DESIGN RESEARCH, PRACTICE, AND PRINCIPLES FOR DIGITAL KIDS

Prepared for the Exploratorium and the Macarthur Foundation

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Research Goals

The Macarthur Foundation's has expressed interest in deploying Foundation funding toward the goal of supporting research that will result in significant improvement in the use of technology to aid in extra-institutional learning for the K-12 demographic in the United States. This interim report focuses on achieving the stated goal within a subset of the target population: Millennials, defined roughly as those kids for whom the web has been a fact of life since their earliest experiences with technology. This translates into a group of kids up to the age of 14 or 15. I will analyze this demographic more closely in the following sections.

Design Research

Design research is simply research intended to inform design so as to improve the chances of success, however that is measured. In the case of the research goal described above, success would therefore be measured in the effectiveness of research in creating prototypes and systems that result in a significant improvement in the extra-institutional learning within the target demographic through technological delivery systems, including both hardware, software, and technologically enhanced environments.

Types of Research

Design research is distinct from market research primarily in terms of its goals. Market research typically examines a potential market for purposes of determining whether a particular product or service will be attractive to that market and is primarily focused on influencing marketing. Design research has the goal of discovering what sorts of products or services might be created to serve a particular market segment and is primarily focused on influencing design. [1] [2]

The methods of research design fall into a few general categories. Human-centered research examines a particular population or cohort. Through quantitative methods, the demographic characteristics of that population may be understood. Quantitative research typically employs large sample sizes (50 or more respondents). [3] Qualitative research – including forms such as

interviews, focus groups, and observational and immersive ethnography – delves more deeply into social, psychological, cultural, and other aspects of a population, employing smaller sample sizes.

Process-oriented research examines and experiments with the process of design to improve outcomes. Process-oriented methods include the arrangement of design environments so as to immerse the designer in the culture and artifacts of the intended audience or formal outcome. [4] It may also involve examination and "engineering" of organizational structures so as to facilitate knowledge transfer from research entities to development organizations or to facilitate organizational buy-in of a creative idea through design, development, and marketing phases. [5] Formal design research uses the elements of design itself as the tools of investigation. [6] For example, in their book Rules of Play, Katie Salen and Eric Zimmerman examine of gameplay patterns in formal and structural terms. [7]

Research Heuristics

The domain of human-centered research includes a broad palette of methods. It is difficult to understand which to deploy, especially when one is constrained by time or money. The following structure has proven in my experience to be efficient and effective and is not necessarily extremely costly.

1. Secondary research

Literature review: Review existing studies that can shed light on the subject. These include academic and scientific research, demographic compendia such as Statistical Abstracts or the US Census Report, and commercial research that is in the public domain.

Expert interviews: Based upon the findings from the literature review, identify experts whose knowledge is particularly relevant to your goals. You may also identify other experts who have not published in the field but who have relevant knowledge; for example, a marketing manager for a consumer products company that addresses the same segment of the population. Invite those experts to participate in interviews. Such interviews may be conducted by email, telephone, or face-to-face. Typically, experts will be motivated to participate if you agree to share all your interview material with each participant.

2. Analysis of secondary research

Analyze your findings from the literature and interviews. Look for patterns in the data. What are the hot spots? Which areas seem to attract the greatest attention? What are the most salient questions posed by the findings? Where can knowledge be extended through qualitative methods? These questions yield a set of research opportunities. Evaluate those opportunities in terms of the specific goals of your research and narrow the field to those which are most relevant to you. Consider conducting more quantitative research in those areas where quantitative methods (e.g., questionnaires or rating scales) would yield meaningful results. Formulate research questions to focus qualitative research.

3. Qualitative research

Determine the most appropriate qualitative methods for exploring the research questions you have identified through the process above. Lifestyle questions may best be examined through observational research or photo audits. Questions involving personal goals and motivations may best be explored through interviews of individuals or dyads. Questions involving social practice or daily activities may best be examined through immersive ethnography or various forms of monitoring – e.g., pager responses or audio diaries. With a youthful population (K-12), focus groups are rarely productive because of the overwhelming social dynamics of young groups. Younger respondents are more likely to identify an articulate or aspirational individual in the group and to mirror that person's opinions. However, if your goal is to identify the sort of person who is an opinion leader, the social dynamics of a focus group may be quite informative.

