



Can theatrical games improve museum visitors' understanding of complex topics requiring conceptual shifts?



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For many people, new information doesn't result in a deeper understanding of a topic such as evolution. But deep engagement can help them reframe their existing knowledge and see it differently. And the degree of engagement relates to the likelihood of change.

Intuitive theories

Humans are hard-wired to create theories about how the world works. Unfortunately, our attempts to explain our observations are often wrong. And bad theories can prevent us from understanding science as it really is. (Think climate change denial, anti-vaccination movements, creationism, fears about GMOs, etc.)

- Many truths aren't easy to understand because they defy our earliest-developing and most easily accessed ideas about how the world works.
- To get the science right, we have to dismantle those intuitive theories and rebuild them.

Evolution

"Nothing in biology makes sense, except in the light of evolution."

Yet three decades of research have shown a strikingly high prevalence of misconceptions at all educational levels, from elementary school pupils to university science majors. In fact, fewer than 10% of Americans may have a functional understanding of natural selection.

"The problem is that even the average graduate level biology student believes that adaptation occurs uniformly across all members of a species in accordance with the species' needs." (Shtulman, *Scienceblind*)

But people with a good understanding of evolution are more likely to accept it, even taking into account religiosity and political views. (Weisberg, 2018)

Why theatrical games?

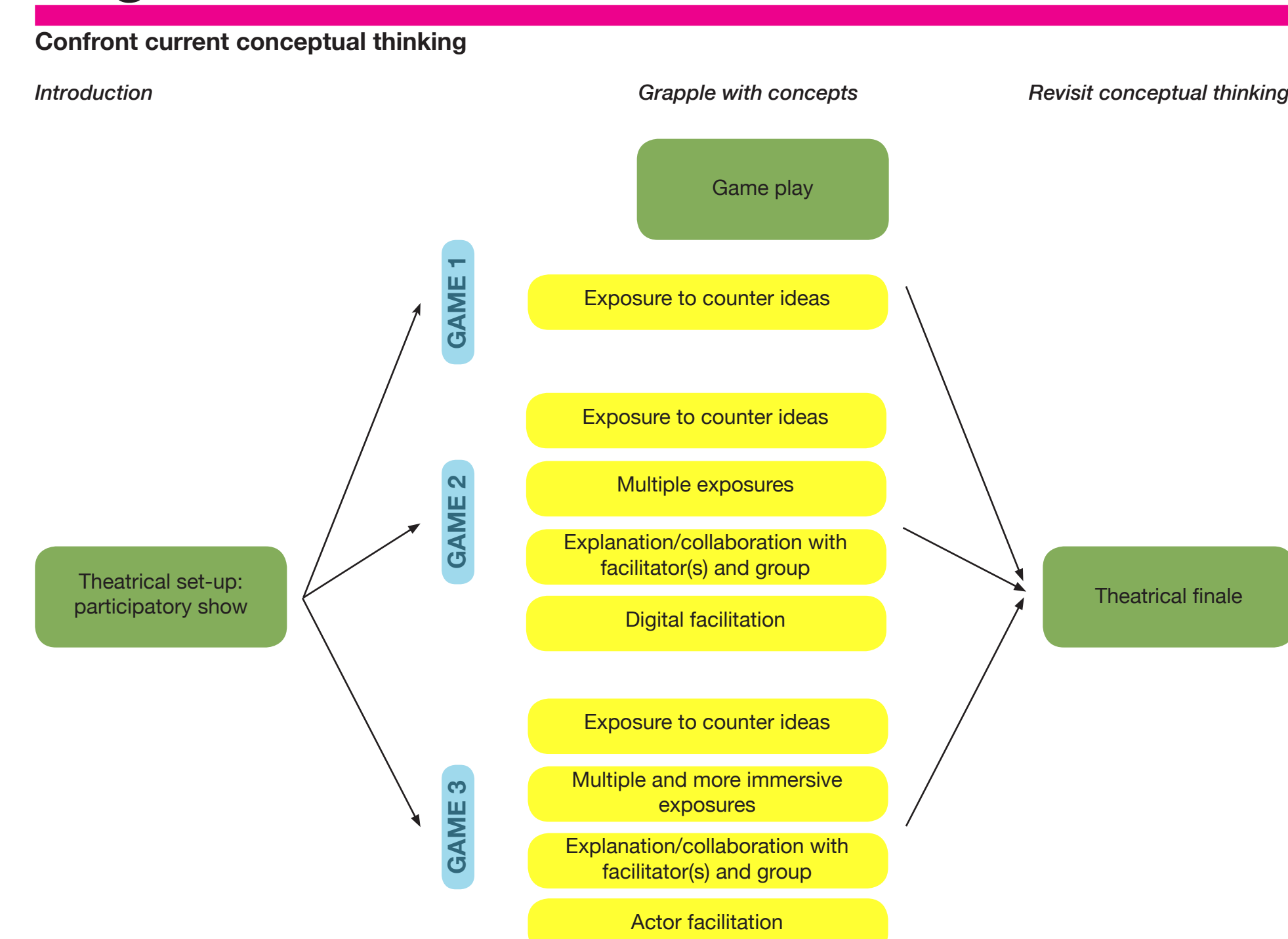
The development of learning through intrinsic motivation begins with a **hook** (which includes stimulating curiosity and interest), then moves to **opportunities for involvement** (sensory, intellectual and emotional), followed by **conditions for flow** (challenges must be compatible to, and balanced with skills), and **growth of complexity** in consciousness. (Pedretti, 2008)

