



Museum of Science®

**Productive Struggle Webinar Series
Webinar 2: What is Productive Struggle?**

August 20, 2020

Current speaker



Katie Todd
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KT, she, her, hers

Agenda

- Where we are in the webinar series
- Negative can be positive
- What is productive struggle?
- Is productive struggle a new idea?

Check in: How are you feeling?

Core affect

Your general body state in two dimensions:

1. pleasant or unpleasant
2. energetic or lethargic

Appraisal

Ongoing evaluations of whether something is:

- Good or bad
- Relevant
- Threatening
- Novel or familiar
- Controllable
- Consistent with social norms

Subjective feeling

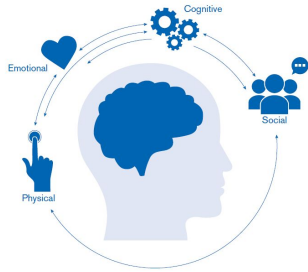
Your understanding of your overall experience, which we label with familiar emotion terms like happiness, sadness, rage, pride, relief, etc.

Emotional intelligence

Your capacity to understand, use, and manage emotion.

**Where we are in the
webinar series**

Webinar series



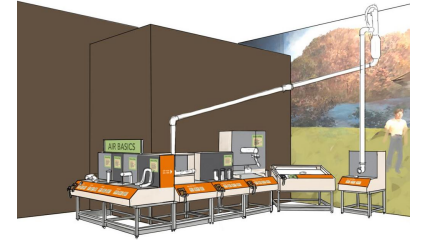
August 13:
Why emotion?



August 20:
What is productive
struggle?



August 27:
Designing for productive
struggle



September 3: Applying
and testing the
framework

Current speaker

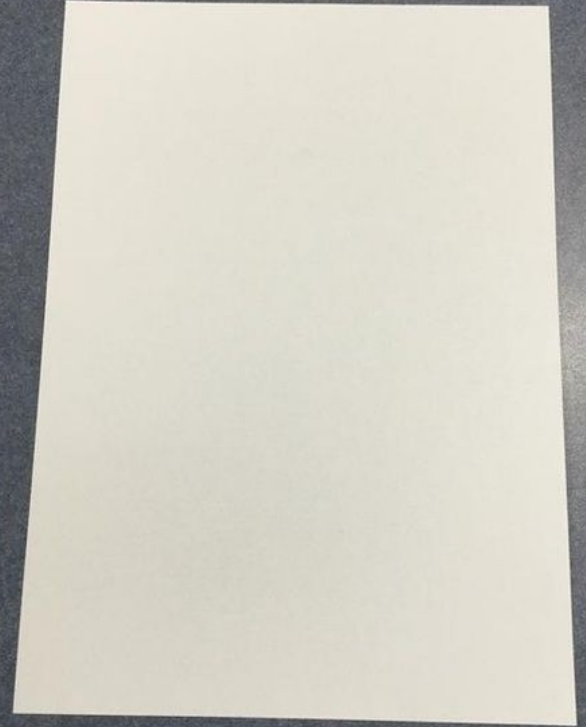


Sunewan Paneto
Senior Research & Evaluation Assistant
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Negative can be positive

Zoom break!

How high can you build a free-standing structure made from a single sheet of paper without using any other materials?



4 minutes

3 minutes

2 minutes

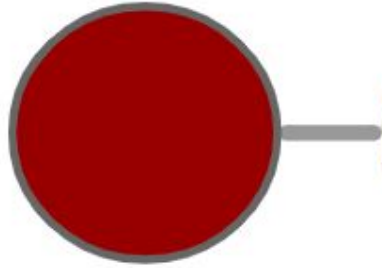
1 minute!

Time's up!

How did you feel while doing that activity?

