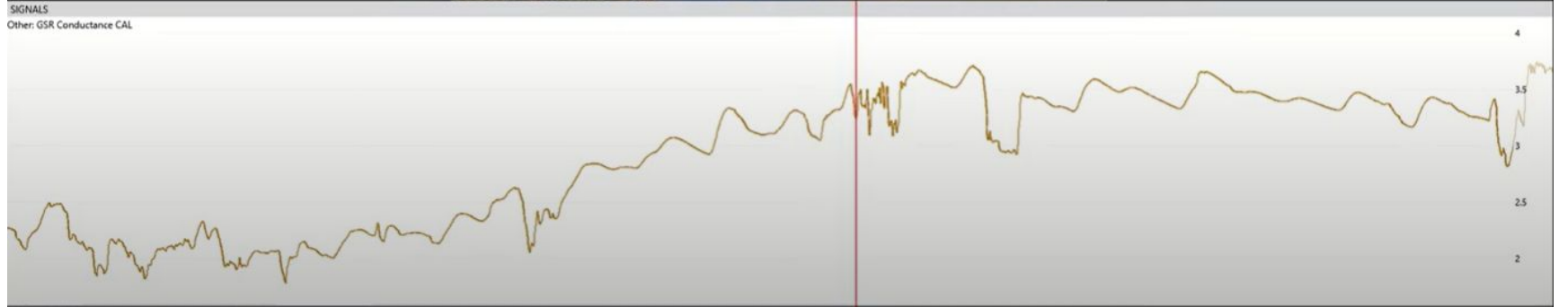
What is happening here?

What were you thinking about?

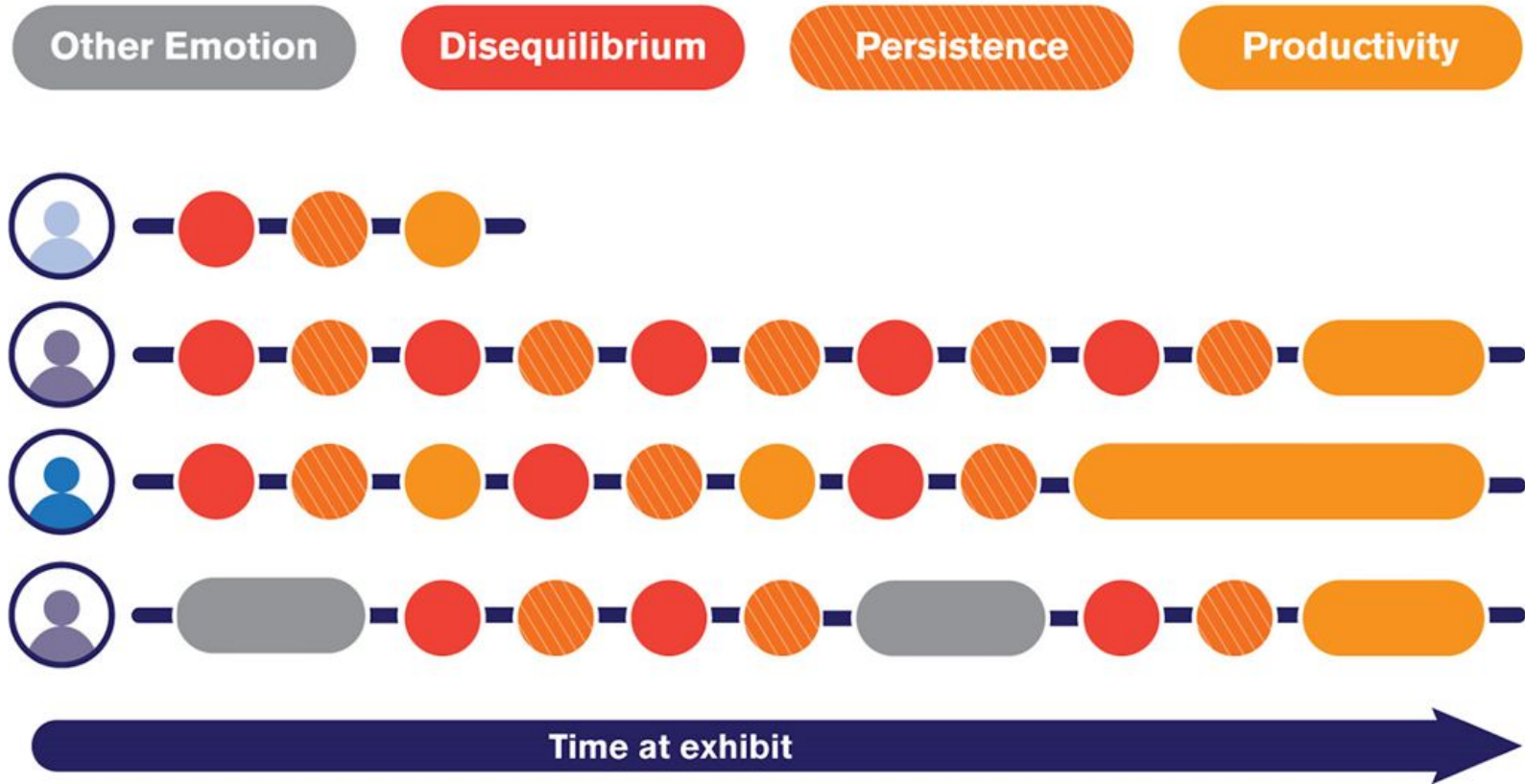
What were you feeling?

What about the exhibit do you think made you feel that way?

“Well, at first when I was going a little fast... well I had to pause because I thought I was going too fast and I wanted to make it first try. So it was challenging. At the end I was happy, I was like [makes a cheering noise]!”