4. Analysis of qualitative research

Three stages of analysis are useful. The first is simply to identify patterns in the findings. For example, you may find that early adopters of particular technologies tend to share certain characteristics; e.g., an openness to experimentation, a social motivation to be perceived as an innovator, or a pattern of curiosity about the technology itself (by the way, each of these profiles maps to a different segment of the youth population – see the Cheskin youth segmentation model below). You may find that the majority of respondents share certain values (e.g., a need for social connectivity with a peer group) or practices (e.g., using the web for homework). You may find that certain types of activities are pervasive among your respondents (e.g., instant messaging).

The second stage is to express the patterns you observe as findings. For example, in the Purple Moon studies (see Appendix A), some of our findings included:

– narrative construction is a preferred form of play for girls ages 7-12
– in computer games, girls value character and story while boys tend to value action and competitive measures
– an activity is considered "play" when one's actions do not have significant real-life consequences

The third stage of analysis involves the transformation of findings into design principles or heuristics. Again, looking at the Purple Moon research, some of the design heuristics included:

– avoid gameplay patterns that emphasize speed
– include gameplay patterns that involve social intelligence
– provide for open play and exploration
– provide early evidence of personal agency within the game context; avoid steep learning curves

5. Validate qualitative findings with quantitative methods

Bracketing qualitative research with quantitative studies can show you whether your findings are accurate for a larger population. An obvious way to achieve this goal is to present a prototype or model to a larger sample for quantitative evaluation (i.e., through questions that have unambiguous or standardized answers so that statistical methods may be used).

Industry Practice

An expressed goal of this study is to examine existing industry practice in design research. Target industries include computer games, videogames, multiplayer games, interactive play environments, and portable devices such as cellular phones and handheld devices (e.g., Palm or iPod). For observations on interactive play environments, see Appendix A. In this section I will focus on computer games, videogames, and multiplayer games.

History and Examples

Two types of historical examples illustrate traditional industry practices. The first is in the domain of computer games and videogames and is drawn primarily from my experiences at Atari, Activision, Epyx, Apple, and Sony from 1980 to 1999 and my interactions with Hasbro and Mattel in 1996-7.

Atari

At Atari, my initial position was as manager of Software Marketing for the Home Computer Division (1980-82). Although the group bore the name "marketing", its charter was to determine what sorts of computer software should be created for the Atari Home Computer (400 and 800). Most of the games produced for the Home Computer Division (HCD) were ported directly from games that ran on the VCS machine, an early videogame console. A key strategic element was to differentiate the home computer from the VCS system. In these early days, the only significant competitors in the home computer space were Apple and Commodore (and somewhat later, Amiga, which was an interesting blend of home computer and videogame characteristics). Because the software budget was limited, the group had to identify which games should be ported and how the remaining development budget should be deployed.

Atari's market research group was devoted to the traditional purpose of figuring out how to market product and not to determine what product should be created. This latter function fell informally to my group, as there was no institutional recognition of the need for such a function at all. This is an historical artifact of the genesis of the computer game industry itself, in which Atari was the first strong player to move from the arcade to the home console. Beginning with "Space War" in 1967, young male engineers had created games for which they were their own audience. [8] It was fortuitous that the engineers' demographic was practically identical to the market demographic. The computer game industry quickly became vertically integrated around this demographic, from engineering and design to marketing, retailing, and institutional management. [9]

Our group had three research goals:

1. Determine which videogames and arcade games to port to or devevlop for the home computer. We achieved this goal in three ways. First, we gathered sales figures for videogames and rankings for arcade games (quantitative data). Second, we worked with engineers to determine which games could successfully be ported to the home computer architecture (expert interviews). Third, we observed kids playing games

in arcades to identify attractive game characteristics (observational ethnography). This last function basically consisted of me going around to arcades, watching kids, and asking questions [9]. These research activities were organizationally unsupported and invisible to the company.

2. Identify non-game applications that would add value to the home computer its general audience. Our methods here were fundamentally speculative and occasionally formal. We looked at areas of existing practice (e.g., financial management, self-improvement, education) and applied formal criteria to determine which of these practices might be enhanced through computer software. This analysis gave rise to such products as a word processor, an early spreadsheet program, a personal financial management program, and the PILOT programming language for kids. It should be noted that we were forced to make broadly speculative decisions about the makeup of our audience and to deduce its needs from existing activities and media (e.g., books, magazines, television, etc.).