Example emotions

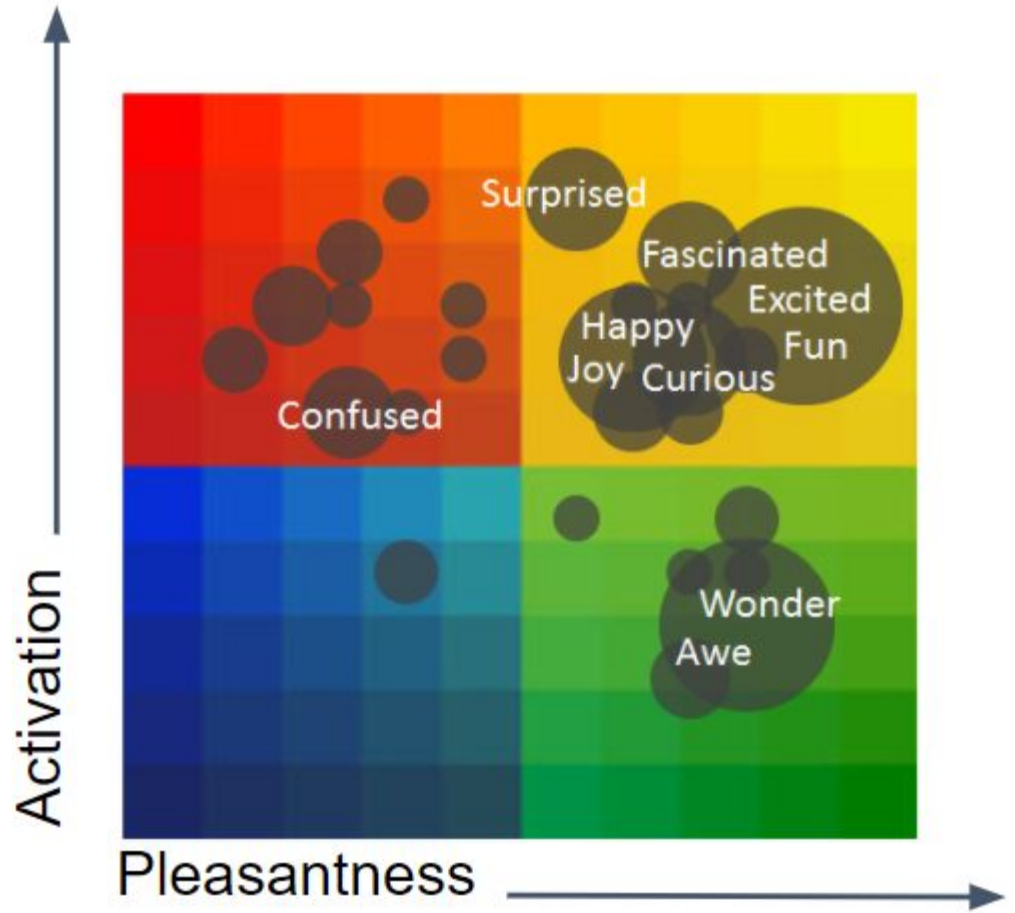
Bored	Challenged	Persistent	Determined
Disappointed	Focused	Proud	Frustrated
Happy	Motivated	Satisfied	Nervous
Uncertain	Confused	Calm	Surprised
Uncomfortable	Confident	Excited	Enthusiastic

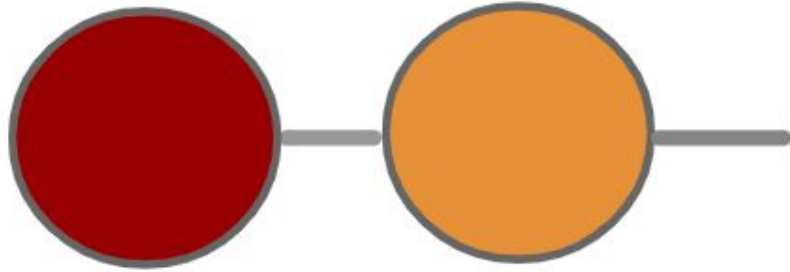


Avoid negative emotion

We want people to
be happy!

“Just thinking about today’s visit, could you describe a time when you felt emotion here in a way that stood out to you?”
(n=93)





Reality check

Takeaway 1: People experience negative emotions in the Museum.

Confusion can be beneficial for learning[☆]

Sidney D'Mello^{a,*}, Blair Lehman^b, Reinhard Pekrun^c, Art Graesser^b

^a 384 Fitzpatrick, University of Notre Dame, Notre Dame, IN 46556, USA

^b University of Memphis, USA

^c University of Munich, Germany

Why Do Only Some Events Cause Learning During Human Tutoring?

Kurt VanLehn, Stephanie Siler, and Charles Murray

*Learning Research and Development Center
University of Pittsburgh*

Takashi Yamauchi

*Psychology Department
Texas A&M University*

William B. Baggett

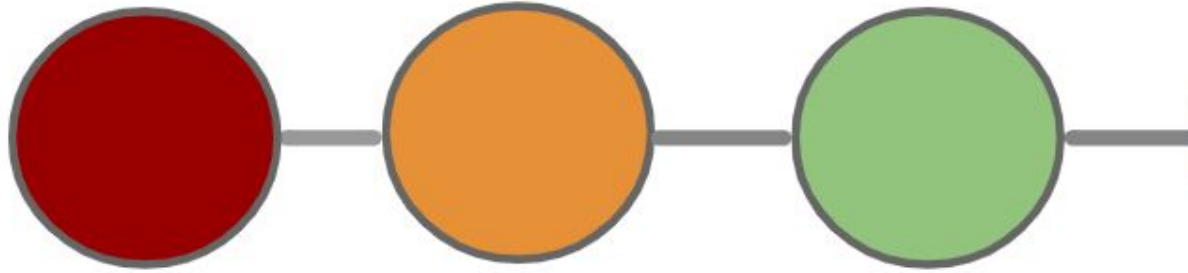
*School of Computer Technology
Pittsburgh*