Different visitors' experiences



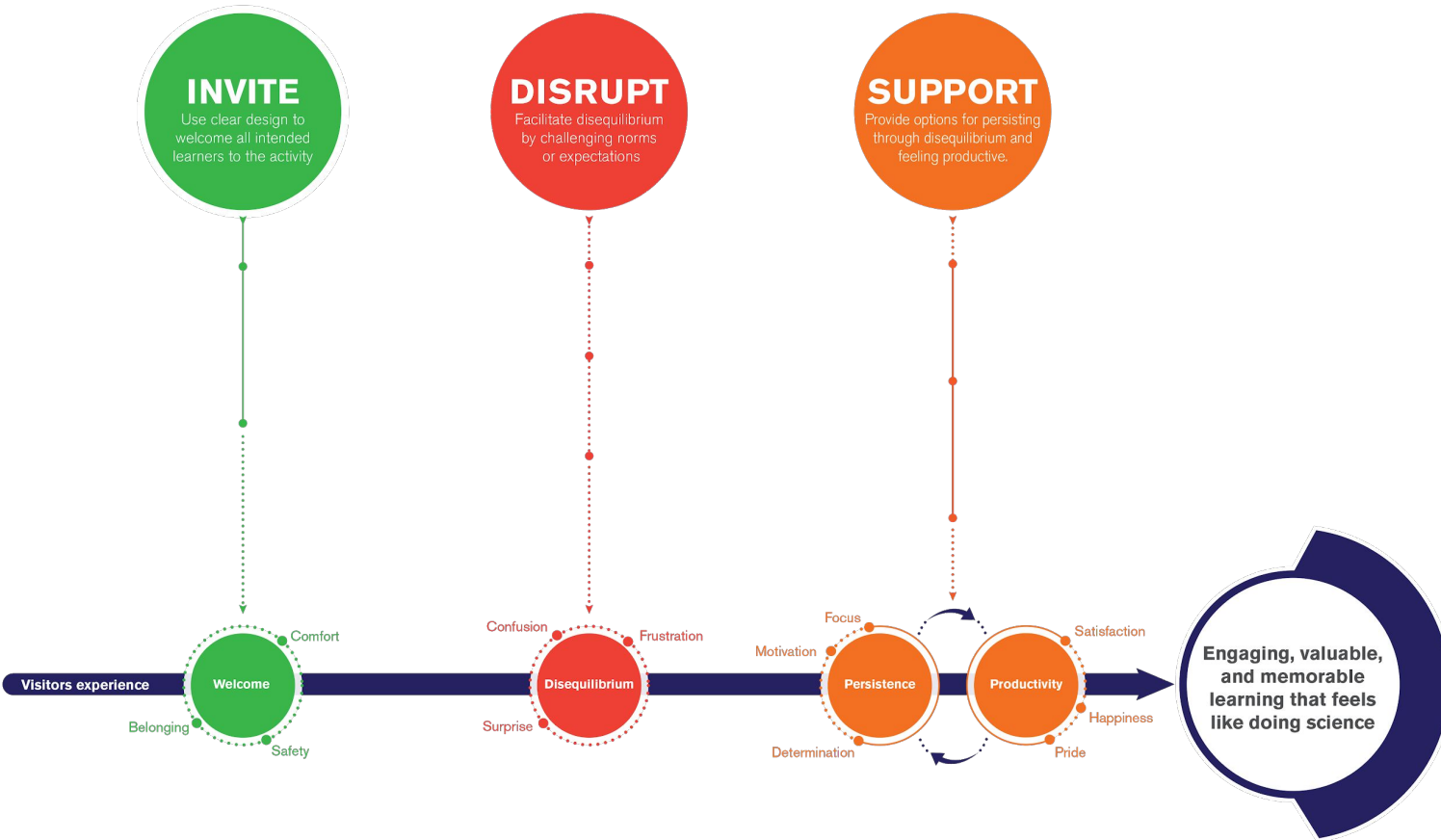
Current Speaker



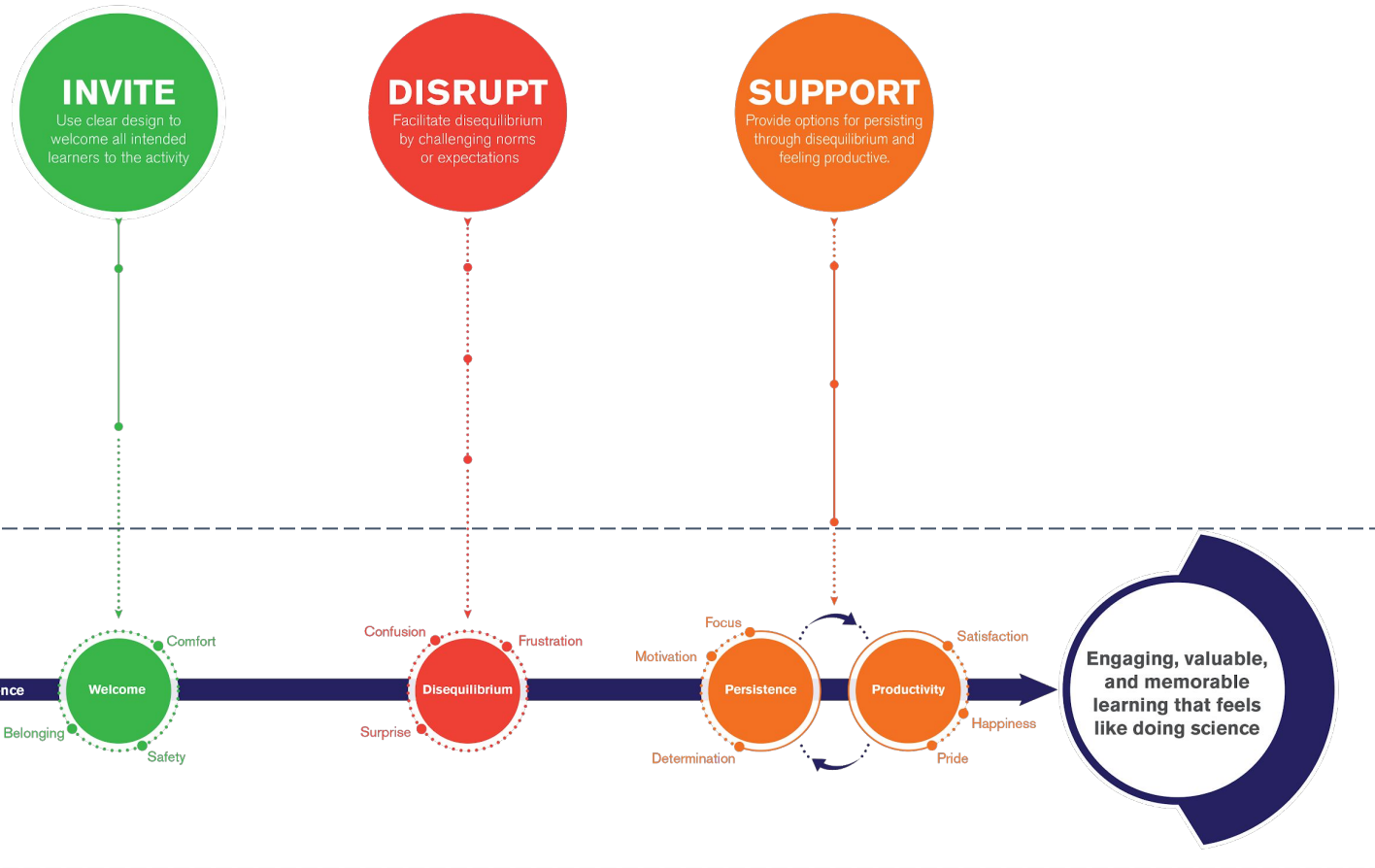
Beth Malandain
Senior Exhibit Designer
Museum of Science, Boston
she, her, hers

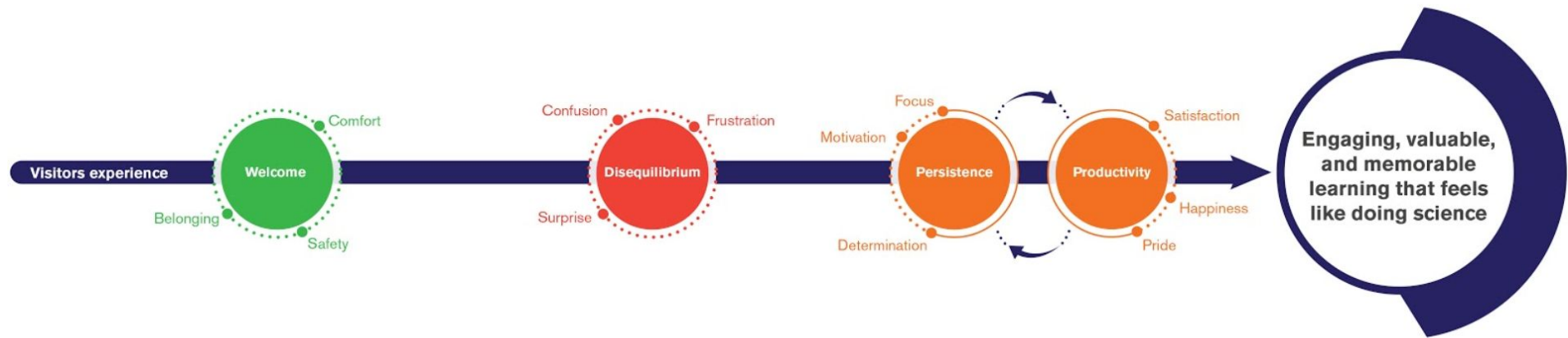
What is a design Framework? Why create a Framework?