3. Develop criteria for usability. Through fundamentally formal analysis, the group developed the first "Human Factors Checklist" in the personal computer industry. Again, this work was unsupported by the organization and not officially part of the charter of our group or any other.

The group performed all of these research activities "under the radar" of the organization because the need for them was not acknowledged and utilizing resources on them was seen as wasteful and inappropriate. This, in a nutshell, was the process in every computer game and software company with which I was subsequently involved, including Activision, Epyx, and LucasArts Interactive.

My conclusion is that when a type of product is deemed successful, its form and derivation (in the case of videogames, this was often based on licensing of successful film properties) become the *de facto* criteria for future product design. Conscientious engineers, designers, and marketers conduct stealth research by *ad hoc* means to do what they know should be done within organizational contexts that do not support their activities or acknowledge the need for research except in relation to marketing and advertising. Play testing and quality assurance are sanctioned *ex post facto* forms of research that are generally aimed at validation rather than innovation.

Apple

I was involved in two significant research activities at Apple Computer during the 1990s. The first was known as the "Guides" project. [10] This research

initiative was begun in the Human Interface Group and migrated to other areas of the research division, eventually under the leadership of Tim Oren. The objective was to explore the potential of anthropomorphic "guides" as an interface to educational information – in the case of the research project, an encyclopedic treatment of Westward Movement in America. A working prototype was produced and tested and was warmly received by research subjects. The first upshot was a canonical "visionary" video entitled "The Knowledge Navigator" created at the behest of John Sculley, featuring an information agent on a futuristic desktop computer. This video, although it did not lead to any product development, enhanced Apple's profile as a visionary company. In fact, the first commercially available anthropomorphic agent was "Bob", a universally disliked help agent in Microsoft software. Bob's successors (e.g., the paper clip) continue to annoy users today. The fundamental idea of using personae and storytelling as a navigational interface has not been seriously pursued by Apple or any other company to my knowledge.

I was also involved in the "Playground" project under the auspices of Alan Kay's Apple Vivarium project. Here the research mandate was to determine how narrative might be used as an interface to the Playground programming language. Rachel Strickland and I conducted qualitative and formal research with kindergarten children to examine their fundamental understanding of narrative construction. We introduced native American "coyote" tales to the children and the kindergarten teacher worked with us to arrange several activities on that theme, including:

– authoring and performance of a "coyote" play, including construction of masks, costumes, and scenery
– cooking of "coyote" food
– authoring of "coyote" stories with the aid of pictograms
– interviews and videographic portraits of the children

Our essential learnings were that, given exposure to non-western narrative structures, young children could generate narratives with alternative structures, including but not limited to the structures of the "coyote" stories to which they were exposed. We also found that children used pictograms in story construction to indicate causality, concurrence, and spatial relations. This finding was especially surprising, as we had predicted that the pictograms would be used exclusively to lay out prompts for linear narratives with a left-to-right temporal and causal arrangement. Our discovery of the narrative flexibility of young children was not incorporated into further work with Playground, a programming environment that was eventually scrapped. The research, however, continues to suggest interesting potentialities in the construction of expressive and educational activities for young children (see Appendix B). [11]

The Apple examples demonstrate once again that while research may be conducted in a sanctioned or semi-sanctioned way within a company, successful knowledge transfer that leads to the actual design and development of products does not occur. This would appear to be a key barrier to research success and should be considered as a highly leveraged area for research and informed intervention.

Sega of America, Sony, Mattel, and Hasbro

During the early research phase for Purple Moon (conducted at Interval Research Corporation), I encountered Sega of America. In 1995-6, Sega had an internal project devoted to exploring the market potential for games for females and families. It was observed that during school hours, up to 70% of the calls to the Sega help center were from adult women – presumably, mom playing games while their sons were at school. This tempted Sega to explore a new market opportunity. I learned from internal sources at Sega that the project was terminated for and interesting reason. Upper management at Sega determined that, were the company to be seen to be developing games for female audiences, their brand equity with their core male demographic would be significantly eroded. They were right. A potentially successful solution would have been to develop a separate label that distanced female-oriented games from the Sega brand, but this approach was deemed to be too expensive and the initiative was discarded. Boxes of questionnaires that supported the hypothesis that female-oriented games were desired by significant numbers of girls and women were destroyed. [12]

