The Use of Games in Museums and Science Centers

By

Joseph Wilson, Spongelab Interactive

This white paper is a game.

To play it, you need to read the text, follow the clues and solve the puzzle.

Throughout this paper, you will find highlighted letters, that, when assembled, reveal a code you can use to unlock a free science game.

1. Assemble the letters here: ☐☐☐☐☐☐☐☐☐☐
2. These letters form an anagram. Unscramble the letters to find the name of a scientist (there a couple of other clues buried in the text if you need a nudge. Or email joseph.wilson@spongelab.com if you're desperate).
3. In what year was this person born? _ _ _ _
4. Input this code into the box at **Spongelab.com/museums** and download Build-a-Body.

Game Play is Human

Human beings are natural game-players. When left to our own devices, we often make games out of boring tasks. Children naturally make games out of found objects, and adults create new games all the time to give themselves a challenge: counting the tiles on the ceiling of the dentist's office or inventing a version of 3D Tetris for putting away the holiday ornaments.

In 1990, psychologist Mihaly Csikszentmihalyi coined the term "flow" to describe the state of becoming lost in game-play, a natural human condition. We often lose a sense of how much time is passing and forget about the "external world" when experiencing "flow." It's worth noting that this is similar to the description many visitors give when immersed in their favorite museum exhibitions.

> "Every flow experience…provided a sense of discovery, a creative feeling of transporting the person into a new reality. It pushed the person to higher levels of performance, and led to previously undreamed-of states of consciousness." – Mihaly Csikszentmihalyi [1]

Good games can't be too easy, nor too hard, but rest in that sweet spot where we're being challenged but not discouraged. Psychologist Lev Vygotsky called this the Zone of Proximal Development [2], but it could just as easily be called the Goldilocks Principle.

Games captivate us because in this zone, they tap into the reward centre of our brain. Every time we solve a new puzzle or successfully deploy a new strategy, our brains reward us with a jolt of dopamine. It's the result of millions of years of evolution that has made us a curious and creative species.[3]

Game-play is such a natural part of what we do that it is often difficult to tease games out from the background noise of living and working. When we poll teachers on how many of them use games in their classrooms, the numbers often start low as teachers consider how often they are in the school computer lab playing video games. But when we remind teachers that "games" could refer to a Bingo card used to memorize French verbs or a clapping game played with Kindergarten kids, more hands go up.

Museum professionals have been using games for years to engage their visitors, both on the floor amidst artifacts and exhibits, and in school programs to engage students. The advent of digital technologies has introduced an exciting new layer to game play, one that museums are just beginning to use to explore.

Figure 1: One of the oldest board games recorded, 'senet' was played in Ancient Egypt. Image Credit: Wikimedia Commons

What is a Game?

Like many things that make us human, a precise definition of what constitutes a game has been the subject of debate. Definitions range from the broad: "A game is a form of play with goals and structure," by

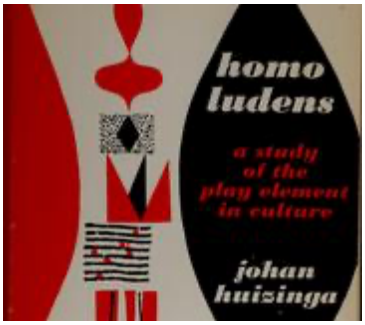


Figure 2: Johan Huizinga's *Homo Ludens*, one of the earliest studies of games in human culture. Image credit: Wikimedia Commons

game developer Kevin Maroney [4], to the prescriptive: "A game is a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome, often eliciting an emotional reaction,"[5] from game designer Ralph Koster.

One of the most useful metaphors to use when thinking about games comes from historian Johan Huizinga in his seminal work *Homo Ludens: A Study of the Play Element in Culture.*[6] Huizinga defines the 'magic circle' as the agreed upon space (either physical or temporal) within which a game occurs. Inside the magic circle there is a tacit agreement amongst the players that the challenge posed inside the game is separate from real life. This is what Samuel Taylor Coleridge called the "willing suspension of disbelief" in context of the theatre. [7]

Without these boundaries, a game would be indistinguishable from real-life. Think of the physical boundaries of a playground or a soccer pitch. Or the well-defined play spaces of Chess or Monopoly. Video games usually have the entirety of the game world enclosed within a computer monitor or phone screen (although these boundaries are blurring with the prevalence of so-called 'pervasive games' such as *Pokémon GO*). When players compete in a game, they are also cooperating in extending the illusion of the magic circle's artifice. The root of the word compete comes from the latin *competere* meaning "to come together" or "to strive in common."