Designing for Productive Struggle

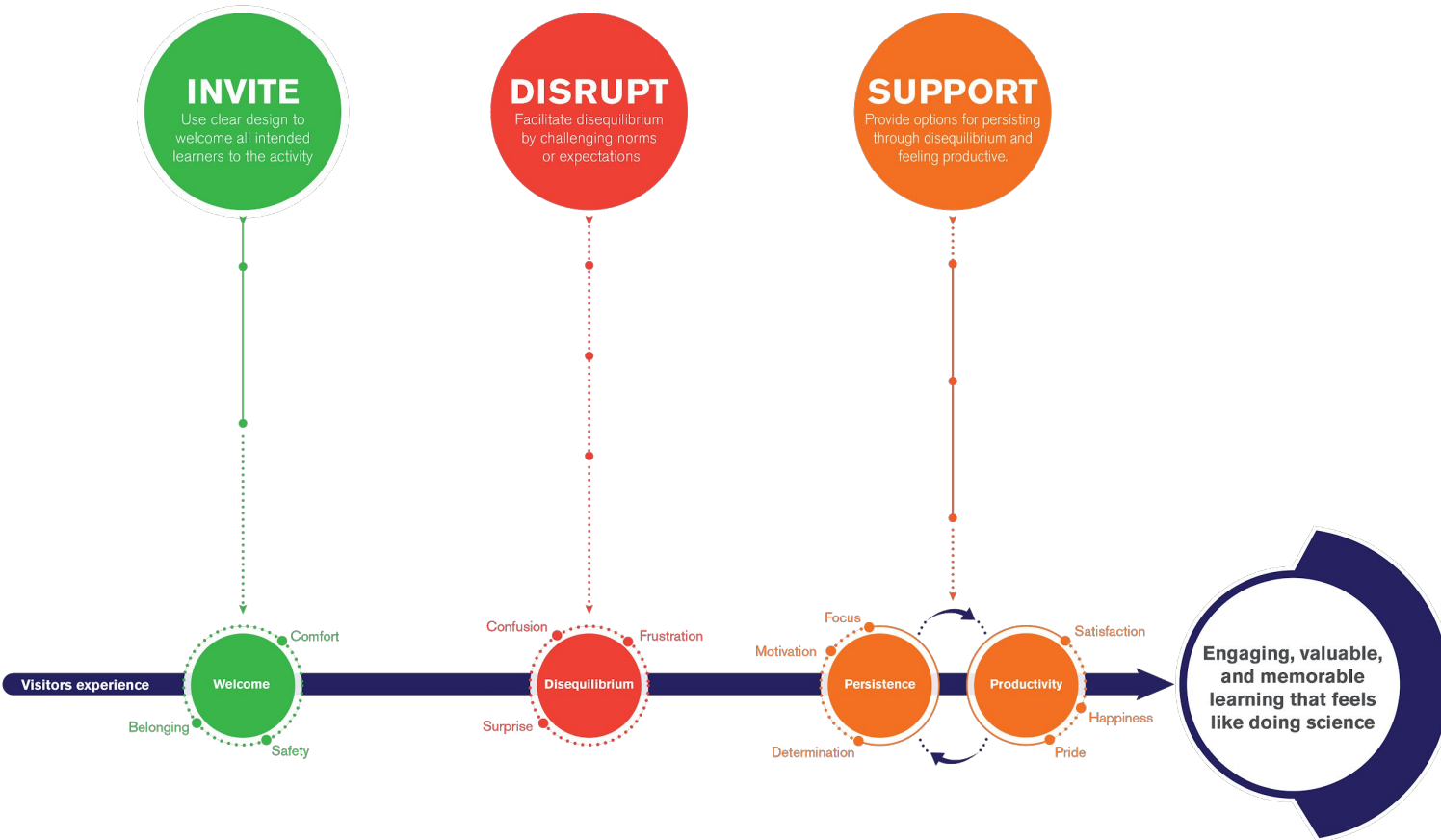


Designing for Productive Struggle





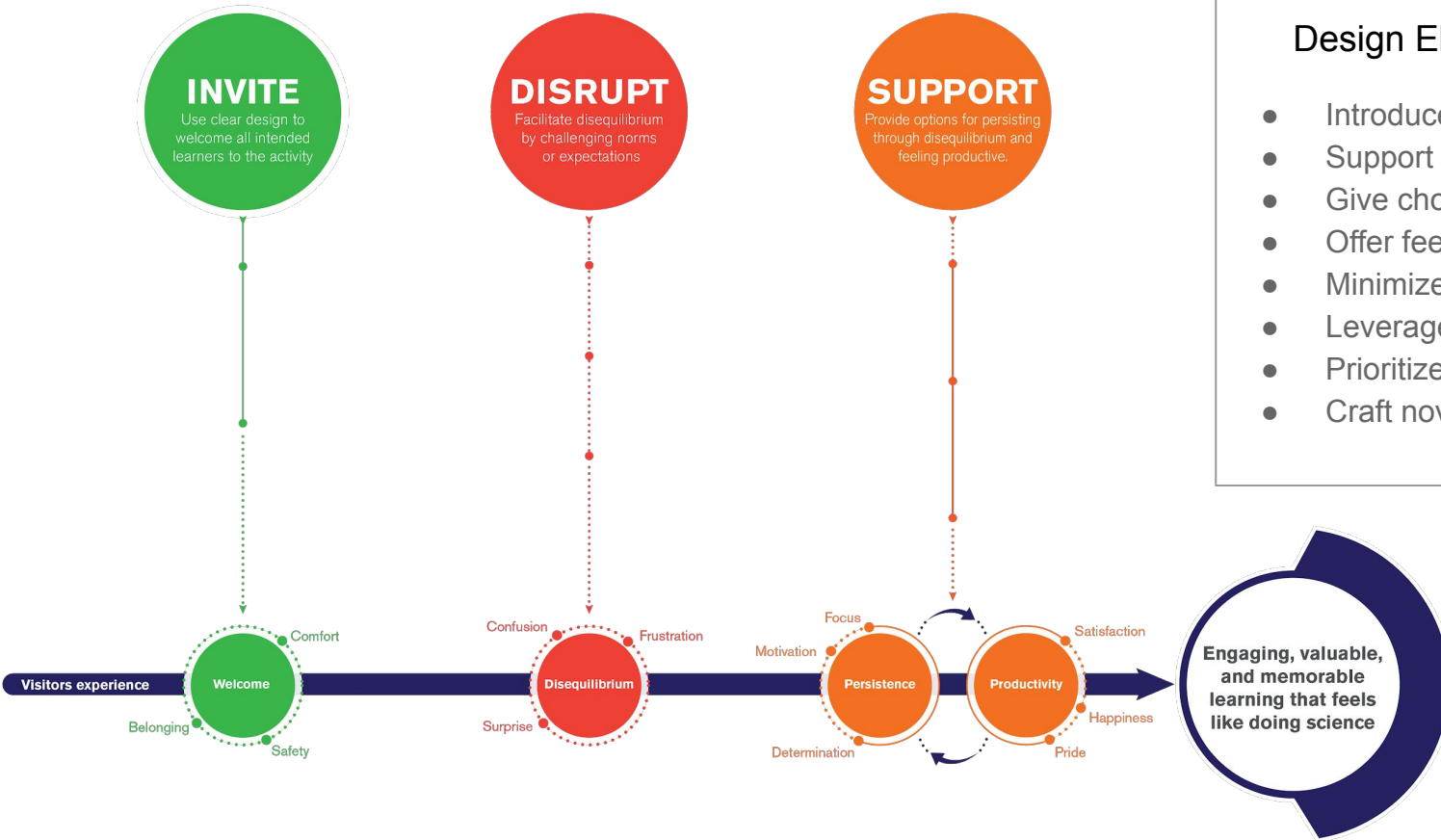
Designing for Productive Struggle



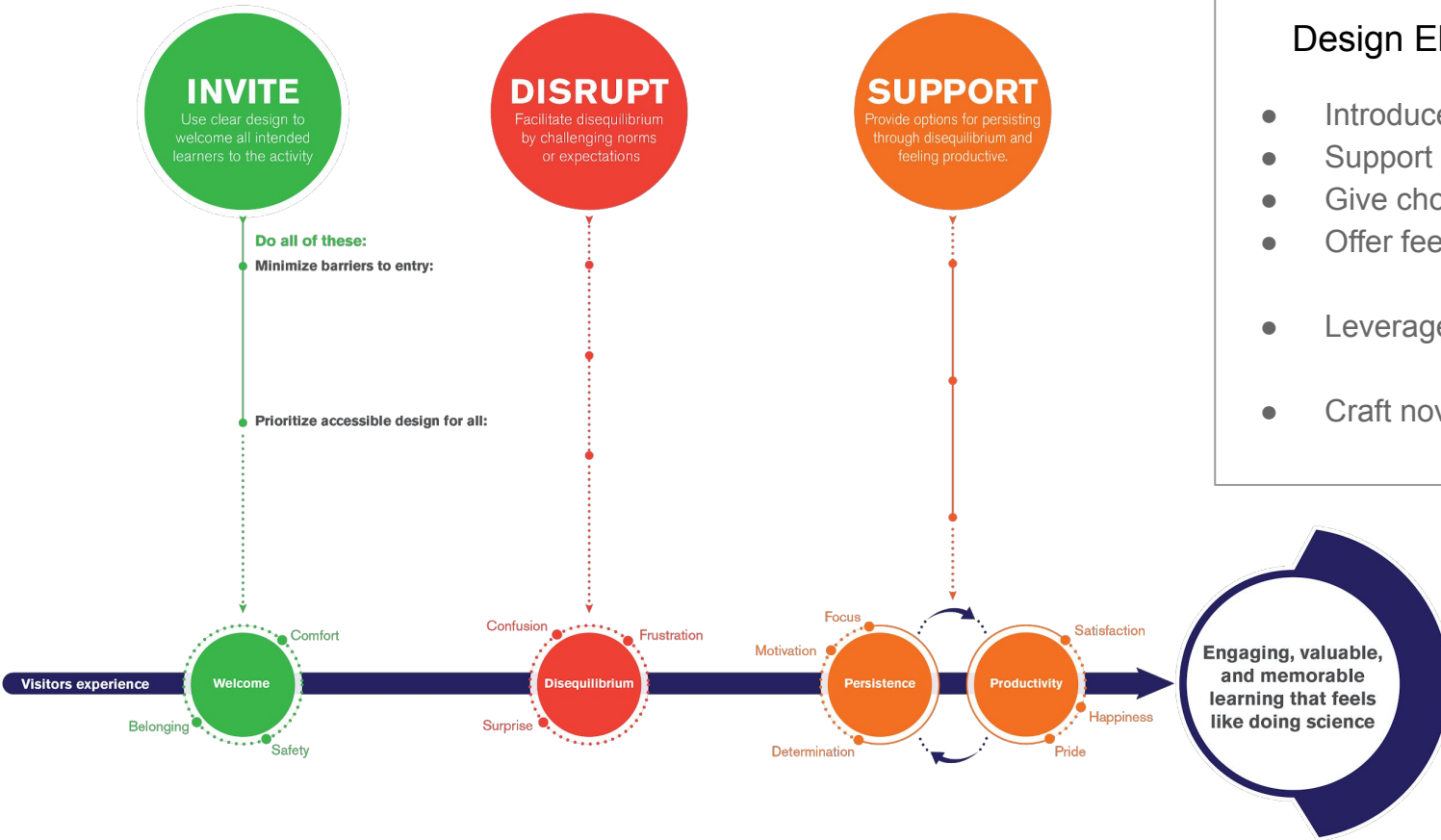
Designing for Productive Struggle

Design Elements Wordbank

- Introduce social unease
- Support self-regulation
- Give choices
- Offer feedback
- Minimize barriers to entry
- Leverage uncertainty
- Prioritize accessible design for all
- Craft novelty



Designing for Productive Struggle



Design Elements Wordbank

- Introduce social unease
- Support self-regulation
- Give choices
- Offer feedback

- Leverage uncertainty

- Craft novelty

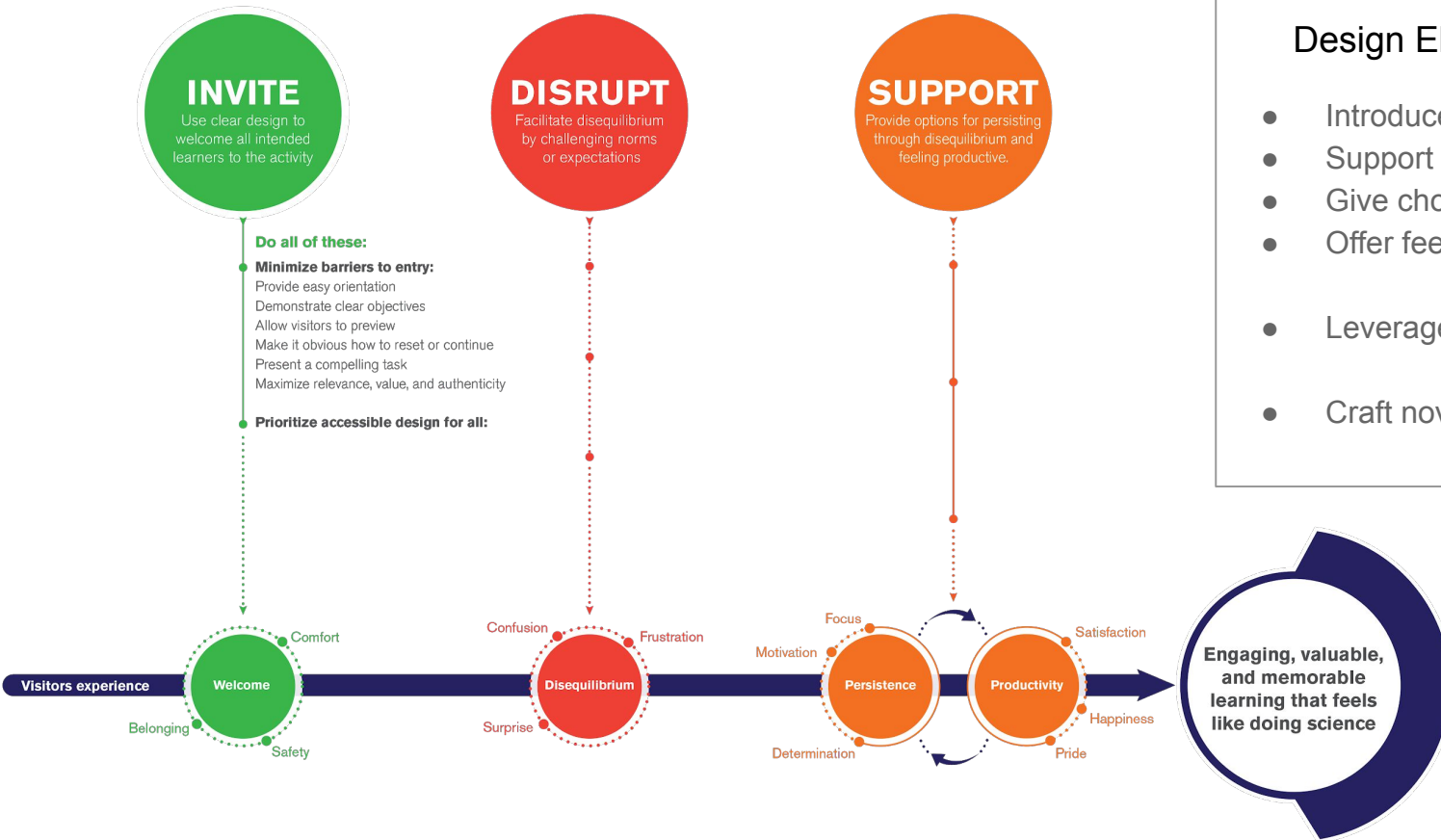
Designing for Productive Struggle

Design Elements Wordbank

- Introduce social unease
- Support self-regulation
- Give choices
- Offer feedback