Two techniques that show promise for engaging learners in deep conceptual thinking in an informal setting are participatory theatre and educational games. They share:

- an emotionally engaging narrative arc;
- opportunities to make sense of systems;
- conflict(s) to resolve;
- challenges and obstacles to overcome;
- and an end state that summarizes or confirms.

The combination of games and theatre—where content is presented within a story context and coupled with a challenge or challenges to overcome (i.e. made into a game)—**significantly improves learning**. (Lepper and Cardova, 1992)

Logic model



Variation is common and important. Individual differences are the fodder for the process of selection.

VARIATION

Offspring inherit traits from parents. Heritable differences are due to mutation and recombination and may be beneficial, neutral, or detrimental.

INHERITANCE

Many offspring don't reproduce. Differential reproduction means some traits are passed on at a higher rate than others.

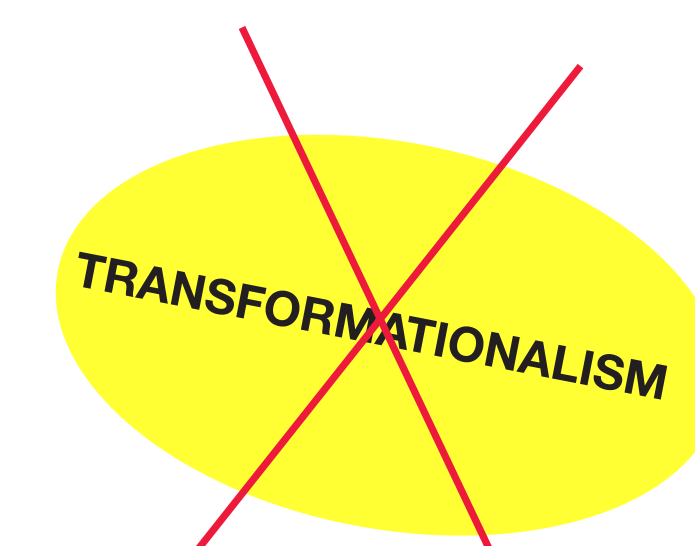
SELECTION

Variations that contribute to survival and reproductive success increase in proportion from one generation to the next.

TIME

A population of organisms becomes more suited to its environment as advantageous traits become predominant.

ADAPTATION



Members of the same species aren't identical, but their individual differences are minor and non-adaptive.