Museums and science centres understand this metaphor well: when visitors cross their thresholds, they are primed to accept a new and different experience that is distinguishable from their everyday life. The museum itself is a sort of magic circle to explore new ideas and objects.

> "When you're hooked on a game, what draws you in is an elemental form of desire: *the desire to see the next thing*." [8] - Steven Johnson

Most games are competitive in nature, in that they pin one or more players against each other to achieve a goal first. These can be games of strategy like chess, Go, or bridge; games of skill such as soccer or car-racing, or games of proximity such as archery or pool. Video games are usually competitive in nature, whether you are competing against other players (*World of Warcraft*), against the computer (*Angry Birds*) or against the clock (*Tetris*). Games of chance are another broad category that includes roulette and Bingo.

French sociologist Roger Caillois gave a similar definition to that of Kostor, but adds the useful distinction that the outcome of the game itself is uncertain.[9] Although we know what constitutes a "win state" we do not know who will win, nor how they will get there. Witness the age-old tendency to super-impose games of chance (gambling) upon game of competition.

Game Play as Scientific Method

The first video game was based on the physics of orbital mechanics. Called *Spacewar!*, it was created in 1962 by students at MIT who were exploring the limits of their new mainframe computer. Two-dimensional maneuvering across the screen was a new feature and, according to computer pioneer Alan Kay, "spaceships seemed like a natural idea." It consisted of two spaceships engaged in a dog-fight while trying to avoid being sucked in by the gravity of a giant star. [10]

If we accept the premise that game play is a natural extension of human curiosity, game development in an electronic medium was inevitable. According to Alan Kay, *Spacewar!* was developed independently at several different places at roughly the same time: "the game of *Spacewar!* blossoms spontaneously wherever there is a graphics display connected to a computer" [11]

Play Spacewar! For free here: http://www.masswerk.at/spacewar/

Museums and science centres are in the business of getting visitors to think critically about the world around them, through art or history collections, or through science exhibitions. The best exhibits do not merely present objects for view, but provide a narrative and invite visitors to ask probing questions.

A game like *Spacewar!*, and most of the video games that follow, rely on the player to "probe" the game world to reveal the rules and limitations of the magic circle. In essence, players follow the scientific method: they create a hypothesis (I am going to fly towards the star and slingshot around it); conduct an experiment (fly at a certain speed towards the star); and observe the outcome (I flew too fast and got sucked in). They then repeat the experiment until they understand the game world sufficiently to make progress (to use the star as a slingshot to defeat their opponent).

Figure 3: *Spacewar!* on a PDP-1. Image Credit: Wikimedia Commons

Modern video games are orders of magnitude more complicated than *Spacewar!* and require the player to make thousands of hypotheses to complete a game, observing carefully the effects of their actions on the world around them.

Theorist James Paul Gee calls this the "probe, hypothesize, reprobe, rethink" cycle.[12] Game players have created sophisticated networks to share their data. They have created complex tables of data on how different weapons can affect different monsters, and sketched out flow charts and maps to navigate difficult level.

Python programmer and game player Gareth Rees has been publishing thesis-worthy dissections of games on his blog since 1995 including a brilliant analysis of "item dependency" and "dungeon puzzle structure" in *Zelda: Ocarina of Time.* [13]

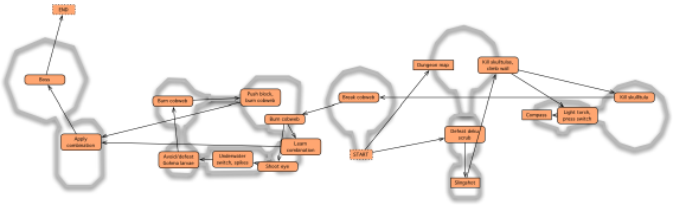


Figure 4: The puzzle structure of a mission in Zelda: Ocarina of Time, mapped against the game world geography. Museums have maps just like this that can be "gamified" to engage visitors. Image Credit: Gareth Rees

The kind of critical thinking that museums and science centres seek to encourage in their visitors can be well served by a well-designed game.

What is Gamification?