- Leverage uncertainty

- Craft novelty



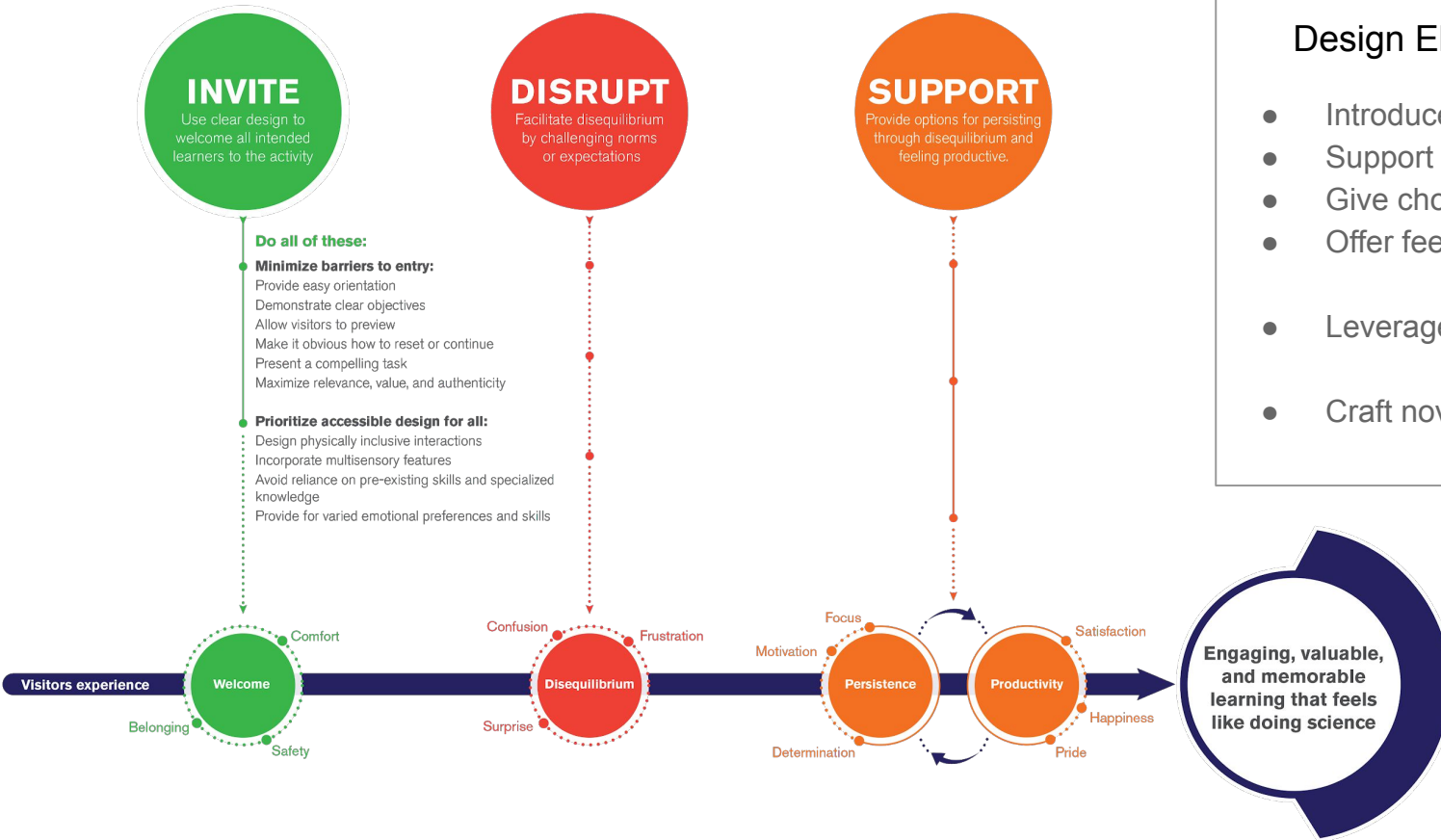
Designing for Productive Struggle

Design Elements Wordbank

- Introduce social unease
- Support self-regulation
- Give choices
- Offer feedback

- Leverage uncertainty

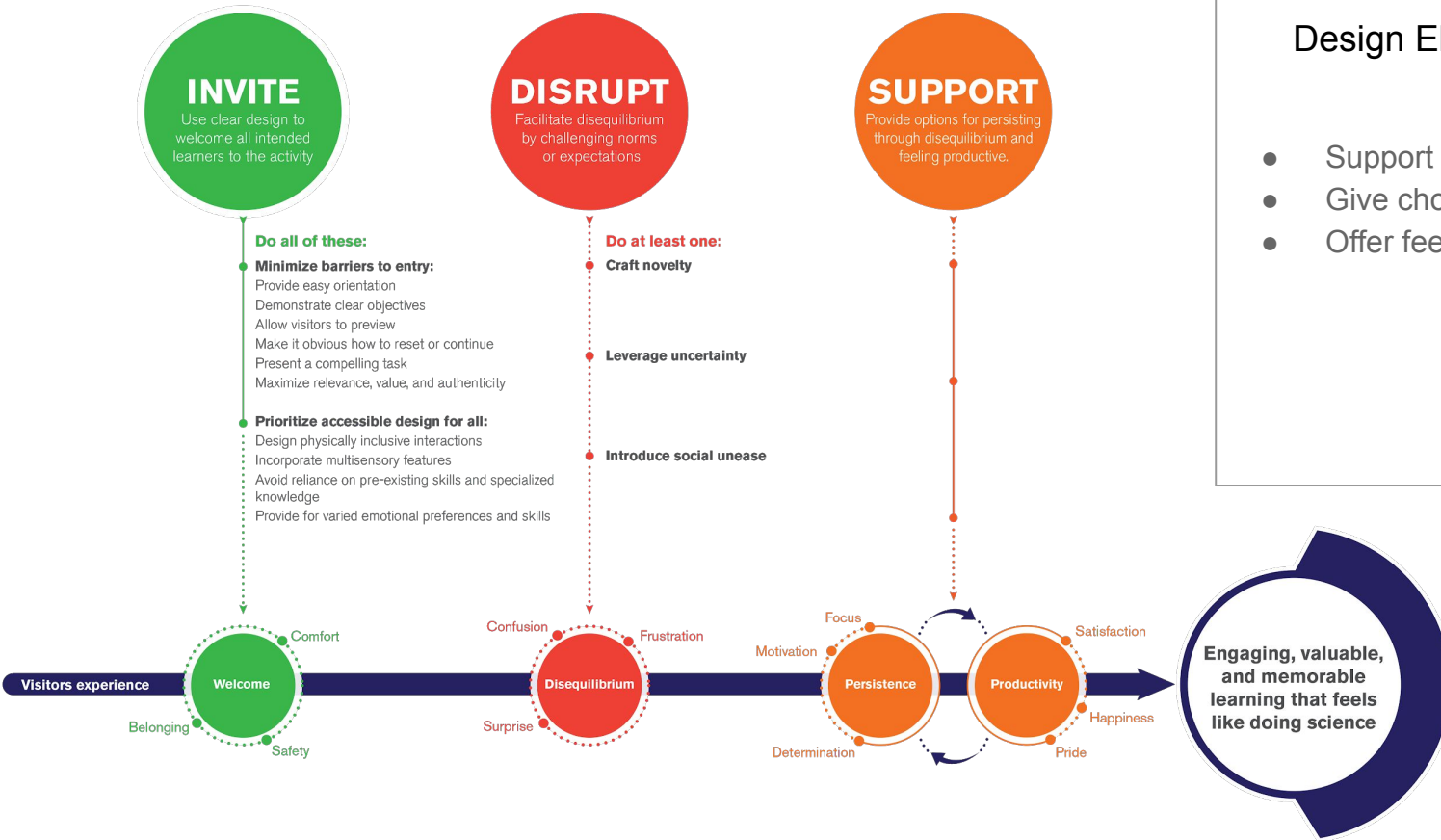
- Craft novelty



Designing for Productive Struggle

Design Elements Wordbank

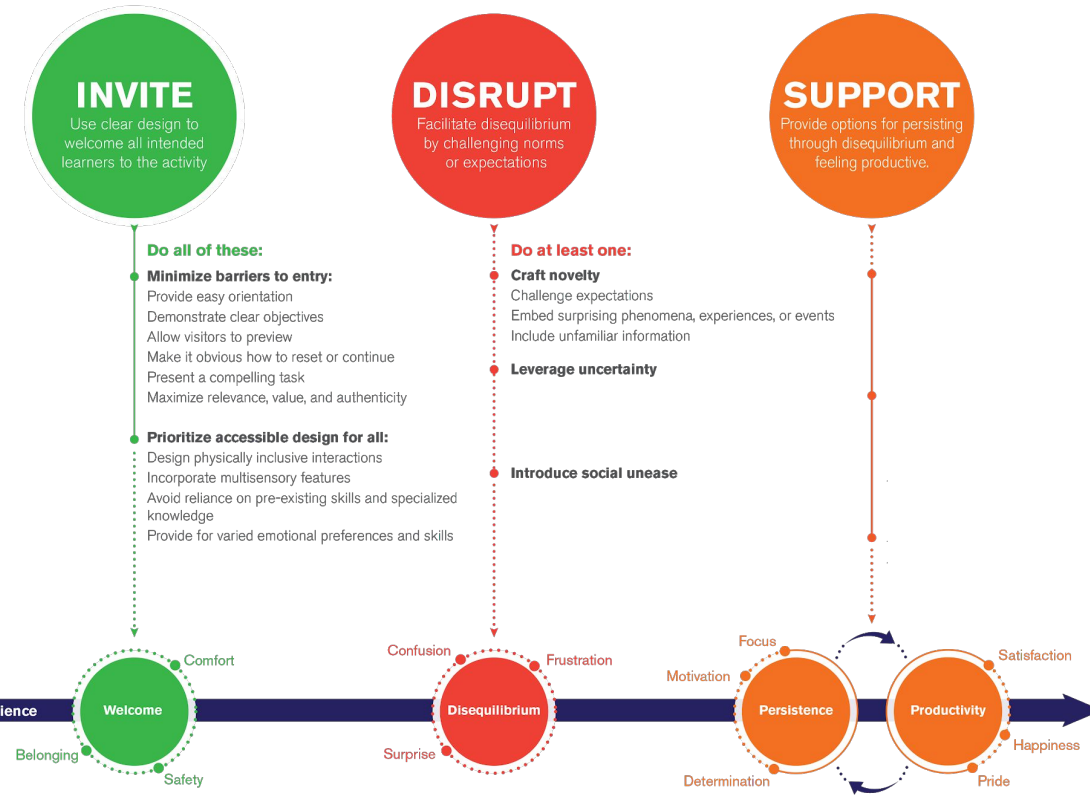
- Support self-regulation
- Give choices
- Offer feedback