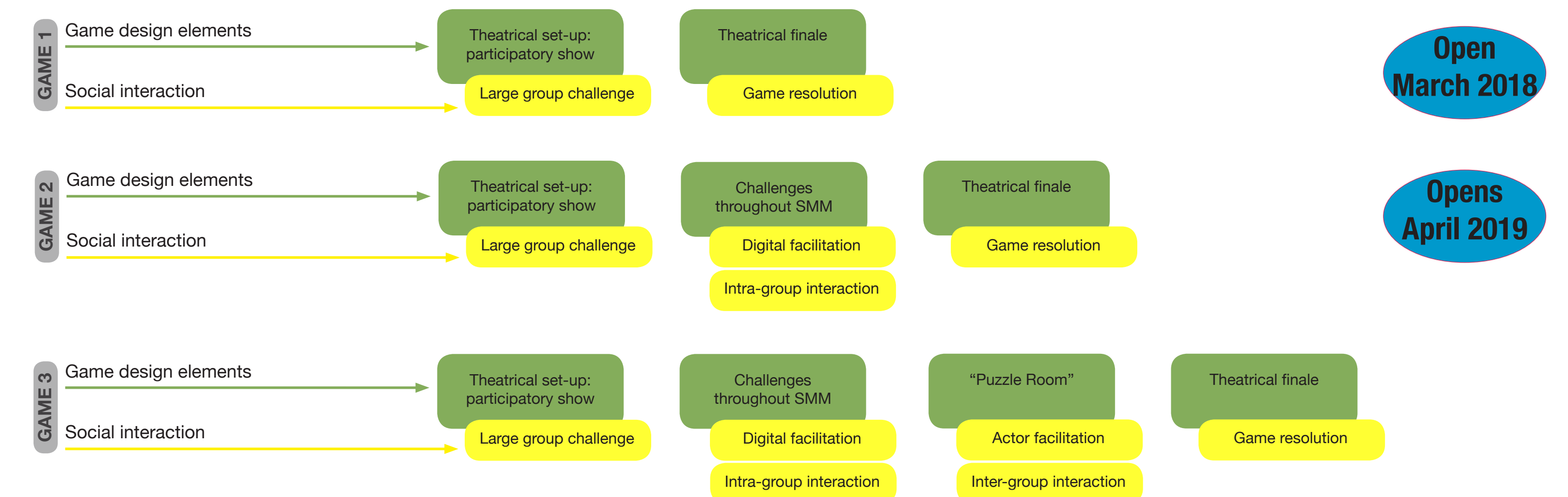
Parents pass beneficial traits to their offspring.

Individuals transform in response to need or the use/disuse of features.

Changes between parents and offspring will be in the direction of further improvement.

Each organism inherits the "essence" of its species, and so each should be equally "fit."

Game design features



Open March 2018

Opens April 2019

So, can we turn transformationalists into variationalists?