After I became actively involved in carving out a new computer game category aimed at a female audience by conducting extensive quantitative and qualitative research [13], I became known as an expert in that arena. It is in that capacity that I encountered Sony. I was hired for one day to present findings from my research to Sony in an attempt to educate their game designers about reaching a female audience. The session was poorly attended and the attendees, with one or two exceptions, made it clear by their demeanor that they were attending only because they had been required to do so. No design work was initiated or influenced as a result of this seminar to my knowledge, but the company probably concluded that they had done due diligence on the opportunity.

During the phase of fund-raising for Purple Moon, I and other members of the Board approached Mattel (Jill Barad, president) and Hasbro (president and several marketing executives). At Mattel, it became apparent that the company's interest was in perpetuating the Barbie line of software products. The company's interest in Purple Moon was focused on having a line of products that Barbie players could "graduate" to. In the end, Mattel acquired American Girl to fulfill this need. The company then proceeded to acquire all other labels in the "girl game space" (including Purple Moon) and then to kill those

competing brands. This play, which cost the company in excess of $700M, effectively destroyed Jill Barad and the software organization that was in place; after the spate of acquisitions, there was not enough money left to service the existing brands. At Hasbro, the girl audience was judged to be too much of a reach for a boy-branded company. In both cases, the "industry practice" was to look at existing brand equity with known audiences and to make strategic marketing decisions about entering the space. While both Mattel and Hasbro do extensive playtesting on their toy products, design research does not appear to drive product decisions.

Contemporary Practice

In this section, I will review contemporary practice in four distinct sectors. The first, commercial research, is represented by Cheskin, a research firm with which I have frequently worked. I am also a member of the Cheskin Board of Advisors. The independent game designer's research perspective will be represented by an interview with Jeannie Novak, a free-lance game designer for such companies as Activision. A commercial game company's research practice is represented by Will Wright at Maxis. Finally, a nonprofit, progressive interactive media company's perspective will be represented by Public Interest Entertainment, headed by David Galiel.

Cheskin

Here is Cheskin's description of its history and function as a company, taken from the website www.cheskin.com:

> Cheskin is a consulting and research firm grounded in marketing and design. At the heart of our work is the recognition that innovation and success rest on in-depth understanding of people, their cultures, and the influences that motivate them. We provide clients with a fresh perspective that guides profitable innovation at every point of the product development process, from identifying unmet customer needs, to visualizing new concepts.

> For over 50 years, our work has benefited much of the Fortune 500 - from technology and life sciences to consumer goods and professional services. Our staff of over 70 professionals is diverse, multilingual, and passionate about our work. Cheskin anticipates change, defining business opportunities, product development, and marketing strategies for the future.

I first worked with Cheskin on the research for my company, Purple Moon. Since that time I have learned a great deal about the company's strengths, methods, and guiding principles. One of Cheskin's leading areas of expertise is the youth audience, from kids to teens.

A crown jewel of Cheskin's research over decades in the teen market is a segmentation model (see Figure 1). The teen demographic (12-18 years of age) can be understood by looking at two axes: a teen's orientation toward "adult" values and culture, and their orientation toward their peers. Five distinct groups can be located on this graph.

ISOLATORS: These are teens who do not affiliate either with adult values or mainstream peer culture. They tend to be kids who do not do well in school and are "at risk" in many ways. They manifest more than the average illegal activity, rebelliousness, teen pregnancy, and other difficulties. This group makes up 7-9% of the teen population.

EXPLORERS: These teens are completely immersed in creating leading-edge teen culture and show very little orientation toward adult tastes or values. Best known for their involvement with alternative music, these kids also create independent media and start trends that sometimes penetrate the more general teen culture such as tattooing, piercing, and extreme fashion. It is worth noting that this segment is the wellspring of most trends that find their way into mainstream teen culture; however about 20% of those trends make it into general acceptance.

VISIBLES: These are the "canonical" teenagers—generally popular, stylish, party-positive kids. Athletes are typically in this segment. Their peer orientation is high; their adult orientation is moderate—they are not going to commit serious crimes, but underage drinking and other such transgressions are normal. The size of this group oscillates between 35 and 40%. When trends enter mainstream teen culture from the Explorer group, they are picked up first by the Visibles.