Designing for Productive Struggle

Design Elements Wordbank

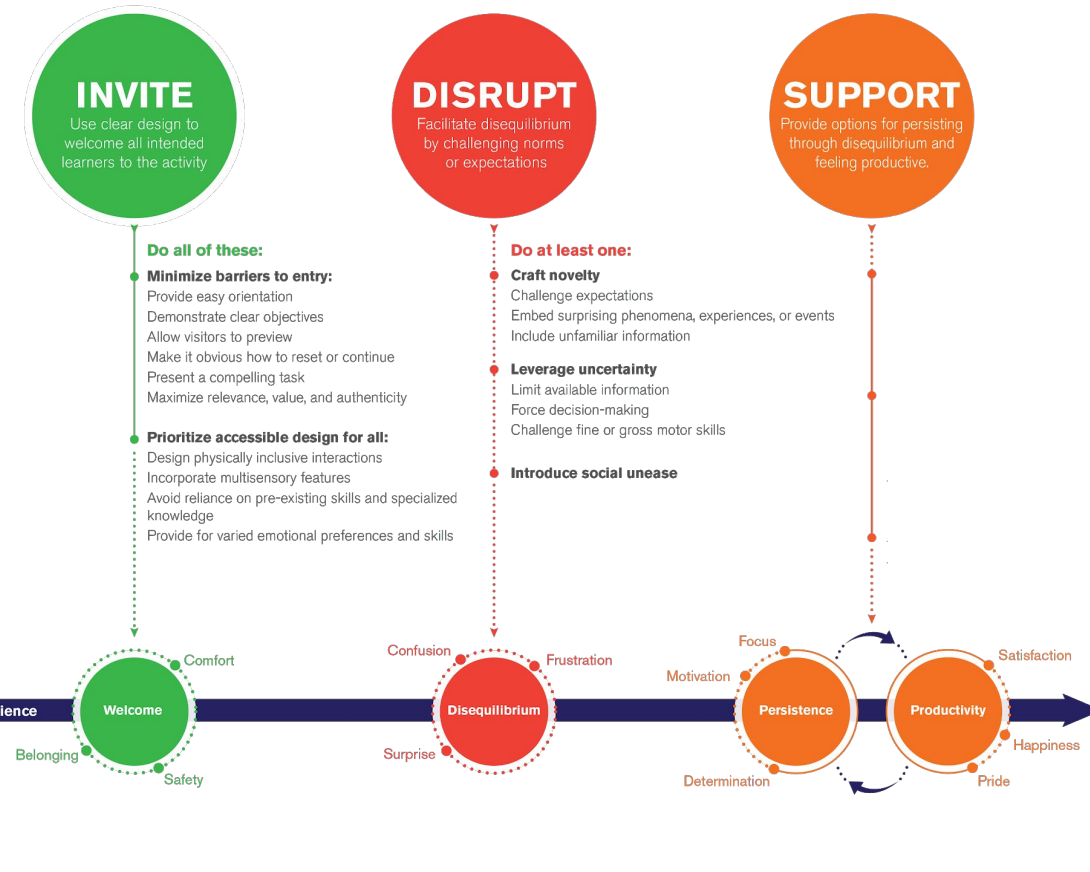
- Support self-regulation
- Give choices
- Offer feedback



Designing for Productive Struggle

Design Elements Wordbank

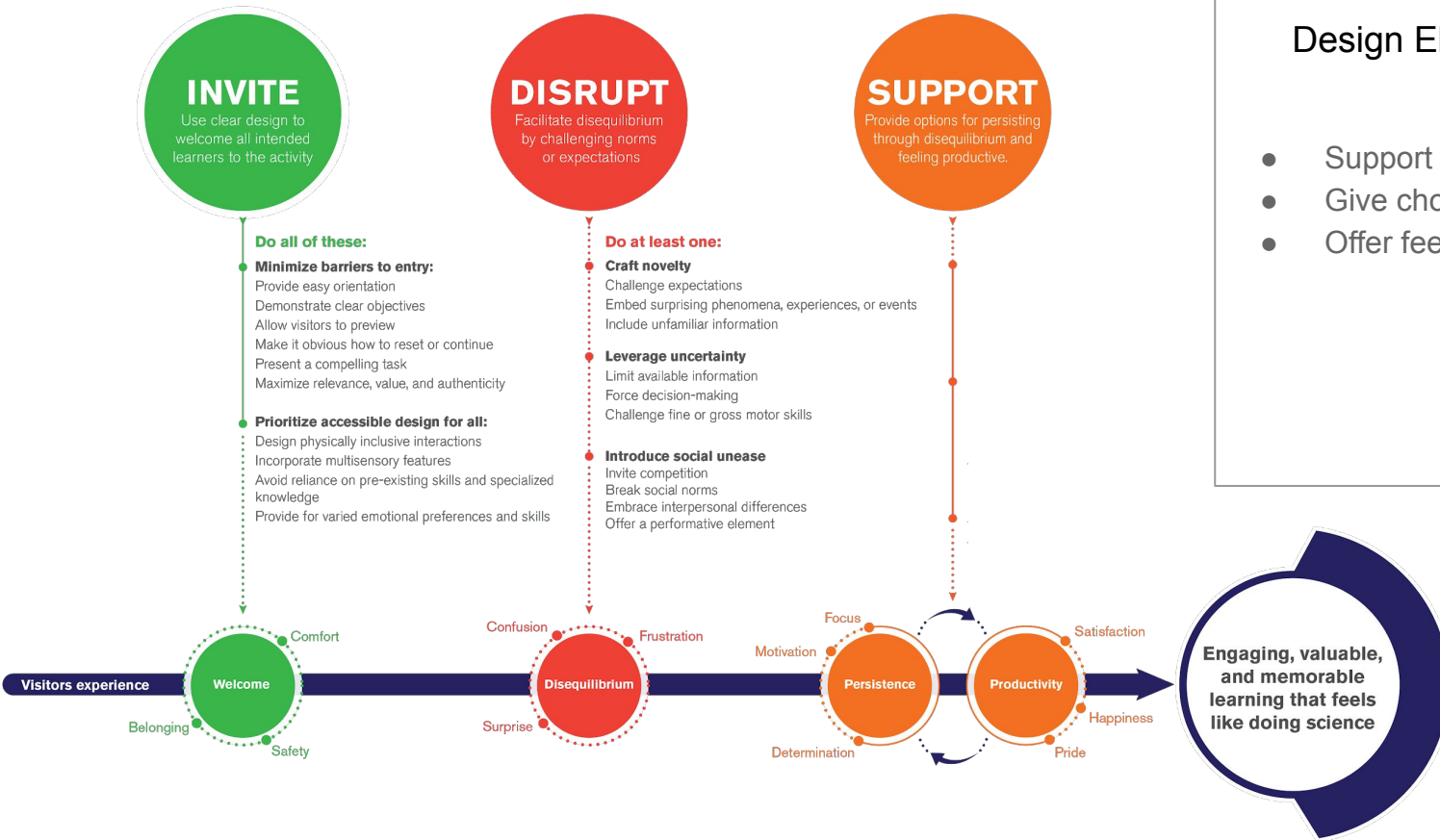
- Support self-regulation
- Give choices
- Offer feedback