CAN DESIRABLE DIFFICULTIES OVERCOME DECEPTIVE CLARITY IN SCIENTIFIC VISUALIZATIONS?¹

Marcia C. Linn, Hsin-Yi Chang, Jennifer L. Chiu,
Zihui Helen Zhang, and Kevin McElhaney

The Role of Emotion in Informal Science Learning: Testing an Exploratory Model

Nancy L. Staus¹ and John H. Falk²



Learning
sciences

Takeaway 2: Negative emotion can be good for learning.

MY PRESENTATION DIDN'T GO WELL. THERE WAS A FAMILY IN THE FRONT ROW THAT JUST DIDN'T LOOK EXCITED.

I'M PRETTY SURE ABOUT THIS ONE.

SO WHAT DO WE DO?

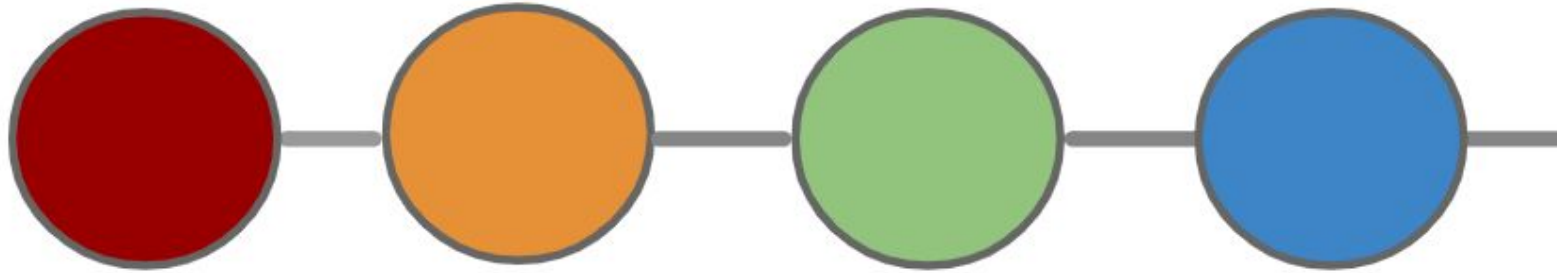


YOU CAN'T ALWAYS TELL WHAT SOMEONE'S FEELING JUST BY LOOKING AT THEM.

A LOT OF VISITORS LOVE YOUR EXCITEMENT, BUT SOMETIMES IT CAN RUB FOLKS THE WRONG WAY.

WE'RE ALL DIFFERENT. PATTY'S SHOWS ARE GREAT FOR VISITORS WHO WANT SOMETHING CALMER.





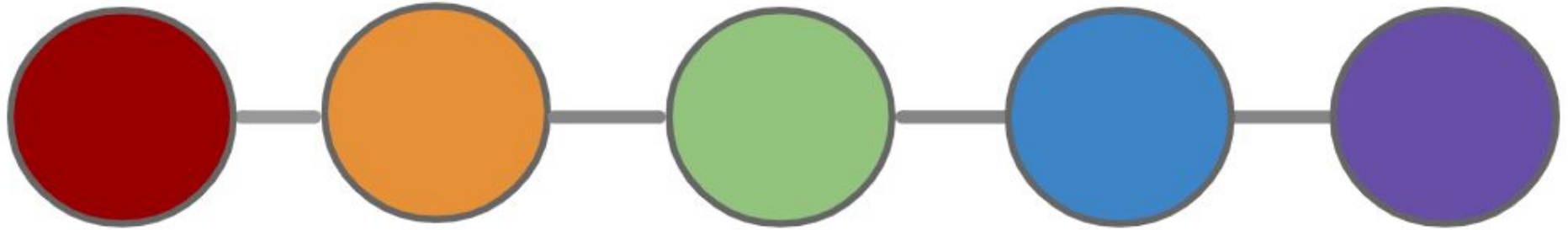
Cultural
differences

**Takeaway 3: Emotional preferences
are culturally situated.**

Can embracing emotional variability and inviting a range of emotions (including negative ones) foster more accessible, equitable learning experiences?

How can we support visitors to productively engage with negative emotions in ways that build real-world emotional skills and make museum visits more meaningful?

Our story



Avoid negative emotion

We want people to be happy!

Reality check

People are having negative emotions in the Museum

Learning sciences

Negative emotion can be good for learning

Cultural differences

People have varied emotional preferences

Embrace negative emotion

Yup, we want people to be confused

Current speaker



Sarah May

Research & Evaluation Associate
Museum of Science, Boston.

she, her, hers

What is productive struggle?