STATUS QUOS: These teens have higher adult orientation than Visibles and are more likely to conduct themselves in accordance with adult values, eschewing the greatest excesses of peer pressure. They tend to be higher achievers academically. They are more likely to go to church. Both African-Americans and Latino teens are over-represented in this segment. Their size, like the Visibles, oscillate between 25 and 35% of the general teen populace.

NON-TEENS: These kids have the highest adult orientation and the lowest peer orientation. They are sometimes called "geeks" or "nergs." They tend to dress and behave like little adults. Non-teen boys were early adopters of computer technology; non-teen girls tend to be interested in the domestic figure of the mother. This is a 10-15% group.

non-teen

status quo

trend movement

adult orientation

visible

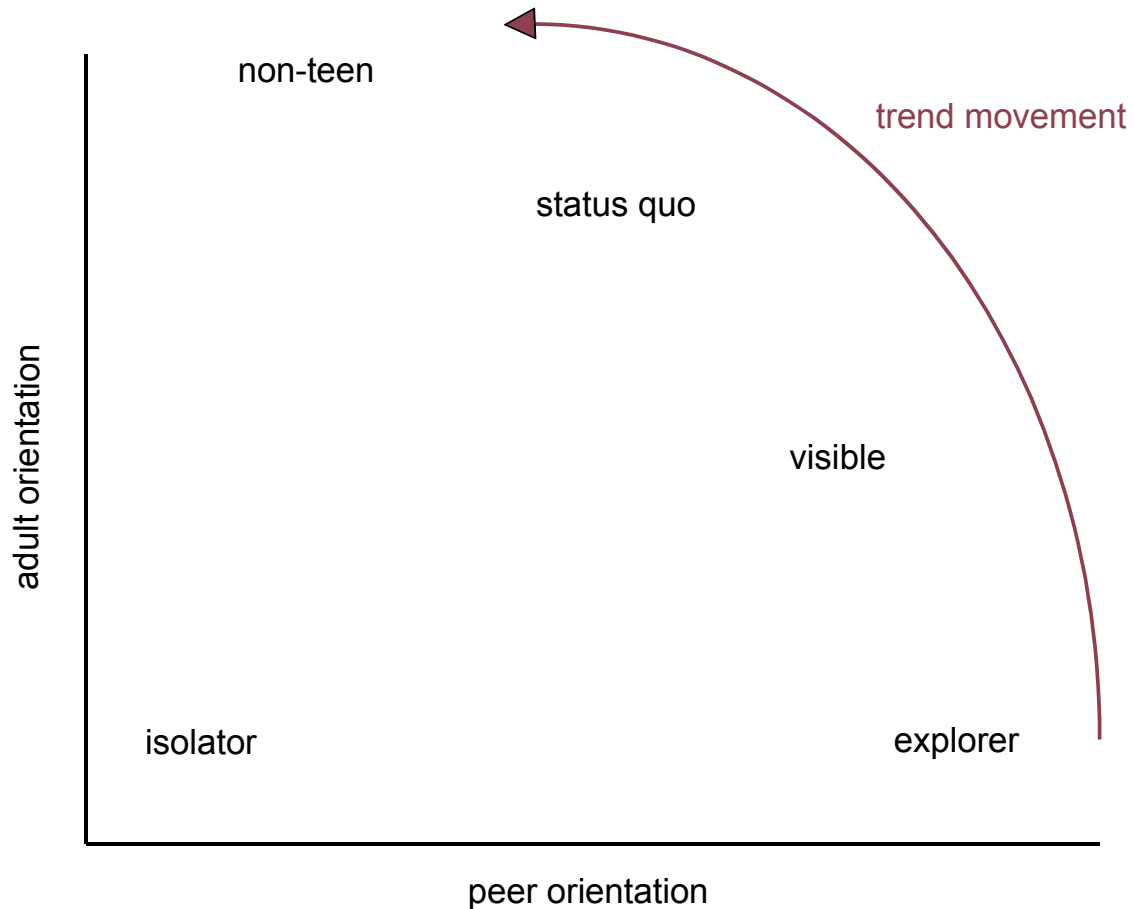isolator   explorer

peer orientation

Figure 1. Teen Segmentation Model, Cheskin

There are two other important aspects of this segmentation model. One is that the balance of groups varies in general according to the currents of contemporary culture. During more conservative periods, the groups with higher adult orientation grow slightly; the converse is also true. Another important factor is the way that trends move through these segments. As stated earlier, most trends originate with the Explorer segment and move counter-clockwise around the graph. By the time a trend is adopted by Status Quos it is generally no longer hot with Explorers. An obvious design heuristic is therefore to look to the Explorer group (or the Visible group) if you are trying to introduce a trend.