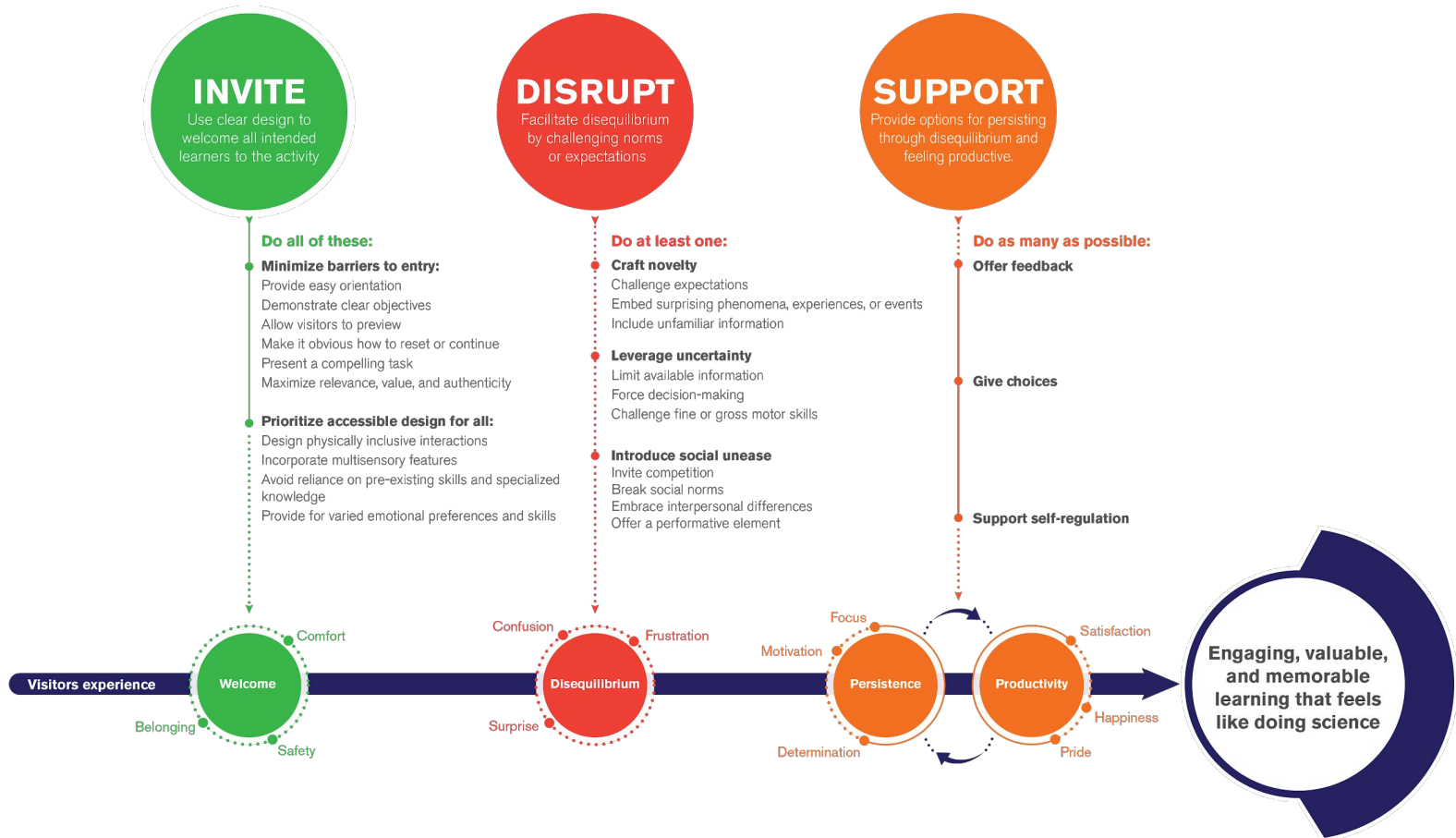
Designing for Productive Struggle

Design Elements Wordbank

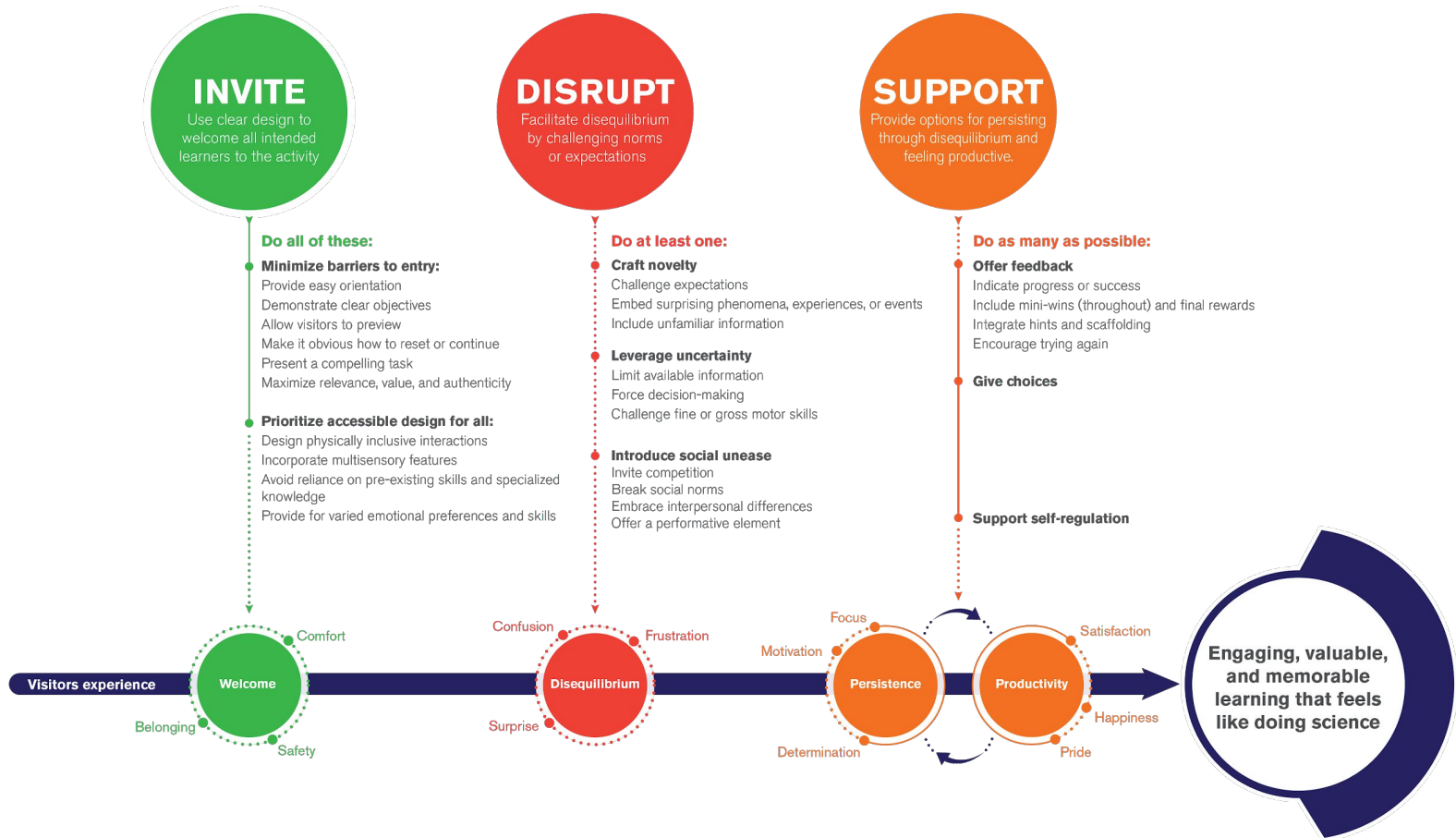
- Support self-regulation
- Give choices
- Offer feedback



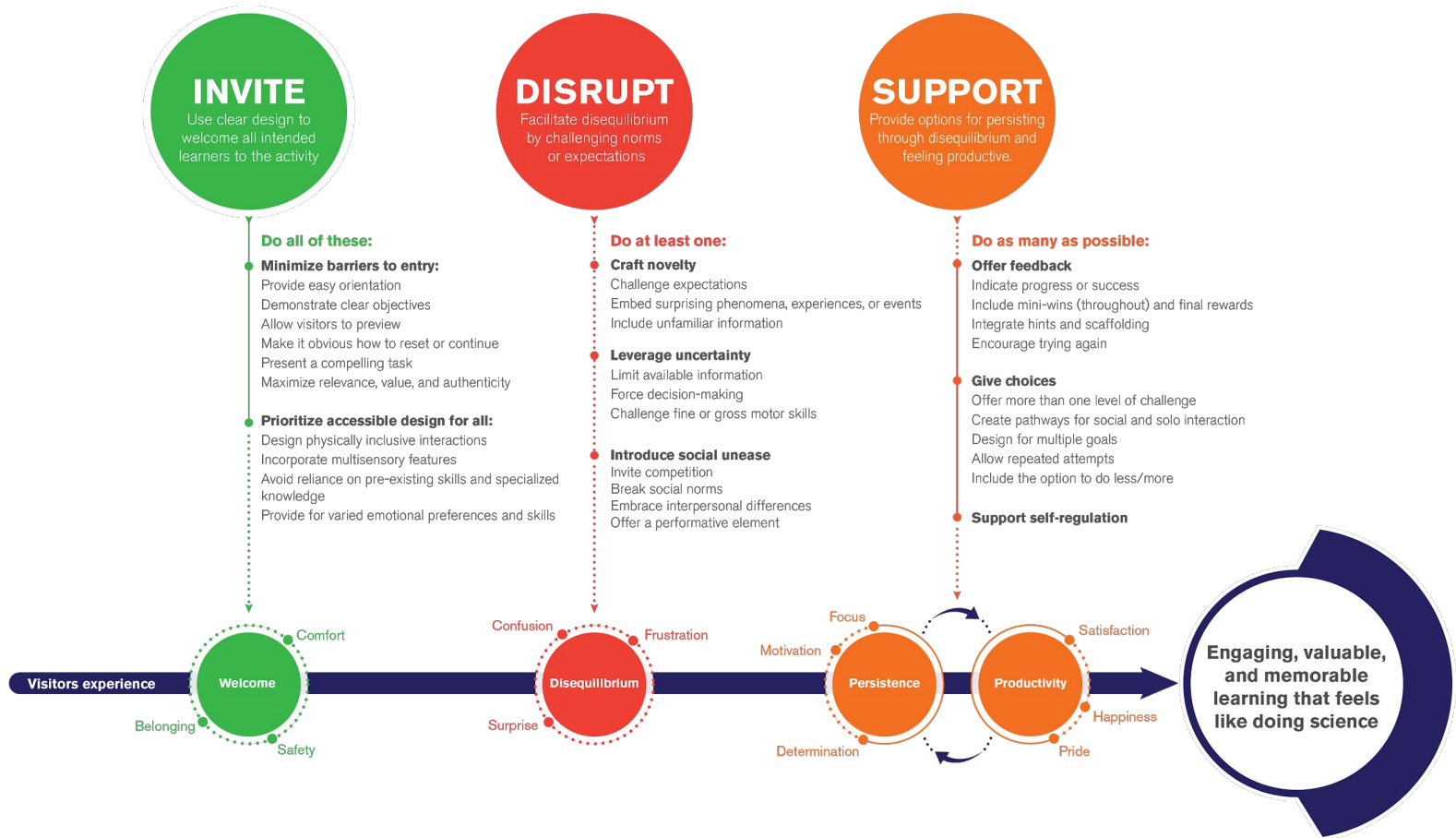
Designing for Productive Struggle



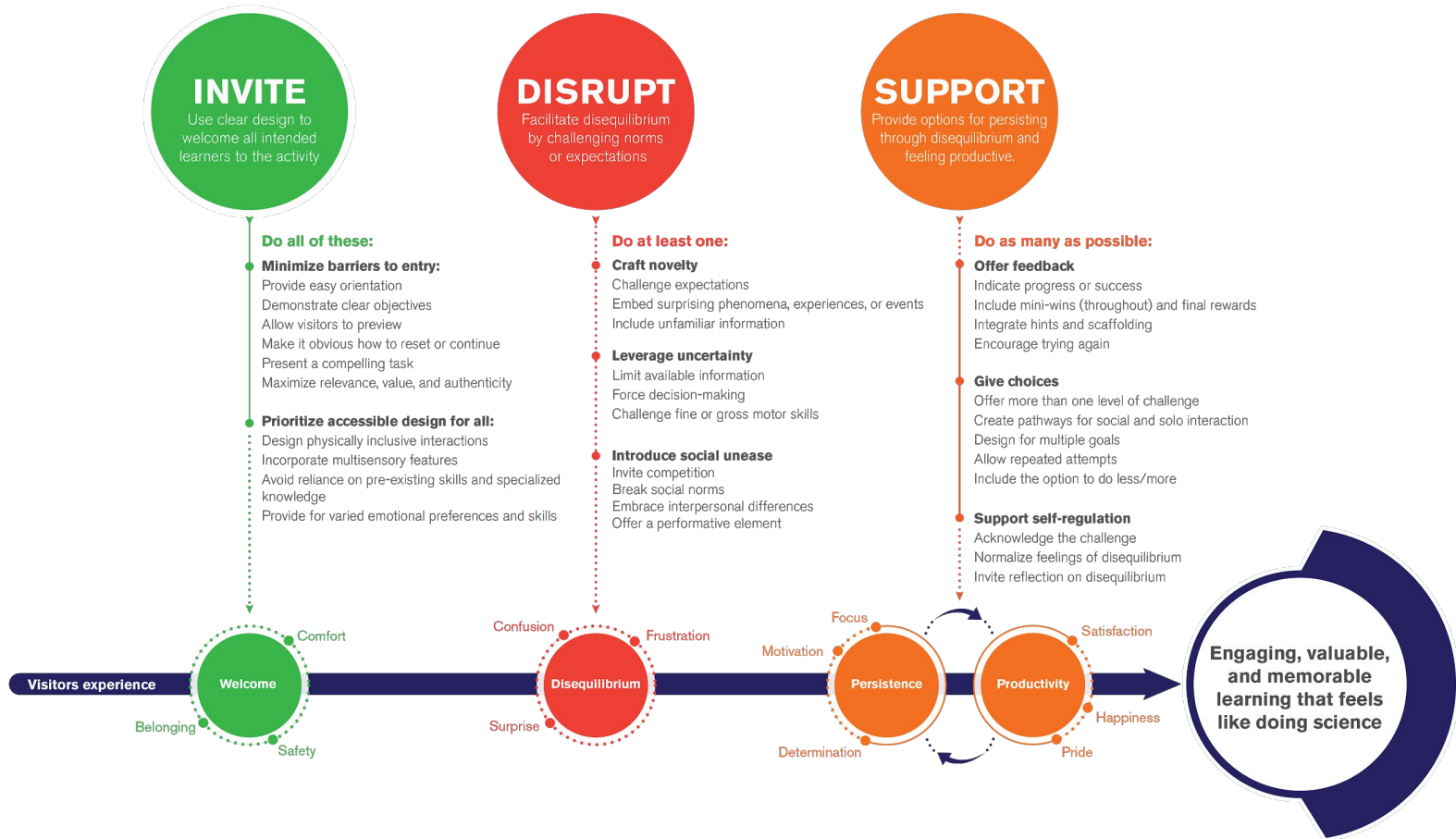
Designing for Productive Struggle



Designing for Productive Struggle



Designing for Productive Struggle



Sneaking Corridor

Two tiny feedback screens

Where did we start?