Storyboards

The first thing I did was

Join the webinar.

And I felt

Curious about the topic.

The next thing I did was

Listen to the speakers.

And I felt

*Interested in what they
were saying.*

The last thing I did was

Ask questions.

And I felt

*Excited to engage with
others.*



First

the visitor... Selected Skull 1 and had to guess the animal. ***“You tell me, you tell me!”***
and she felt... Uncertainty, doubt, fear of failure, seeking support, nervous, pressured.

Next

the visitor... Answered questions about the teeth. ***“Combination of both? ... Take another look.”***
and she felt... Disappointment, frustrated but curious, confused, embarrassment, confusion but followed by ‘aha’, willing w/social support, surprise.

Next

the visitor... Answered questions about the crest. ***“What’s sagittal mean?”***
and she felt... Motivated, getting feedback, curious, interest, recognizing she doesn’t know, seeking support, trust.

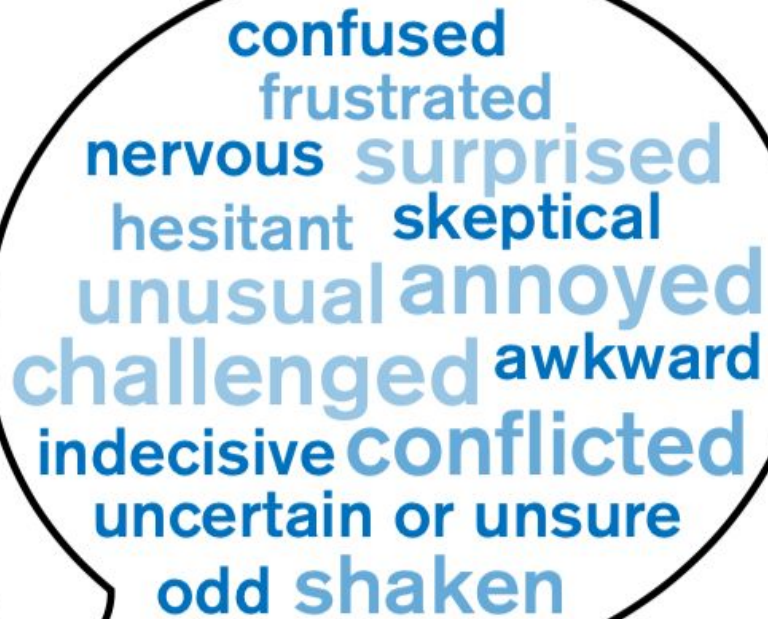
Finally

the visitor... Made her final guess. ***“Probably puma. Yay!”***
and she felt... Satisfaction, triumph, happy, celebration, payoff, relief, resolution.

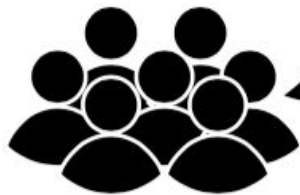
We define productive struggle as an experience with three elements:

- 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)

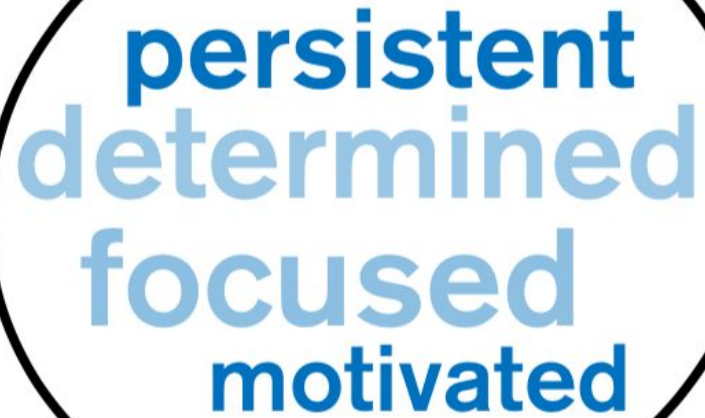




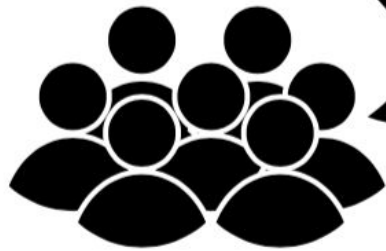
confused
frustrated
nervous surprised
hesitant skeptical
unusual annoyed
challenged awkward
indecisive conflicted
uncertain or unsure
odd shaken



Disequilibrium



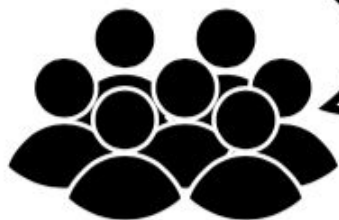
persistent
determined
focused
motivated



Persistence



cool
encouraged
satisfied affirmed
good relieved
joyous empowered
accomplished
happy proud
great