The term 'gamification' is an ungainly word. It has been used in recent years to apply to a wide range of phenomenon. In this paper the term gamification will refer to a process whereby game mechanics are applied to something that is not normally game-like in nature. This can apply to experiences, like shopping or attending a museum, or to products such as a cup of coffee or a white paper.

The experiences of other industries in applying game structure to their products and services can be a source of inspiration for museums and science centres interested in gamifying their experiences:

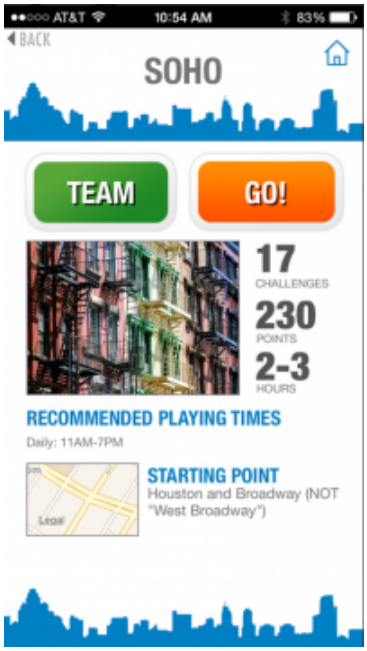


Figure 5: Stray Boots creates games and scavenger hunts for exploring cities around the world. Image Credit: Stray Boots

Travelling: While travelling to distant countries can often include an element of game play such as playing soccer with local kids or learning the local variant of euchre, gamification takes the entire process of travelling and makes a game out of it. The television show *Amazing Race* has created a format of gamifying travel that is enormously enjoyable not only to participate in but also to watch. Companies like Stray Boots and Foursquare use game mechanics like points, badges, trivia and interactivity to gamify trips for average travellers.

Shopping: Air Miles and loyalty cards at your local coffee shop have created an added incentive to buy things by creating a game of tracking your transactions. Users gain points based on what, when and where they buy, culminating in a certain "win state" (free coffee, free flight) that elicits an emotional reaction beyond the acquisition of the bought object. Witness the online outrage that occurred earlier this year when Starbucks changed their loyalty program from based on the number of coffees bought to how much money you spent. The card constituted a sacred magic circle, and Starbucks changed the rules in the middle of the game.

Education: In a sense, education is already structured like a game. Players earn points (percentage points or letter grades) by completing tasks and then get rewarded by leveling up (moving up a grade level). There is a clearly defined "win state" (graduating), and clearly defined rules (no gum!) that apply within the magic circle (school property). The difference is that most games rely on volunteer participation and design the game around the players' motivations. Not playing the game of school is illegal. In recent years, new school models have popped up to "gamify" the school system in a more engaging way. Quest2Learn is a school in New York where kids go on "learning quests" that amount to project-based learning. They have the opportunity to level-up through the awarding of badges based on competency rather than grade. The school also teaches students the process of game design.[14] Creating an engaging game on a complex topic shows a deep level of understanding. Stand-alone apps such as *ClassDojo* have also brought game structure to education, awarding points and badges for behaving in class or completing work on time.

Chores: Although parents have been turning chores into games for their children since the dawn of messy houses, the app *Chore Wars* takes it to the next level. Taking a page from Dungeons & Dragons, people earn experience points (XP) for performing certain chores and can move up levels by completing more difficult or time-intensive chores. The game master assembles a team of "adventurers from your household or office" and sets the amount of XP delivered to the player after completion.

> "My generation of gamers – whose youths were spent holed up in paneled wood basements crafting identities, mythologies, and geographies with a few lead figurines – are the filmmakers, computer programmers, writers, DJs, and musicians of today"[15] - Peter Bebergal

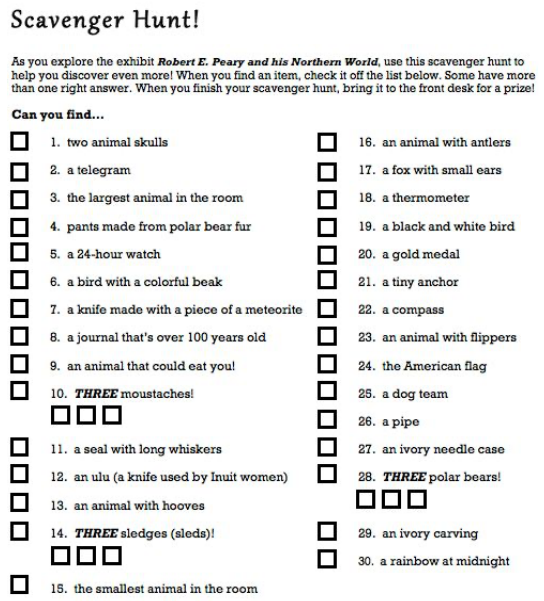
Surgery: Sophisticated virtual simulations have been training pilots and military personal for years. Surgeons are also often trained to perform risky operations within the confines of a game where the consequences of failure are low. Game designers can also include scenarios in a simulation that test a surgeon's critical thinking skills and reaction time that would be impossible to model in the real world. These simulations are not particularly new, and do not need to be high fidelity. The game *Operation* was launched in 1965 complete with 13 organs that needed to be extracted from "Cavity Sam." While not used to train surgeons, it certainly tapped into the same human need to play, replay and improve.