Many, small, hard-to read graphics

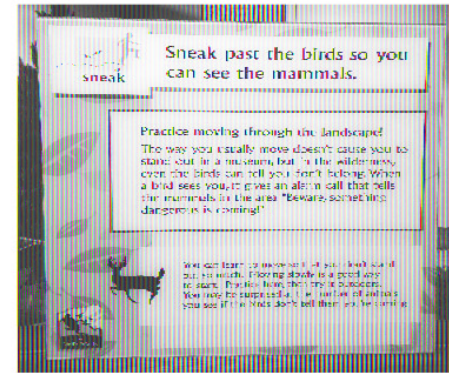
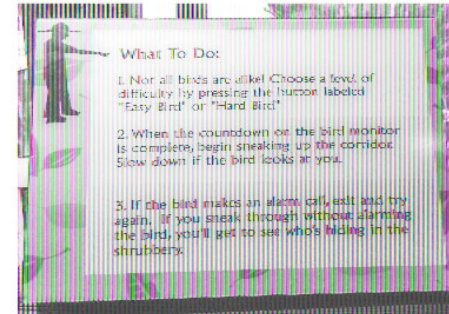
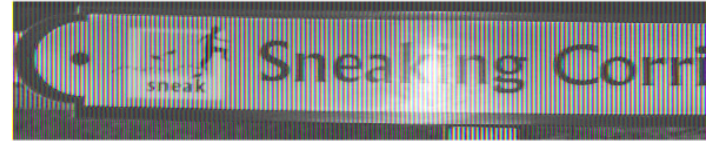
Enclosed space without clearance for wheelchairs



Print Graphics



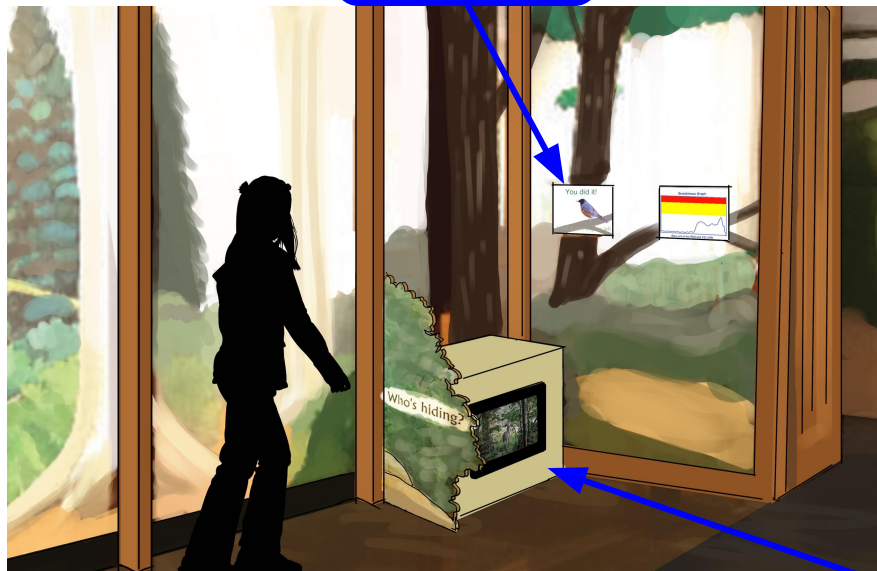
Old Sneak Graphics



Screen Graphics

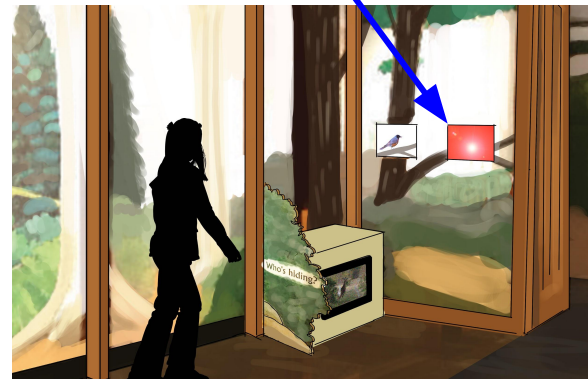
“Look down
to your left”

Sneak Success



Flashing red
screen

Sneak Fail



The location of
the reward video
was on the floor,
perpendicular to
the visitor's
approach

Why Sneak for Productive Struggle?

- Redesign for wheelchair access
- Achieve learning goals
- Disruption already present
- Would allow experimentation with varying levels of challenge and offering feedback about progress
- Could incorporate rewards

Current speaker



Katharina Marino

Exhibit Content Developer
Museum of Science, Boston
she, her, hers

Invite

Do all of these:

Minimize barriers to entry:

Provide easy orientation

Demonstrate clear objectives

Allow visitors to preview

Make it obvious how to reset or continue

Present a compelling task

Maximize relevance, value, and authenticity

Prioritize accessible design for all:

Design physically inclusive interactions

Incorporate multisensory features

Avoid reliance on pre-existing skills and specialized knowledge

Provide for varied emotional preferences and skills



Invite

Do all of these:

Minimize barriers to entry:

Provide easy orientation

Demonstrate clear objectives

Allow visitors to preview

Make it obvious how to reset or continue

Present a compelling task

Maximize relevance, value, and authenticity

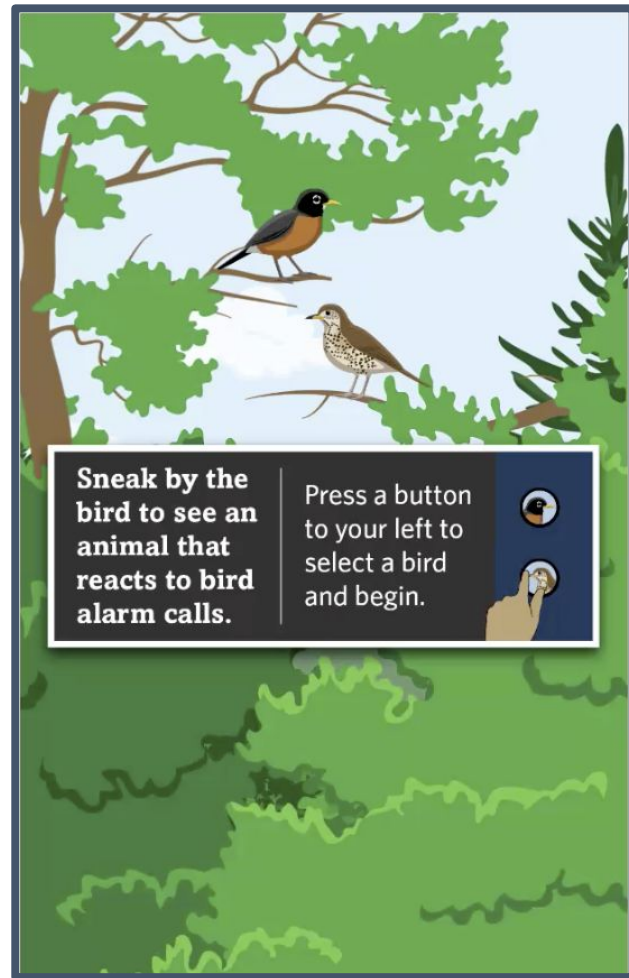
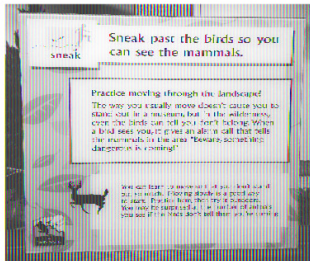
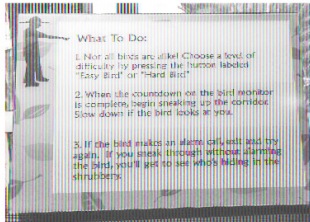
Prioritize accessible design for all:

Design physically inclusive interactions

Incorporate multisensory features

Avoid reliance on pre-existing skills and specialized knowledge

Provide for varied emotional preferences and skills





Disrupt

Do at least one:

● Craft novelty

Challenge expectations

Embed surprising phenomena, experiences, or events

Include unfamiliar information

● Leverage uncertainty

Limit available information

Force decision-making

Challenge fine or gross motor skills

● Introduce social unease

Invite competition

Break social norms

Embrace interpersonal differences

Offer a performative element

What supports do you notice?

Support

Do as many as possible:

Offer feedback

Indicate progress or success

Include mini-wins (throughout) and final rewards

Integrate hints and scaffolding

Encourage trying again

Give choices

Offer more than one level of challenge

Create pathways for social and solo interaction

Design for multiple goals

Allow repeated attempts

Include the option to do less/more

Support self-regulation

Acknowledge the challenge

Normalize feelings of disequilibrium

Invite reflection on disequilibrium

Support



Do as many as possible:

Offer feedback

- Indicate progress or success
- Include mini-wins (throughout) and final rewards
- Integrate hints and scaffolding
- Encourage trying again

Give choices

- Offer more than one level of challenge
- Create pathways for social and solo interaction
- Design for multiple goals
- Allow repeated attempts
- Include the option to do less/more

Support self-regulation

- Acknowledge the challenge
- Normalize feelings of disequilibrium
- Invite reflection on disequilibrium

What supports did you notice?

Support

Do as many as possible:

Offer feedback

Indicate progress or success

Include mini-wins (throughout) and final rewards

Integrate hints and scaffolding

Encourage trying again

Give choices

Offer more than one level of challenge

Create pathways for social and solo interaction

Design for multiple goals

Allow repeated attempts

Include the option to do less/more

Support self-regulation

Acknowledge the challenge

Normalize feelings of disequilibrium

Invite reflection on disequilibrium

Robin (with sneak-o-meter)



Woodthrush (without sneak-o-meter)



Support

Do as many as possible:

Offer feedback

- Indicate progress or success
- Include mini-wins (throughout) and final rewards
- Integrate hints and scaffolding
- Encourage trying again

Give choices

- Offer more than one level of challenge
- Create pathways for social and solo interaction
- Design for multiple goals
- Allow repeated attempts
- Include the option to do less/more

Support self-regulation

- Acknowledge the challenge
- Normalize feelings of disequilibrium
- Invite reflection on disequilibrium

Robin (with sneak-o-meter)



Woodthrush (without sneak-o-meter)



Support

Do as many as possible:

Offer feedback

- Indicate progress or success
- Include mini-wins (throughout) and final rewards
- Integrate hints and scaffolding
- Encourage trying again

Give choices

- Offer more than one level of challenge
- Create pathways for social and solo interaction
- Design for multiple goals
- Allow repeated attempts
- Include the option to do less/more

Support self-regulation

- Acknowledge the challenge
- Normalize feelings of disequilibrium
- Invite reflection on disequilibrium

What supports did you notice?

