PRODUCTIVE STRUGGLE: Measuring and Designing for Meaningful Challenge Katie Todd & Sunewan Chunhasuwan Paneto, Museum of Science, Boston

ABOUT

This work is based on an NSF-funded designbased research project (DRL-1612577) investigating productive struggle in the museum environment.

Productive struggle is...



arousal









that leads to

fruitful learning

OPERATIONALIZING PRODUCTIVE STRUGGLE

Our preliminary definition of productive struggle has 4 criteria:

1. High activation: A peak in electrodermal activity, measured by Q Sensor skin conductance data.

2. Self-reported productivity: On the survey or interview, the visitor indicates that she or he experienced pride, accomplishment, or a similar indication of self-defined success.

3. Self-reported struggle: On the survey or interview, the visitor shares that she or he felt confusion, difficulty, or frustration during the activity.

4. Progress towards a goal: During the observation or interview, the visitor demonstrates that she or he was working towards a goal.



MEASURING EMOTIONAL ENGAGEMENT



Electrodermal activity sensors Q Sensors measured subjects'

physiological activation levels



Video observations Tracked behavior and facial expressions



Self-report scales

Subjects shared their emotions and completed the Grit and Self-Control Scales (Duckworth & Yeager, 2015)



Eye-tracking glasses Tobii eye-tracking glasses measured cognitive & behavioral engagement



Post-interviews

Subjects picked 1-2 words and described their feelings at each exhibit



CONNECTIONS TO EXHIBIT DESIGN

The project will look at a number of exhibit strategies including:

Q Social interaction **Competition**

() Time pressure **E** Scaffolding

LESSONS LEARNED

 People experience many emotions at once • It can be **difficult to observe** arousal level • Data sources can contradict each other \Rightarrow Recall \neq immediate self-report \Rightarrow Self-report \neq physiological data

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Images: Face by Dev Patel; Activity by Gregor Cresnar; Idea by Botho Willer; Wristband by Leonardo Schneider; Video by Jivan; Glasses by Hea Poh Lin; Clipboard by Nick Bluth; Interview by Gregory Cresnar; Chat by Logan; Time by Kidiladon; Ladder by Jae Deasigner; & Cup by Bezier Master from the Noun Project





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