Games in Museums and Science Centers

Museums and science centers are perfect venues for setting up games. The floors of artifacts and exhibits are just like the levels in a game, full of hidden surprises and "Easter Eggs". Below, games are categorized by their target audience and whether they are digital, analog, or a blend of the two:

On-floor

Analog: The use of games on the museum floor did not begin with the digital medium. For years museums and science centres have created scavenger hunts and passport programs using nothing more than paper and a pencil. Art museums often include sketching programs that can be gamified along a certain theme (ex "draw all the animals you can see") or a time period ("sketch three figures from the Renaissance gallery").



Scavenger Hunt!

As you explore the exhibit ***Robert E. Peary and his Northern World***, use this scavenger hunt to help you discover even more! When you find an item, check it off the list below. Some have more than one right answer. When you finish your scavenger hunt, bring it to the front desk for a prize!

Can you find...

1. two animal skulls
2. a telegram
3. the largest animal in the room
4. pants made from polar bear fur
5. a 24-hour watch
6. a bird with a colorful beak
7. a knife made with a piece of a meteorite
8. a journal that's over 100 years old
9. an animal that could eat you!
10. ***THREE*** moustaches!
11. a seal with long whiskers
12. an ulu (a knife used by Inuit women)
13. an animal with hooves
14. ***THREE*** sledges (sleds)!
15. the smallest animal in the room
16. an animal with antlers
17. a fox with small ears
18. a thermometer
19. a black and white bird
20. a gold medal
21. a tiny anchor
22. a compass
23. an animal with flippers
24. the American flag
25. a dog team
26. a pipe
27. an ivory needle case
28. ***THREE*** polar bears!
29. an ivory carving
30. a rainbow at midnight

Figure 6: The paper-based scavenger hunt is one of the most popular analog methods for gamifying the exhibit hall. Image Credit: Peary MacMillan Arctic Museum & Arctic Studies Center

Paper-based scavenger hunts are particularly well-suited for small museums with limited budgets like this example from the Peary MacMillan Arctic Museum & Arctic Studies Center in Brunswick, Maine.

Blended: One of the challenges of integrating digital experiences into a museum exhibit is the risk that it will take visitors away from the physical space around them. Many of the best digital games used by museums and science centres take a blended approach that pulls the user back and forth between the physical objects around them and the digital world on their phones or at a kiosk.

SFMOMA has created an app called the *Family Gallery Game* that prompts visitors to interact with the artwork and with their fellow visitors. Its strength is that it uses a digital medium to allow visitors to interact meaningfully with their fellow patrons and the artwork that is physically present.[16]

Digital: Many museums and science centres have purely digital games set up in their exhibit halls. In the past 20 years, touch screens and digital games are often the medium of choice, allowing visitors access to experiences not confined to the museum walls. The Royal Ontario Museum in Toronto has a game entitled *Challenge of Mining* designed for up to eight players standing around a multi-touch table. The game illustrates the importance of mining in our daily lives and discusses the social and environmental responsibilities surrounding mining as well as our responsibilities as consumers of products of the Earth**.** This game requires players to choose a specific role (a miner, an environmental advocate, a health and safety inspector etc.) and then work together to manage a successful ethical, and productive mining project.

Figure 7: The *Challenge of Mining* game in the Teck Suite of Galleries, Royal Ontario Museum. Image Credit: Joseph Wilson

School Programs:

Analog: Such paper-based scavenger hunts or Q&A sheets have also been the staple of museum school programs for years.
Museums such as the National Portrait Gallery in DC have developed even more elaborate, non-traditional analog games for visiting students in the form of theatre. Educators lead students on a re-enactment of the trial of abolitionist John Brown, loosely following the actual court proceedings from 1859.