Over the years, Cheskin has been involved in many forms of consumer product, entertainment, and technology brands. Their report on creating digital experiences for the youth market are in appendix F.

An Independent Game Designer: Jeannie Novak

Jeannie Novak has designed computer games and music for games. She also acts as an independent researcher for various game clients and teaches Game Design at Art Center College of Design (her resume is attached in Appendix C). I interviewed Jeannie on June 30, 2004.

Jeannie reports that television entertainment and mobile phone companies are expressing great interest in the computer game arena today. Jeannie's specialty is the demographic cohort known as "Millennials"—kids for whom digital technology has been a persistent part of most of their lives, born in 1982 or later. In their book, *Millennials Rising: The Next Great Generation* (Vintage Books, 2000), authors Neil Howe and William Strauss assert that "today's teens are recasting the image of youth from downbeat and alienated to upbeat and engaged." [14] Jeannie concurs with Howe and Strauss' characterization of the Millennial cohort. "Millennials have grown up with the internet, and their Boomer parents' generation also influence them. Their lifestyles are more open, more team oriented, more collective, more mixed-gender and mixed-race. Crime and drugs have gone down." She adds, "For them, privacy is just a non-issue."

Jeannie identifies other factors that have influenced the character of this particular generation. Structured play at recess, for example, may serve to reinforce collaboration as a value. Technology has enabled "buddy lists" that allow teens to work with multiple social groups as part of their personal networks. The abundance of media and tools for manipulating it has earned this generation the nickname of the "mix" or "remix" generation. In terms of gaming, multiplayer games entered the mainstream with the internet, thereby extending the crop of communities to which a young person may belong. The popularity of multiplayer online gaming has made it a topic of interest as a structure for online learning (this is the philosophy behind the *Mars Founders* project (Appendix D).

Just as interest in gaming has extended into mobile technology and web companies, so product placement by consumer product companies has penetrated the worlds of both stand-alone and online games. "The real and the virtual are co-mingled for Millennials," Novak says. She and others like her are working to extend the understanding of the Millennial cohort to non-game companies and non-traditional gaming groups. The message from the field is that games aren't just for gamers—or game companies—any more.

Maxis and the Sims Online: New Research Tools

Will Wright, inventor of the *Sims* family of interactive media and founder of Maxis, is a tireless student of the players of his games. *Sims Online* boasts a 65% female market share—an unheard-of statistic for the computer game culture. Will

did not set out to make *Sims Online* a female space, but he did intend for the game to be inclusive and to support many kinds of diversity.

Will has invented tools to aid him in his quest to understand his players better and to adjust the game as he learns. He understands that an online game is a living thing, never finished until it's literally taken off the air. He mines various fan sites for examples of games that have been posted—over 50,000 of them—with the player's data and choices embedded in the files. He also scans fan sites that post other forms of *machinema*—narratives from within gaming worlds. He enters his own game in many personae to look around and has formed alliances with various persistent players.

Perhaps the most stunning tools Will has invented are embedded data-collection tools that automatically notice players' actions and preferences. In one example, Will has defined a number of sub-genres of play that correspond to literary genres such as mystery or romance. He crafts his monitoring software to look for clues about a player's genre preferences. When the system sees a pattern beginning to emerge, it can automatically offer more objects and affordances that nudge the player's experience in the direction of their preference. This is an early example of the kind of communal or social intelligence that will be built into multiplayer game engines in the future. For an in-depth view of Will's work, see "SimSmarts: An Interview with Will Wright" in *Design Research: Methods and Perspectives*. [15]

Mars Founders: An Intervention

David Galiel began a project several years ago that was to be an online game about creating a new society on Mars. He named his company Planetary Arts and set about gathering a team and raising money, but the venture community didn't deliver as the dot-com bubble burst. Without going into bloody details, David spent some time rethinking his mission and asking himself some hard questions. The result was PIECORP—Public Interest Entertainment Corporation, a nonprofit entity devoted to a larger vision of developing open-source tools for using the immersive potential of computer games to create large-scale, engaging, and constructive online environments.