Productivity



Surprise
Confusion
Frustration



Focus
Persistence
Determination



Happiness
Satisfaction
Pride

First the visitor... Selected Skull 1 and had to guess the animal. ***“You tell me, you tell me!”***

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Finally the visitor... Made her final guess. ***“Probably puma. Yay!”***

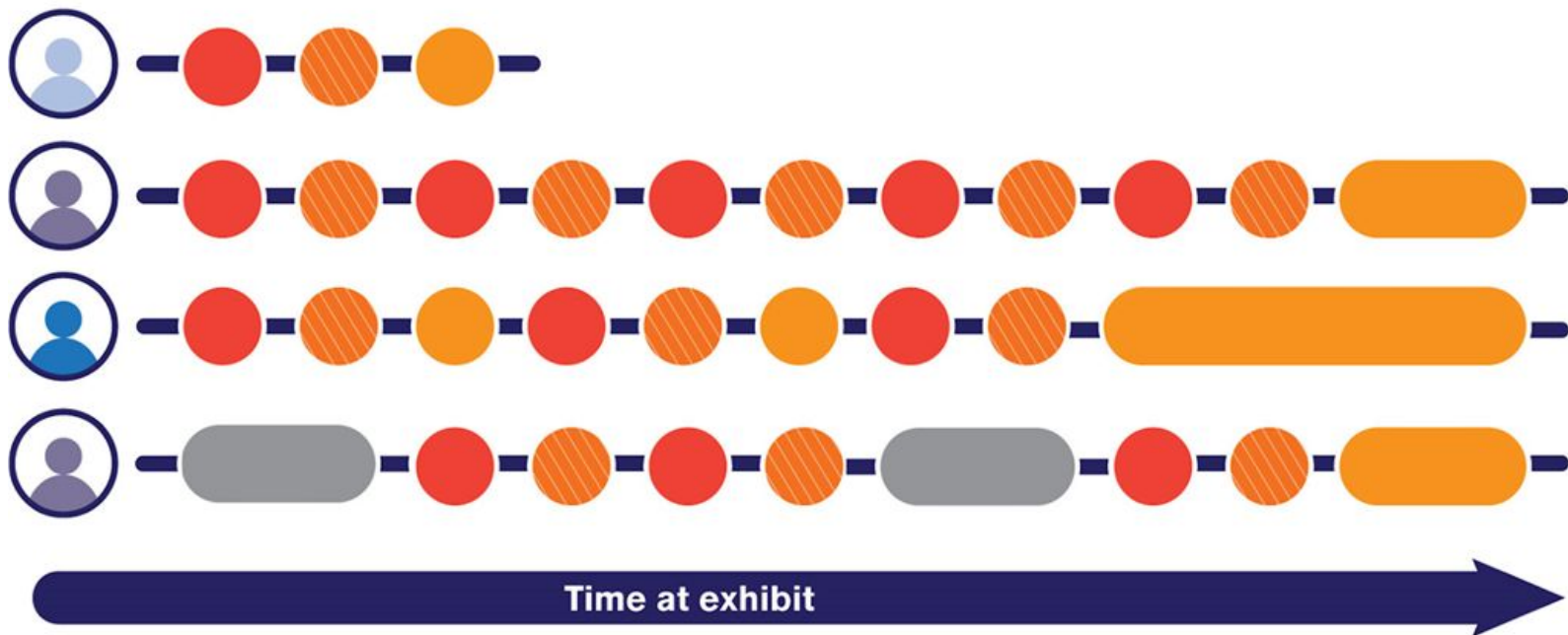
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Different visitors' experiences

Disequilibrium

Persistence

Productivity



Productive struggle experiences involve disequilibrium, persistence, and productivity, with room for variability.

Current speaker



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Is productive struggle a new idea?