Face-to-face education workshops at museums often use the same kinds of games that teachers use in classrooms. The Ontario Science Centre has a suite of education workshops for students as young as 4 and as old as 17. The workshop designed for Junior Kindergarten and Senior Kindergarten students, *Adventures in Science*, contains a narrative where the children need to use their powers of observation to help a raccoon get home. Students need to play games peppered throughout the workshop such as a simple matching game where they classify objects as living or non-living.

At Science North in Sudbury, Ontario, the Nature Exchange encourages children to be on the look-out for natural specimens in their environments. When they are in the school-yard, or exploring the geography around their homes, they are encouraged to collect specimens. A decent collection of

specimens (rocks, pinecones, an insect exoskeleton, a maple key) nets the player a certain amount of points. Points lead to badges, rewarding students for their curiosity and tenacity.

Blended: Like on-floor exhibits, successful school programs can also blend the digital with the analog. In Kew Gardens in London, Kevin Walker gave phones to student groups as they explored the garden. They were assigned a certain food plant and then had to create a rhyme or riddle about it for the other groups to solve. The resultant media were varied: raps, songs, recitals. The media were digital but the plants were physical. [17]

Walker found that the students performed their best work when they shared devices, and when he created questions that forced the students to closely examine the world around them instead of playing an on-screen game. The mobility of the devices allowed for easier physical exploration than large kiosks or digital tables might.

Digital: Purely digital school programs exist at many museums as well, such as the Distance Learning program at the Royal Tyrrell Museum in Alberta. Students and their teachers can book time to connect remotely with a paleontologist, either for a pre-structured talk or for a Q&A session about the museum's collections. These programs are synchronous, unrolling in real time between the two parties. They have connected to over 57,000 participants since 2006, mostly in North America. For these students, the magic circle is virtual, connecting their classroom with the Museum's Distance Learning Studio in a symbiosis of exploration.

Figure 8: The Royal Tyrrell Museum in the badlands of Alberta runs a Distance Learning program for schools and home-schooled children. Image credit: Royal Tyrrell Museum

Adult Programs:

Analog: Many museums have adult-only nights or programs geared to adults in an effort to broaden their user base and make use of their buildings after hours. Museum Hack, in New York City, run a series of scavenger hunts at local museums for corporate groups or teams of friends. A favorite feature is their inclusion of the "Buy, Steal or Burn" question, where team members need to explain which of the three options they would apply to a piece of artwork hanging on the wall. Urban Capers Scavenger Hunts runs murder mystery scavenger hunts at the Royal Ontario Museum in Toronto, although the museum does not vet the content or have an official partnership. A wealthy museum curator has been murdered and the teams must search the museum for clues. Clues take the players all over the museum, poking into exhibits, decoding Latin phrases, interpreting maps, and engaging with exhibit interactives like videos and voting boards. The structure itself is entirely analog and relies on players to scribble answers to clues on paper, unscramble anagrams and do some on-the-fly math. In fact, players are explicitly told to turn their phones off and are penalized for their use.

The Telus Spark Centre in Calgary curates a series of monthly Adults Only nights at which they have prominently featured games. The program coordinators created an entire program for visitors to play old-school games on the museum floor such as *Twister, Monopoly* and *Operation*. Nostalgia factor aside, visitors were quick to comment on the thematic similarities between the table-top games and the play-based learning encouraged in the walls of the science centre.

> "Among the many various literary and artistic pursuits which invigorate men's minds, the strongest affection and utmost zeal should, I think, promote the studies concerned with the most beautiful objects, most deserving to be known." [18]

Blended: There have also been some lovely attempts at blended game-based learning. In 2011, game designer Jane McGonigal used the collections at the New York Public Library as a platform for a blended game for adults called *Find the Future*. Curators took teams up into stacks in search of clues hidden amongst books, maps, and artifacts. They learned some history and curatorial philosophy, and also pushed the game narrative forward and were encouraged to use their web-connected phones to do research, connect with their social networks and crowd-source the de-coding of the clues. The outcome was a mixture of stories written by the participants themselves culminating in a co-written book with hundreds of pages. The book is currently housed, complete with an ISBN number, in the NYPL's special collections.