Mars Founders (Appendix D) is the first step in the PIECORP project. The project relies upon a novel approach to design research that involves the use of an online community to engage in a kind of speculative fiction—a discussion group to fantasize together about what the *Mars First!* world would be like, what sorts of things people would do in it, and what would make it persistently engaging. A group of 90 potential players that reflects an optimal mix of teen segments will be recruited through various websites, bulletin boards, and other community venues. Moderators will

guide and observe the discussion group. A group of 10-12 representative contributors will be recruited for ethnographic study consisting of interviews and home visits.

At the conclusion of the *Mars Founders* research project, data and findings will be published in the public domain for all to use. Specifications for the online environment and play infrastructure will be generated from the findings. These will form the foundation of the second phase of the project, the "MiniMars" Simulation, which will utilize an existing multiplayer 3D graphical game engine. The third stage of the project, *Mars First!*, will be a seamless, continuous, persistent 3D virtual world, simulating a future human civilization on Mars. At all stages, data, analayses, principles, systems, tools, and technologies that are generated will be released into the public domain.

The PIECORP mission is an example of a thoughtful, well-staged, sustained effort to make a difference in the landscape of online interactive media for youth. The creators of Mars First! will investigate existing science and civics curricula in middle and high school to guide the production of content and affordances that will help players learn lessons that are deemed important by their schools as well. The first requirement, however, is to learn as much as possible about what will make the *Mars First!* world fun and engaging enough to evoke sustained involvement by young players.

DESIGN HEURISTICS

In the following section, I will provide examples of various types of design heuristics that deal with the design of interactive media for young people, with special emphasis on the objective of informal learning.

General Heuristics for Interactive Experiences for Youth

In their report "Designing Digital Experiences for Youth" (see Appendix F), Cheskin provides the following general design heuristics for digital experiences targeted at the youth market:

– **create a sense of fun and spontaneity**
– **provide personalization**
– **incorporate fashion elements into design**
– **promote connectivity—make it mobile**
– **include creative tools (i.e., create custom music/movies, clothing, etc.)**

In addition to these Cheskin's core heuristics, a few other principles emerge from Cheskin's and my own research over the years.

- **establish personal relevance**
- **incorporate existing social practice**
- **connect to popular culture**
- **create affordances for fan activity**
- **allow for significant interaction**
- **provide for transgressive play**
- **avoid serious consequences**

Personal relevance cannot be over-estimated in importance. Not accidentally, this is also a crucial design heuristic for learning materials. How does this activity, content, or outcome intersect with the personal life of the user? Does it enhance self-esteem or social status? Does it stimulate creativity or support self-representation? Very often, students tell me that they lack interest in many of their classes because the subject matter literally has nothing to do with them. In these cases—often revolving around mathematics, history, or science—neither the teacher nor the text has made the case for why a particular kind of knowledge matters. Narrative and storytelling are often key components of establishing personal relevance. Our favorite teachers are often those we remember for the stories they told about their own connections with their subject matter or about how knowing a particular thing could make a difference in someone's life. Detail and personal connection are key.

Existing social practices make excellent springboards for new inventions; for example, the existing practices of dating and seeking people with common interests have fueled online dating services and affiliation systems like *Friendster* and *Linkedin*. Interestingly, the technology-based versions of these activities admit of more complex or heretofore impossible social topologies. Another example, political advertising and campaigning, has fed the emergence of new social topologies in systems like *Moveon.org*. Kids' practices such as collecting, trading, and sharing artifacts have been captured and amplified by a variety of computer games, websites, and mobile technologies.

Popular culture is the sea in which young people swim. They know more about movies, actors, music, athletes, and other brands than most adults can fathom. In fact, one way of looking at a young person's identity construction is as a collage of brands, where "brand" may mean affiliation with a particular musical group (e.g. Spearhead), a film or fiction world (e.g., Lord of the Rings), or a manufacturer of clothing, shoes, or even sporting equipment. Looking at the brand clusters that are chosen by specific young people give us great insights into the teen segment to

which they belong and the sort of construction they wish to project to their peers (and to adults). A young person would typically be hard-pressed to provide a description of himself or herself without including several references to names or brands that exist in popular culture.