Game 1



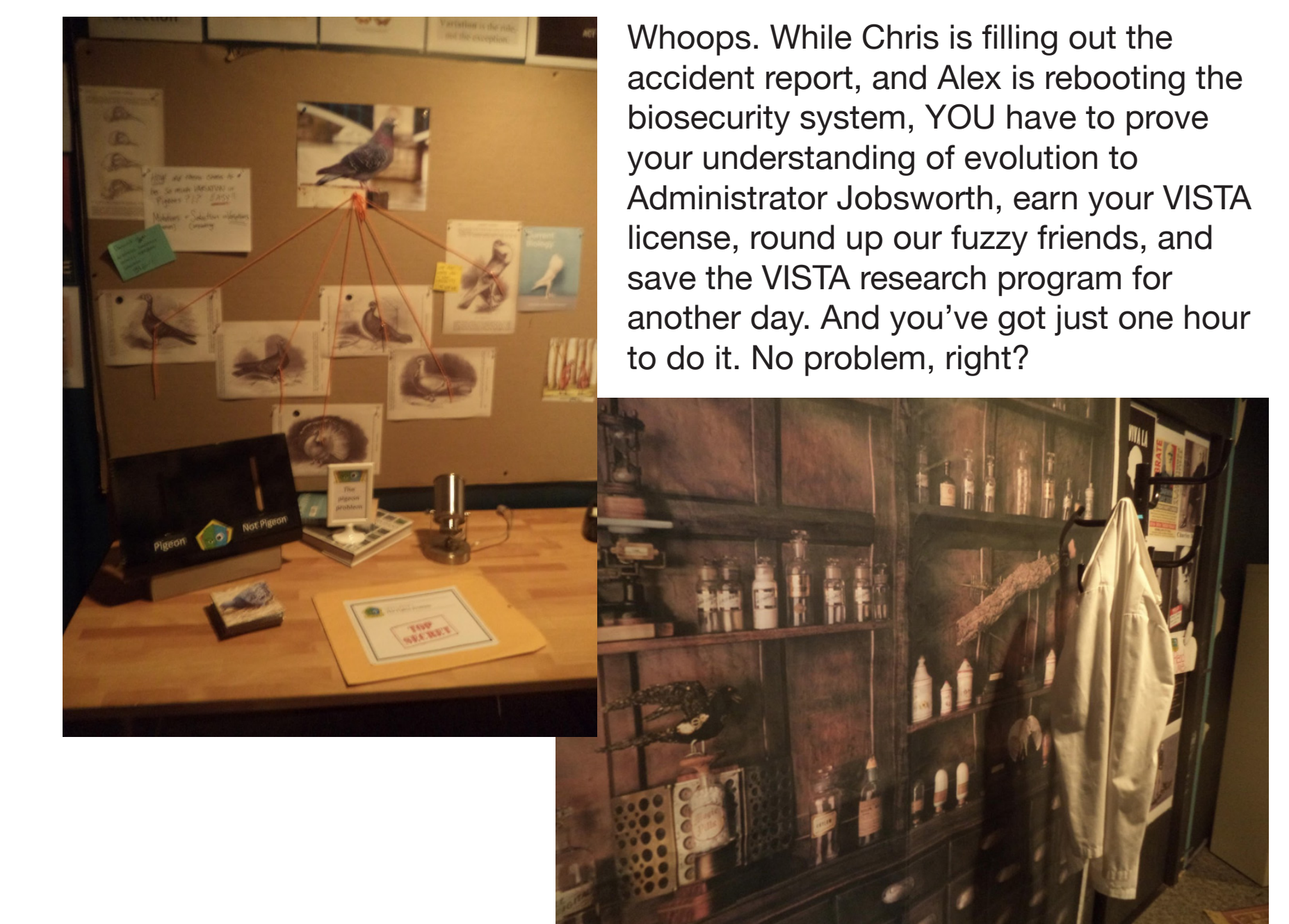
Animal breeder Chris is domesticating a strange new creature with assistance from you (and the fundamentals of evolution). It's fun, funny, and perfectly safe...as long as everything goes according to plan. We're sure it will.

Variation's the name of this game—
Everything has it, wild or tame.
In any group,
School, flock, or troupe,
Individuals are not all the _____.

Here's what "inheritance" means:
A baby's slate doesn't start clean.
Her mom and her dad
Passed on traits that they had,
And her kids get some of her _____.

It's a fact you just can't ignore:
Useful traits get "selected for."
Your strength, size, stealth, or coloration
Can help you succeed in your situation
By surviving longer and reproducing _____.

Game 2



Whoops. While Chris is filling out the accident report, and Alex is rebooting the biosecurity system, YOU have to prove your understanding of evolution to Administrator Jobsworth, earn your VISTA license, round up our fuzzy friends, and save the VISTA research program for another day. And you've got just one hour to do it. No problem, right?

Whenever a new feature appears—
Like long hair, sharp teeth, or big ears—
Genes must accumulate
Before all have the trait,
And that can take thousands of _____.

At first it may seem very strange:
Evolution's not a path you arrange.
The environment organisms share
Makes traits common or rare
And causes a species to _____.

What we know so far

- Visitors—even adults and very young ones—describe the games as engaging and fun.
- They can use VISTA words to describe what happened to the VISTAs in the theatrical presentation.
- They struggle to articulate variationalist explanations for selection and adaptation.