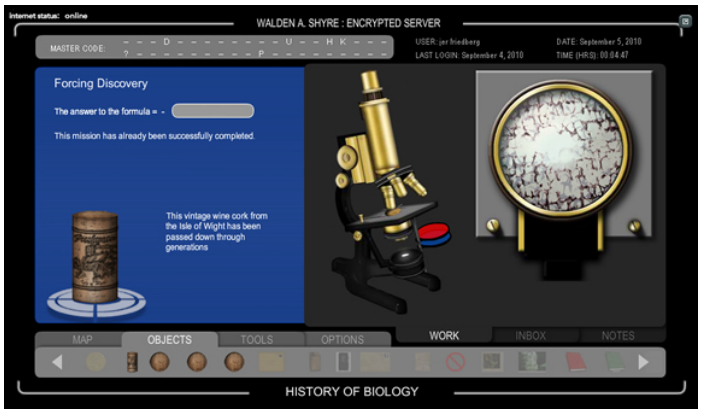


Figure 9: In Spongelab Interactive's *History of Biology*, players scour the internet to search for clues to unlock the mystery of the missing scientist. Image Credit: Spongelab Interactive

Digital: The game *History of Biology*, developed by Spongelab Interactive is a long-format (10 hours+) mystery game that is a cross between *The DaVinci Code* and an online scavenger hunt. The themes in the game align with the focus of natural history museums and can be used to keep visitors engaged in museum content when they are not at the museum itself.

In the game, players put together clues to find a missing character, (fictional) scientist Walden A. Shyre, and at the same time piece together a history of biology based on famous figures from the past. Clues are hosted on fake websites and real websites such as Wikipedia.

Case Study: Game Jam

In order to engage millennials, whose whose attendance has been declining across the museum sector over the past decade e, The Royal Ontario Museum created a program called Game Jam. Teams of game developers, designers and writers convene at the museum over a (long, sleepless) weekend to create video games.

They have hosted four such hackathons on the themes of

Figure 10: Nectocaris pteryx, a creature from the Cambrian era, makes an apperance in an app developed over one weekend at Game Jam. Image Credit: Spongelab Interactive

biodiversity, ancient cultures, planetary science, and this year, the evolution of life on Earth.

Teams get a behind-the-scenes tour of museum collections and hear from curators and subject-matter experts. This year, entries for the "Dawn of Life" themed game jam, ranged from a game entitled Hungry, Hungry Trilobites, to an evolution simulation, to a dating app for Cambrian animals.

The ROM chooses the best games to include in their 'ROM Arcade' for visitors to play at events within the museum throughout the year. They also include games in their school programs as a way to teach content, but also as a way to introduce 21st century skills, coding and digital literacy.

Millenials, born between the early 1980's and 2000's, are the so-called 'social-generation.' They value collaboration, co-creation, participatory experiences, and genuinely want to make a difference in the world. Hackathons like Game Jam are decentralized and collaborative in nature and appeal to digital natives that museums often have trouble connecting with. So far, 25,000 visitors to the ROM have contributed to the process of game development, as developers, on-floor game testers or as school children attending a workshop.[19]

Figure 11: *Clash of the Talons*, developed by Last Hour Games, is the first game to be commercialized from the ROM's Game Jam program. Image credit: Last Hour Games

Clash of the Talons, a game developed in 2014 by Last Hour Games, is the first game from this process to be commercialized and is now available as an app for iOS and Android. The game features birds of prey competing for food in the wild. Players square off against each other as eagles, hawks or owls of various kinds in their respective environments. Those who catch the most prey, win.

The collaborative effort incorporated feedback from Ornithology experts, museum visitors and educators. In typical millennial fashion, portions of the revenue are donated back to the ROM.

Conclusion

As museums and science centers decide how they want to use games to boost their exhibits and programs, there are a number of decisions that need to be made. To avoid developing a game just for the sake of it, or to avoid creating a game that is beyond the ability of your internal staff to maintain, we encourage you to keep the following tips in mind:

Begin with your learning goals and work backwards: Decide what the goals of a particular exhibit or program are, then work backwards to see if any game mechanics can be used to achieve that goal. There are two main categories of learning goals for games: those dealing with content and those dealing with process. The facts of an artifact's pedigree, for example, or the details of a historical event might be best relayed through a game where the visitors uncover facts when they are ready, as they explore, rather than on a pre-determined schedule dictated by a curator. Process goals can include practising skills of critical thinking or art criticism, and can be worked into the structure of a game. Visitors can pretend they are art critics or scientists inside the magic circle and easily test the tools of the trade.