Umbrella of involved work

Productive Struggle

Cognitive Dissonance

Active Prolonged Engagement

Zone of Proximal Development

Desirable Difficulty

Productive Failure

Flow

Hard Fun

Word Bank

Flow

Hard Fun

Productive Failure

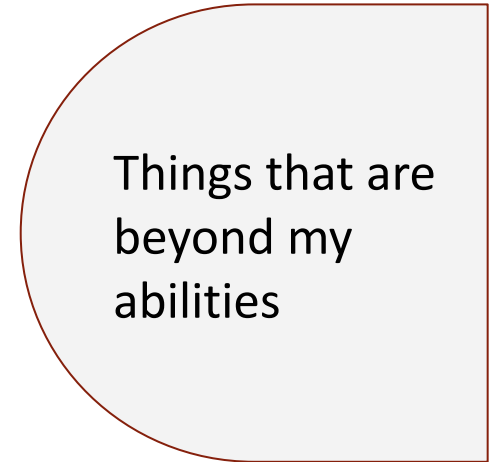
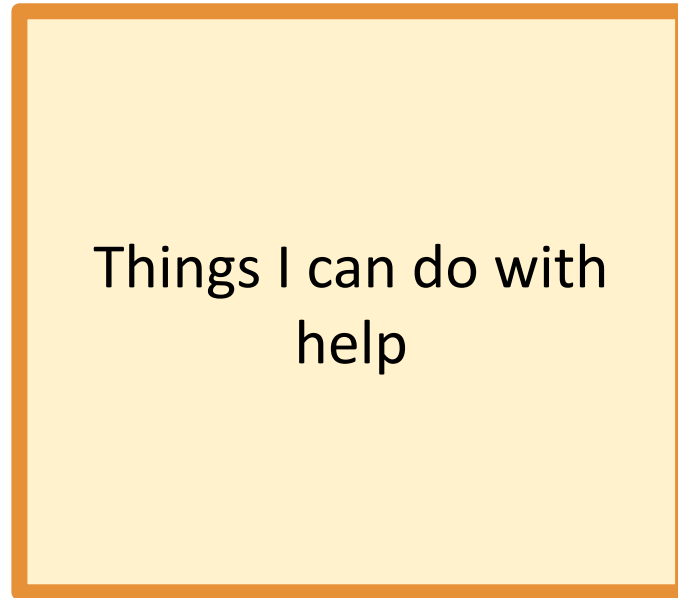
Desirable Difficulty

Zone of Proximal Development

Active Prolonged Engagement

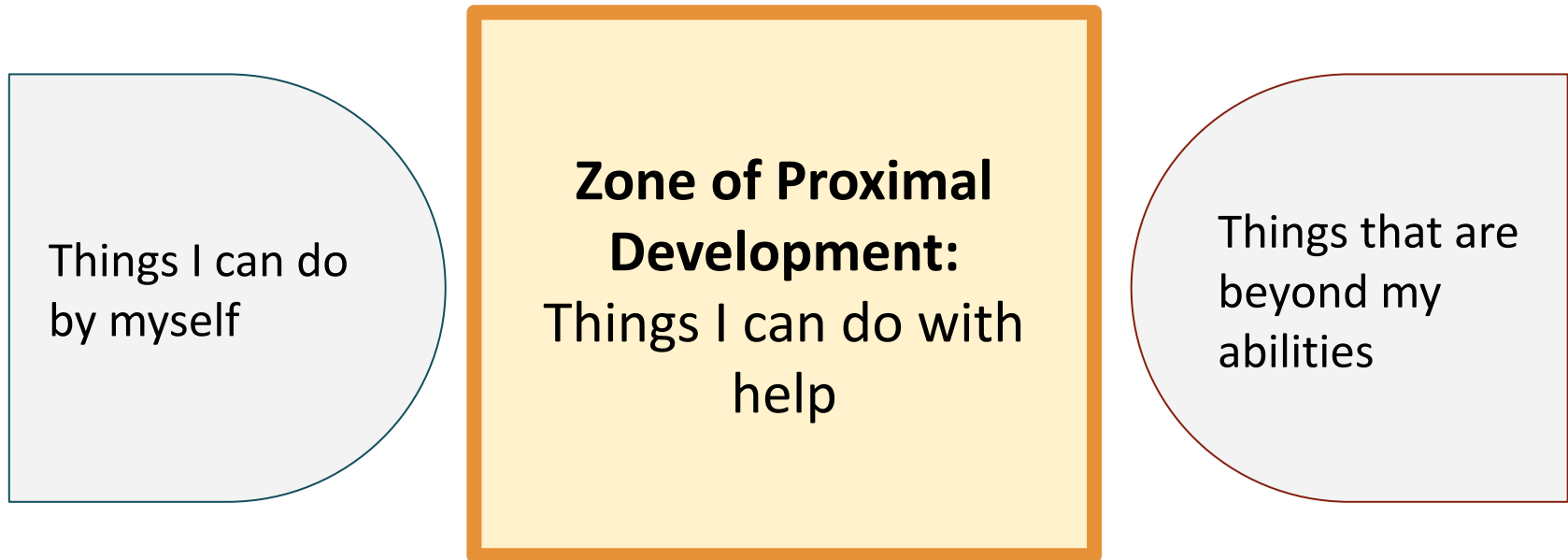
Cognitive Dissonance

A level of challenge where you can only be successful with assistance.



Zone of Proximal Development

A level of challenge where you can only be successful with assistance.