Support

Do as many as possible:

Offer feedback

Indicate progress or success

Include mini-wins (throughout) and final rewards

Integrate hints and scaffolding

Encourage trying again

Give choices

Offer more than one level of challenge

Create pathways for social and solo interaction

Design for multiple goals

Allow repeated attempts

Include the option to do less/more

Support self-regulation

Acknowledge the challenge

Normalize feelings of disequilibrium

Invite reflection on disequilibrium

**What did we learn from Sneak
about Productive Struggle?**

People need a clear objective

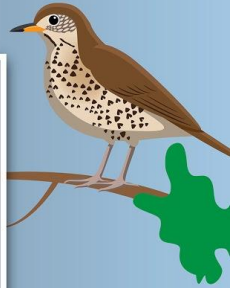
Sneak

Can you get by the bird to see other animals?



In the wilderness, walking quickly makes you stand out. Even birds can tell you don't belong. When a bird senses something unusual, it will stop and listen before giving an alarm call that lets nearby animals know, "Something dangerous is coming!"

It can be hard to sneak by birds, but if you do, you may see more animals in the woods.



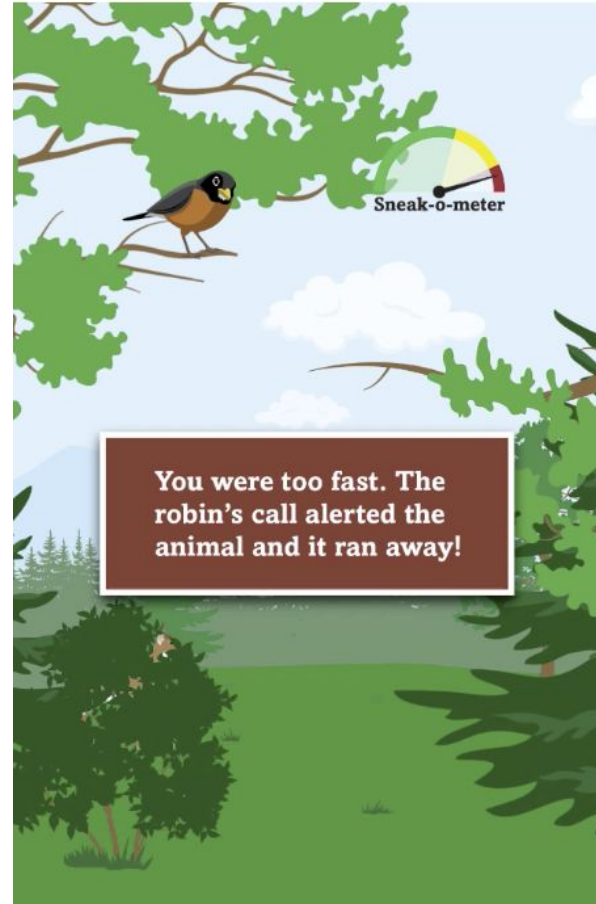
**Additional information doesn't
necessarily make it easier**



Language Matters



Failure language



Current speaker



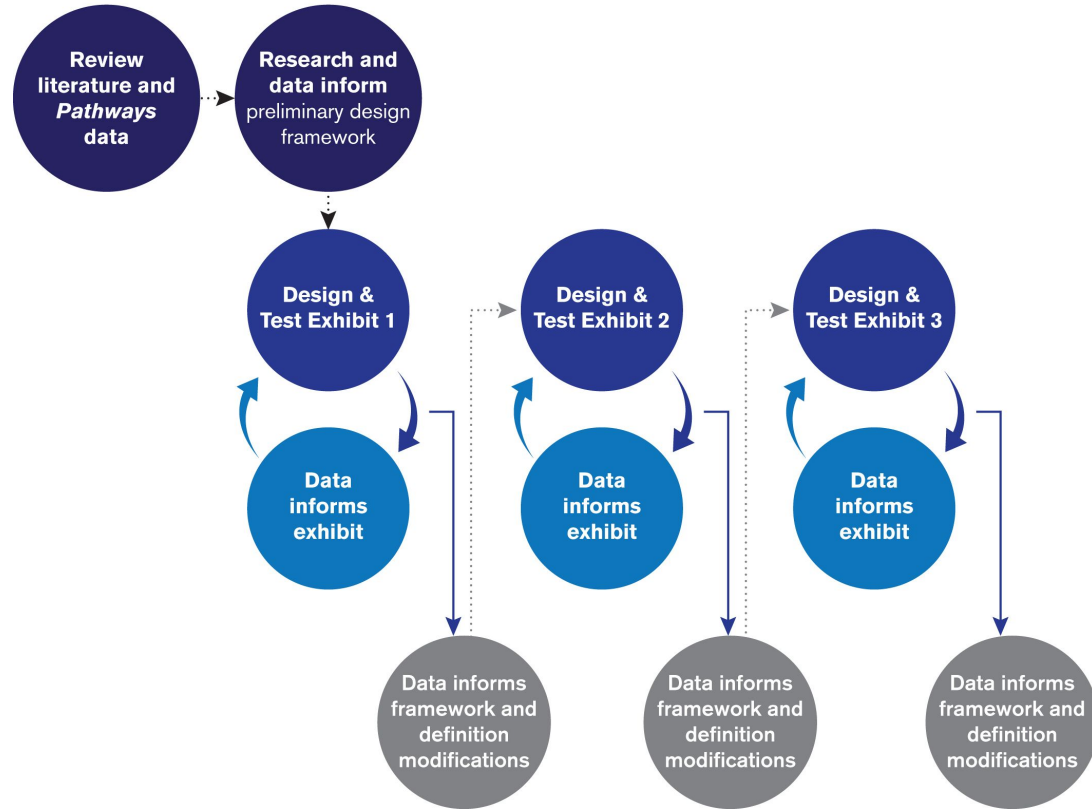
Sunewan Paneto

Senior Research & Evaluation Assistant
Museum of Science, Boston

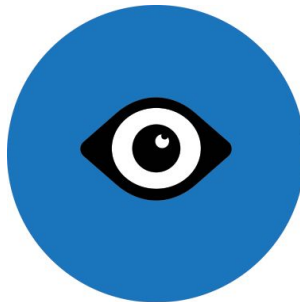
she, her, hers

How do we know that our changes worked?

A design-based research process



What methods did we use?



Observations



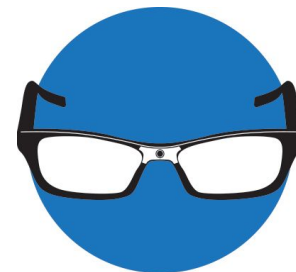
Interviews



Surveys

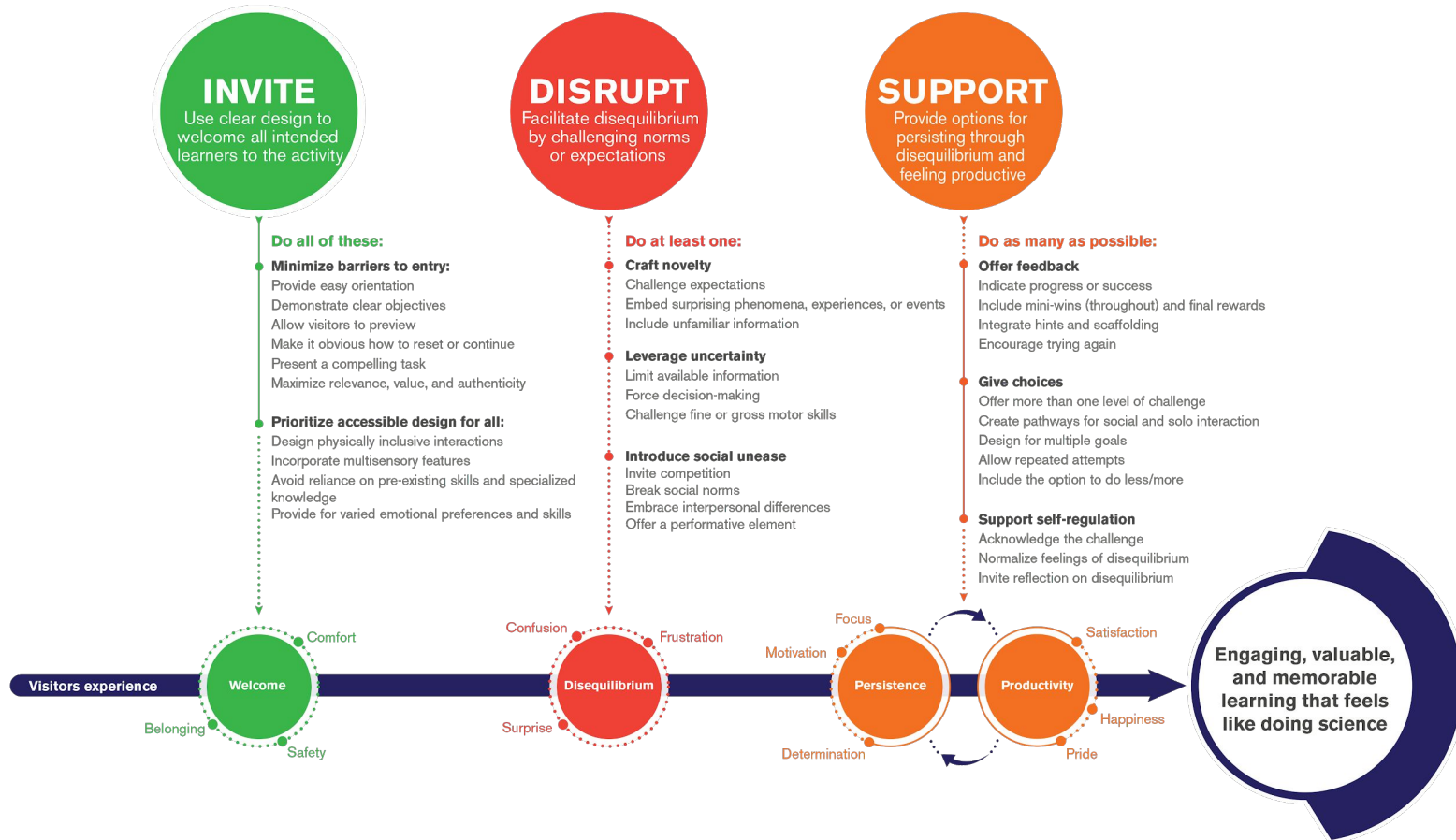


Guided Recall
Activities



Technology-
based data
collection

Designing for Productive Struggle





This presentation is based on work supported by the National Science Foundation under Grant No. DRL-1612577. Any opinions, findings, conclusions, or recommendations expressed in this presentation are those of the author and do not necessarily reflect the views of the Foundation.

THANK YOU!