Emphasize the social: Game players are often emboldened by the contract of the magic circle and are more outgoing or social than they might otherwise be. The most memorable visitor experiences are ones where they make a connection with another person, and experience something new. Consider what social unit is most relevant to a particular exhibit: a family, a couple on a date, a group of friends in a school group, or even strangers who are asked to join forces for a 'mission' for a discrete moment in time at the museum.

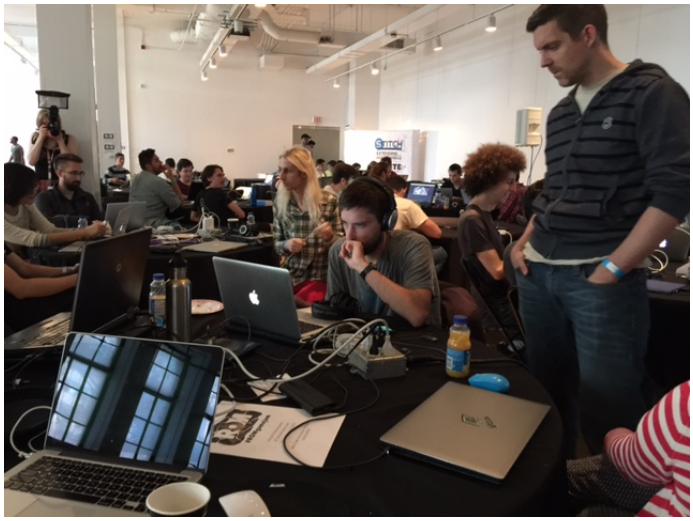


Figure 12: The social element of game events like the ROM's Game Jam is what keeps people coming back for more. Image Credit: Joseph Wilson

Blend the physical with the digital: The most effective games for visitor engagement include elements strongly grounded in the physical reality of the museum, but also include experiences through digital devices they would not normally have access to. For example, visitors could scour the museum for codes that might unlock new characters in an online game, or use information from exhibit copy to enhance a digital experience.

Use web-based technologies: It's tempting for museums to spend their digital budgets creating stand-alone apps for iOS or Android devices but one of the drawbacks is that they can be difficult to update and keep relevant. New technologies like HTML5 allow museums to build interactive 'web apps' that can be accessed through mobile devices and can be updated in real time. When curators include newsworthy events from the science or politics of the day, it increases the resonance between visitor and exhibit.

Use content specific to your museum: Although apps like *Pokémon GO* can be exploited to get visitors into museums, the content of the game is divorced from the context. This means that visitor engagement is likely to be shallow and their attendance fickle. Focusing on what a museum does best and why the physical space is unique is a strategy that will result in deeper engagement and longer lasting relationships with visitors.

Don’t spend lots of money on an untested project. Games can often be tested for very low cost. Paper prototypes and wireframes can be tested on visitors within days. Digital games can often be boiled down to a core strategy that can be tested in an analog way, then ported into the digital realm. Similarly, digital games can be created for fairly low cost by development partners to align with particular exhibits and piped into institution websites.

Above all, when creating a game strategy for your museum or science centre, have fun. Psychologist Johan Huizinga highlighted ‘fun’ as the single most important element to game play: one that has united generations of humans throughout history in the playing of games.

Notes

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[4] Maroney, Kevin, "My Entire Waking Life" in *The Games Journal*, 2001. Accessed Sept 20, 2016: http://www.thegamesjournal.com/articles/MyEntireWakingLife.shtml

[5] Koster, Ralph, A Theory of Fun for Game Design. Scottsdale, Paraglyph Press: 2005

[6] Huizinga, Johan, *Homo Ludens: A Study of the Play Element in Culture*. Abingdon, Routledge: 1949

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[8] Johnson, Steven, Everything Bad is Good for You. New York: Riverhead Books, 2005

[9] Caillois, Roger, *Man, Play and Games*. New York: Free Press of Glencoe, 1961

[10] Laurel, Brenda, *Computers as Theatre, 2nd Edition*. New Jersey: Addison-Wesley, 2014

[11] Brand, Stewart, *II Cybernetics Frontiers*. New York: Random House, 1974

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[13] Rees, Gareth, *The Puzzle Structure of Ocarina of Time*. Accessed Sept. 20, 2016: http://garethrees.org/2004/12/01/ocarina-of-time/

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