Word Bank

Flow

Hard Fun

Productive Failure

Desirable Difficulty

Zone of Proximal Development

Active Prolonged Engagement

Cognitive Dissonance

**Ma_ing inf_r_mation-p_rocessing mo_e c_allenging in ord_r
to enh_nce _emory.**

Desirable Difficulty

Making information-processing more challenging in order to enhance memory.



Word Bank

Flow

Hard Fun

Productive Failure

Desirable Difficulty

Zone of Proximal Development

Active Prolonged Engagement

Cognitive Dissonance

Prompting learners to experience short-term failures that lead to long-term increases in comprehension.

First

Attempt

In

Learning

Productive failure

Prompting learners to experience short-term failures that lead to long-term increases in comprehension.

First

Attempt

In

Learning

Word Bank

Flow

Hard Fun

Productive Failure

Desirable Difficulty

Zone of Proximal Development

Active Prolonged Engagement

Cognitive Dissonance

A learner chooses to engage in a task because of a desire to be challenged.



Hard Fun

A learner chooses to engage in a task because of a desire to be challenged.



Word Bank

Flow

Hard Fun

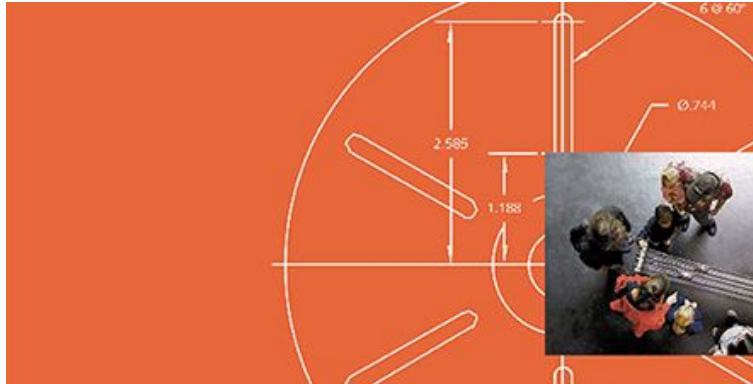
Productive Failure

Desirable Difficulty

Zone of Proximal Development

