

STEM Escape

Immersing urban and rural families in a biomedical mystery

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An escape room for STEM learning

Escape rooms are an engaging and increasingly popular game format in which a team is "locked" in a room and challenged to solve a series of narrative-embedded puzzles encoded in the room's artifacts in order to "escape" within a set period of time. We and our project partners will develop and evaluate a "serious game" based on the escape room model.

Our traveling/loanable pop-up escape room with extension activities will engage diverse families in museums and libraries in solving a biomedical mystery. The experience will be designed to engage critical-thinking and collaboration skills, stimulate interest in biomedical research careers, and communicate NGSS-aligned content – in particular, basic concepts regarding evolutionary relationships a topic with a wide variety of medical applications.

The wheelchair-accessible room will serve:

- mixed family groups with 4-8 active participants, age 8 and up
- urban and rural audiences
- English- and Spanish-speakers

Goals

1. Increase public understanding of basic NGSS-aligned biological content knowledge, particularly evolution, that is critical to medical research, and make this accessible to underserved populations
2. Increase awareness of and interest in biomedical research careers, particularly among underserved youth and teens
3. Investigate the opportunities afforded by immersive, family gaming for STEM learning in informal science institutions (ISIs) from the learner and institutional perspectives

Who we are



Lisa White, Assistant Director of Education and Outreach
Anna Thanukos, Principal Editor



Teresa MacDonald, Associate Director of Public Programs



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Rockman et al

Kristin Bass, Senior Researcher
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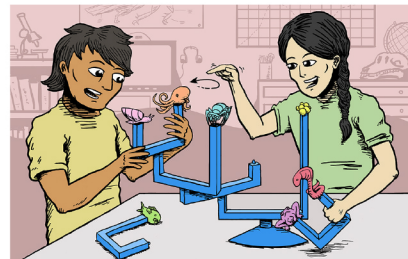


Your family enters the moss-covered trailer to find a deserted field station filled with specimens and lab equipment. A branching diagram is scrawled on a chalkboard. Anatomical drawings hang over a microscope on the lab bench. You and your daughter use a magnifying glass to peer at a set of skulls next to a notepad with a series of symbols and scribbles. Your son opens a laptop, finding a video message from Dr. Leticia Lopez. She needs your help identifying the treatment that will save her life and recover her research from the evildoer behind it all. You begin searching for clues together and puzzling over mysterious objects found in a drawer. Now the game is afoot! – STEM Escape scenario

The game

Players take on the roles of researchers at a remote field station, working together to identify the agent that caused Dr. Lopez's "mysterious wound" and to select the appropriate treatment (e.g., correct antivenom). A series of interwoven puzzles leading to this solution are embedded in the room contents. For example:

3-D tree: Participants discover components that can be assembled into a three-dimensional phylogenetic tree of organisms that might have inflicted the wound. Rotating the branches to match the sketch of a tree on a chalkboard reveals a code that unlocks a desk drawer containing skull casts of selected vertebrates.



Trait comparison: Participants compare skeletal casts of a fish, snake, and frog to identify homologous characters. Each trait is color-coded. When a projector is turned on, participants notice that the color barcode for each organism corresponds to an image on the slide associated with a number. The numbers are the combination to unlock a file box containing more puzzles/clues, as well as (significantly!) UV flashlights.

...and so on.

Extension activities

After the game, players can take part in three extension activities. For example:

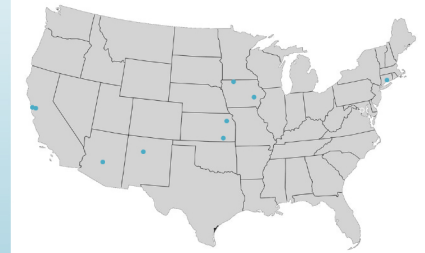
Bacteria Battleship: On one side of a visual barrier, player 1 "races" five bacterial taxa (i.e., five index cards stamped with a bacterial shape) through an evolutionary tree, each collecting different "mutations" (i.e., stamps) along the branches of the tree. Player 2 is given the taxa and uses parsimony to reconstruct the original tree.

Takeaway media

Youth players receive a comic-laden activity book featuring NIH-funded evolutionary biologists, Elda Sanchez, Folashade Agosto, Satish Pillai, Greta Binford, and Shannon Bennett (right).



Partners and host sites



- Urban/suburban sites:**
- Arizona Science Center
 - Berkeley Public Library
 - California Academy of Sciences
 - New Mexico Museum of Natural History and Science
 - University of Iowa Museum of Natural History
 - University of Kansas Natural History Museum
 - Yale Peabody Museum of Natural History

- Rural sites:**
- Estherville Public Library, Iowa
 - Independence Public Library, Kansas
 - TBD library in Northern California
 - TBD library in New Mexico

Timeline

Project phase	Program component	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Aim 1: Development	Develop game (puzzles, props, pop-up room)	█	█	█	█	█
	Develop extension activities	█	█	█	█	█
	Design takeaway media and email with at-home activity links	█	█	█	█	█
Aim 2: Assessment	Develop ISI support kit (docent guide, set-up videos, media kit, etc.)	█	█	█	█	█
	Formative evaluation of game, activities, and media at sites in California and Kansas	█	█	█	█	█
	Formative evaluation of ISI support kit at sites in Iowa and New Mexico	█	█	█	█	█
	Summative evaluation, phase I, at sites in Iowa and New Mexico	█	█	█	█	█
	Summative evaluation, phase II, at sites in Arizona, California, Connecticut, and Kansas	█	█	█	█	█
Aim 3: Dissemination	Exploratory evaluation with other audiences in California	█	█	█	█	█
	Development of and additions to project website	█	█	█	█	█
	Presentations and exhibit booths at ISI and library conferences	█	█	█	█	█
	Publications in ISI and education journals	█	█	█	█	█
	Long-term deployment by UCMP as a rentable exhibit	█	█	█	█	█