

Games for Math & Science: Agenda

I. Theoretical Considerations (15 minutes)

A short overview of how games can help teach math & science at various educational levels. Due to short allotted time, the most experienced panelist in each sector (math and science) will lead the presentation, with others adding commentary as they see fit.

II. Case Studies (15 minutes)

Each panelist now gets 3 minutes to relate an experience they've had using games in educational settings. To make sure this section doesn't get out of hand, the moderator will have to be fairly dictatorial with the time limits. (If there are fewer than five panelists, adjust allotted time.)

III. Demo Bazaar

The panelists split up, heading for separate tables from which to demonstrate any hands-on materials they've brought along. Attendees are invited to wander the room investigating those games which interest them. Shorter games can be actually played, while longer ones (typically the science games) will just get the "elevator pitch" treatment.

Simulation Games for Teaching Science

This document lists games that can be used for experiential teaching of science. The conflict simulation side of the hobby is overrepresented here, because paper simulations are uniquely suited to interactive classroom activities with high content density. (Contrast this with mainstream science-themed games, in which the scientific involvement is limited to trivia questions or even just the game theme.) Simulation games convey scientific concepts stealthily, as part of the game rules, while players are engaged in pursuit of victory. Educators can also integrate simulations into their existing units, using the games to illustrate recently-covered concepts or as springboards for motivating further inquiry.

Key: *Italic* titles are all-ages, while underlined titles are currently out-of-print and only available through the secondary market. *Last Update: June 2005*

Paleontology and Evolution

Dino Hunt

Steve Jackson Games

American Megafauna

Sierra Madre Games

Trilobite

Fat Messiah Games

Survival or Extinction: The Dinosaur Game

Latz Chance Games

Quirks

Eon Games (out of print)

Biology/Ecology

Insecta series

Fat Messiah Games

Yellowstone

Avalon Hill (out of print)

American Megafauna

Sierra Madre Games

Quirks

Eon Games (out of print)

Physics

Triplanetary

Game Designer's Workshop (out of print)

Mayday (Triplanetary descendant)

Game Designer's Workshop (out of print)

Rocket Flight (Triplanetary descendant)

Sierra Madre Games

Star Fist (Triplanetary descendant)

Steve Jackson Games (out of print)

Attack Vector: Tactical

Ad Astra Games

Hard Vacuum

Fat Messiah Games

Astronomy (star maps)

Traveller: 2300/2300 AD

Game Designer's Workshop (out of print)

StarForce

Simulations Publications Incorporated (out of print)

Web & Starship

West End Games (out of print)

Mathematics/Computer Science/Logic

Ricochet Robot
Rio Grande Games

US Patent #1
Cheapass Games

Button Men
Cheapass Games

RoboRally
Wizards of the Coast

Robotanks
Fat Messiah Games

All CCGs, e.g., Magic the Gathering
(Wizards of the Coast) and Yu Gi Oh
(Upper Deck) are useful for probability
theory and combinatorial math.

*Note that both Attack Vector: Tactical and
Rocket Flight trick players into doing
college-level math by making college-level
math feel like simple arithmetic.*

RPGs

Traveller (physics)
Steve Jackson Games (GURPS version)
Far Future Enterprises (reprints)

Blue Planet (ecology)
Fantasy Flight Games

Tribes (sociology)
Steve Jackson Games

Parting Words

This list will be posted in a more detailed fashion with hyperlinks to specific game information resources on the Chimera Magazine web site <<http://www.chimeramag.com/>>.

“When a scientist doesn’t know the answer to a problem, he is ignorant. When he has a hunch as to what the result is, he is uncertain. And when he is pretty darn sure of what the result is going to be, he is in some doubt. We have found it of paramount importance that in order to progress we must recognize the ignorance and leave room for doubt. Scientific knowledge is a body of statements of varying degrees of certainty — some most unsure, some nearly sure, none *absolutely* certain.

Richard Feynman

Games for Science: Theoretical Considerations

Neal Sofge, Fat Messiah Games

It's difficult to teach science, especially in a modern educational setting. So it should come as no surprise that integrating games is equally difficult. There are two main uses for games: as interesting side activities that build interest, and as experiential educational activities in their own right.

Mainstream Games: Building Interest

Most science-oriented games are either themed traditional games (*Dino Checkers*, *Solarquest*) or trivia games with lots of science questions (*Mars 2020*, *Dinosaur Dig*). These games impart superficial knowledge, and their mechanics rarely reflect the subject matter. However, they are fast-playing, easy to find, and thus easy to integrate into classroom settings. Mainstream games are good for introductory-level students, exposing them to scientific concepts and building enthusiasm for specific subjects.

Hobby Games: Experiential Learning

Hobby games ("adventure games" to some) are more complex and involved than mainstream titles. This is a double-edged sword; the complexity allows for far richer educational experiences, but complicates implementation (especially in classrooms) due to longer play time and a steeper learning curve.

The most useful hobby games are conflict simulations, descendents of historical wargames. They are usually combat-oriented, which might cause trouble in some ideological settings, but have the key property of being simulations. Thus the game mechanics represent the subject matter, and communicate a central scientific concept: a system can be described by rules. The simulation aspect also means that students will gain a deeper understanding of the subject matter just by playing the game, possibly without even realizing that it's occurring.

Even more difficult to use, but richest of all, are roleplaying games like the ubiquitous *Dungeons & Dragons*. These games have very long play times and are quite hard to learn, but are the richest possible environments due to their total immersivity. If handled well, they also teach a uniquely advanced critical-thinking concept: more than one set of rules can apply to a system, and figuring out which set is best is not a trivial exercise.

Special Mention: Scientific Thinking

The basis of scientific thought is forming and testing hypotheses. (This is in contrast to magical thinking, which uses a similar rule-based framework but derives those rules dogmatically with no experimentation). I believe the best game for demonstrating this cognitive style is Looney Labs' *Zendo*, where players vie to deduce a hidden rule by building experiments and seeing whether they have the "Buddha nature" or not. The beauty of *Zendo* for educational use is that the rule boundaries are weakly defined. So the Zen master can adjust the game's difficulty to fit the players and keep potential frustration to a minimum.