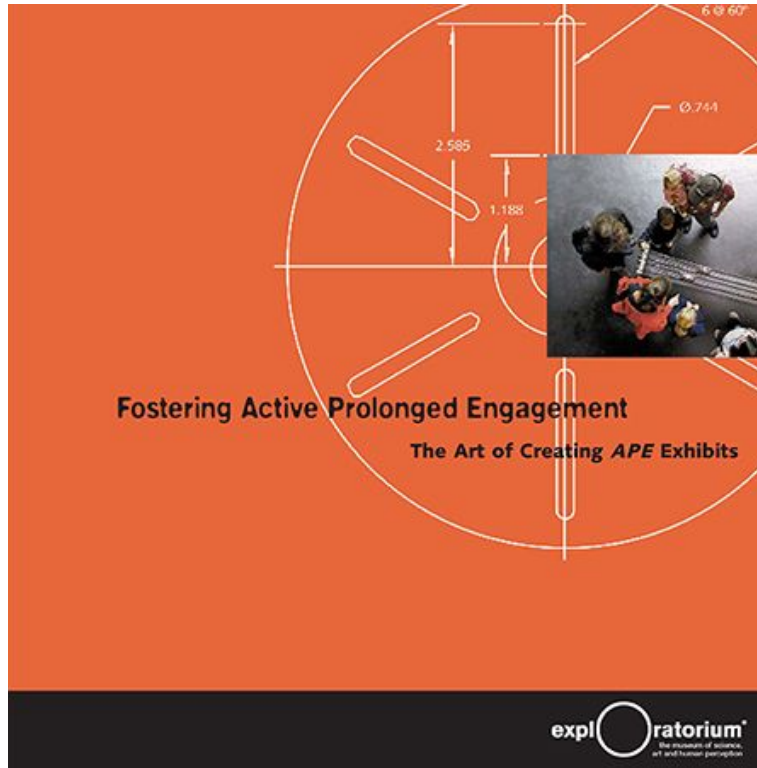
Active Prolonged Engagement

Cognitive Dissonance



- Visitor-led learning
- Long dwell time
- Variety in interaction

Active Prolonged Engagement



- Visitor-led learning
- Long dwell time
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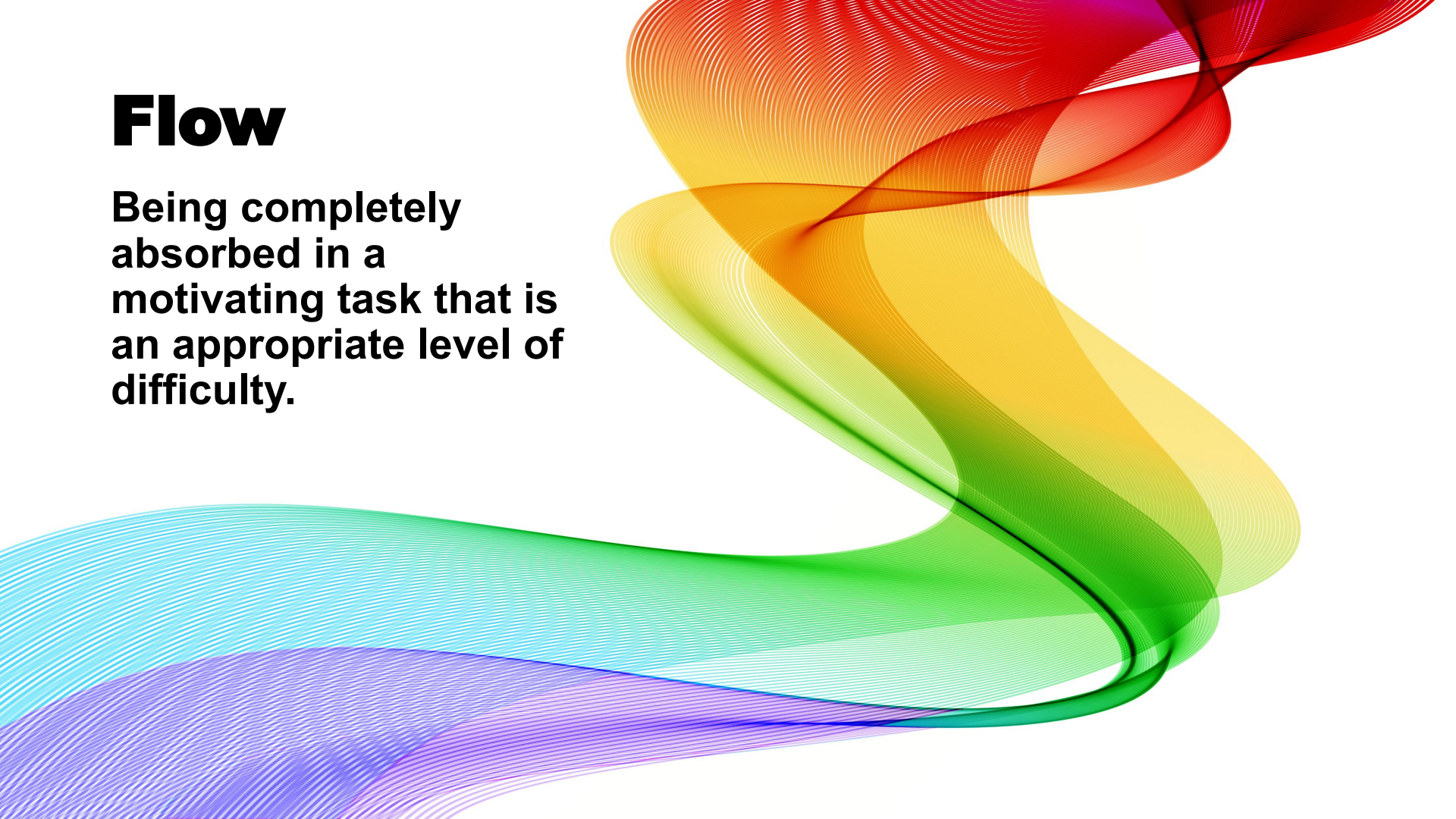
Cognitive Dissonance

Being completely absorbed in a motivating task that is an appropriate level of difficulty.



Flow

Being completely absorbed in a motivating task that is an appropriate level of difficulty.



Word Bank

Flow

Hard Fun

Productive Failure

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Zone of Proximal Development

Active Prolonged Engagement

Cognitive Dissonance

A desire to resolve inconsistencies in knowledge, opinions, or beliefs in order to restore a sense of balance.



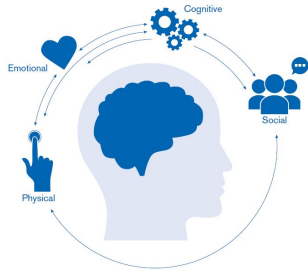
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A desire to resolve inconsistencies in knowledge, opinions, or beliefs in order to restore a sense of balance.



Upcoming webinars

Webinar series



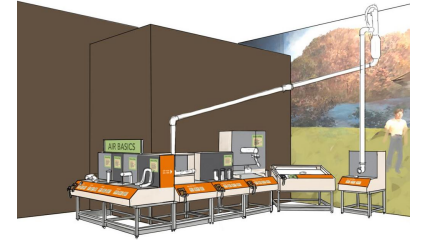
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THANK YOU!



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Questions and comments