Fan activity goes along with popular culture as a kind of rallying point for young people. Dr. Henry Jenkins, chair of the Comparative Media Studies Program at MIT, has studied and written extensively about fan culture. In his books *Science Fiction Audiences: Watching Star Trek and Doctor Who* [16] and *Textual Poachers: Television Fans and Participatory Culture* [17], Jenkins explains that the central activity of a fan is to appropriate characters, settings, and other aspects of entertainment properties and repurpose them to create personal relevance and meaning. Fan fiction is one of the more visible artifacts of fan culture. In order to create a property that is fan-friendly, it must be possible for fans to appropriate materials—legally or otherwise—and to find ways to affiliate with one another around the artifacts they create. The web has given a terrific boost to fan communities by making both affordances much more widely and easily available. Games and activities that encourage such "fannish" appropriation and affiliation strengthen their attractiveness to their audiences.

Significant interaction is a term I coined while working on *Computers as Theatre* [18], a book of theory about interaction design that is still in print today. In the days before game consoles or personal computers, what people experienced as "interactivity" in their lives consisted in things like turning light switches on and off or changing the TV channel. The idea that one could make a choice that would change the outcome of a story, for example, was unthinkable. Early game and interaction design pioneers were working in uncharted waters as they hatched the first play patterns and game controllers. Today, people expect a great deal of interactivity, especially from technology. Hard-wired choices are not as good as choices you cook up yourself; for example, a list of stored telephone numbers would be irritating if the manufacturer had created slots for "mom", "husband", or "best friend." People want to make up their own categories or to use no categories at all, but other idiosyncratic methods of organizing their data. Likewise, the "branching tree" structure of early games is generally experienced as inferior to the more open-ended play afforded by multiplayer games, where much of the interactivity comes from the relatively unpredictable behavior of other players. In education, students are very often faced with insignificant choices—filling in the blank or performing a carefully prescribed activity. More significant interaction means greater latitude in choice-making and greater potential for making a difference. As one interaction designer, Meg Withgott, puts it, "the best interactive designs are very *un*-done—because the user completes them" [19].

Transgressive play allows a person to be a little bit naughty. In his book *Rules of Play: Game Design Fundamentals* (co-authored with Katie Salen) [20], Eric Zimmerman reminds us of the value of transgression as an element of many forms of play. His online game "Sissyfight", for example, allows players to assume the roles of school-girls who fight with one another by teasing, shunning, sulking, and other bad behaviors. Zimmerman and others suggest that transgression (within bounds) feeds the sense of personal agency and allows a young person to "own" a game or activity in the sense that adults might not entirely approve of it. Transgressive play is a special sauce not to be used with every dish, but it often spices up activities that would otherwise feel too safe to be fun.

The absence of serious consequences is one of the most important qualities that distinguishes play from other sorts of activity. In this way, play is to action as comedy is to drama. Theorist Henri Bergson postulated that things are only "funny" if there is no real harm depicted (e.g., the man who slips on the banana peel gets up). [21] The Playtime studies conducted by Interval Research and Cheskin (1993-95, unpublished) confirmed that kids see the absence of serious consequences as crucial to the sense of play. The kinds of play where this principle dances closest to the edge are in highly competitive activities like team sports, where winning and losing can have serious personal and social consequences unless the rhetoric of "good sportsmanship" wins out. This heuristic is important in the domain of informal learning if we see playfulness as part of what would engage a person in a non-mandatory activity. It suggests, for example, that a student's success with a learning "game" should not be used for grading purposes.

Design Heuristics for Millennials

Based upon my own secondary and primary research as well as my interview with Jeannie Novak, the following design heuristics specifically address the Millennial cohort.

– **provide for collaboration**
– **support multiple communities**
– **facilitate user-created media**
– **avoid outdated stereotypes based on gender, race or culture**
– **optimize for positive social interaction**

Collaboration is one of the hallmarks of the Millennial cohort. They are far more comfortable with it than the Gen-X gamers of yore. In fact, individual competition may be viewed more sternly as anti-social behavior by this group.

Multiple social networks and communities are a hallmark of the Millennial cohort's lifelong experience with email, the web, instant messaging, and SMS—i.e., the omnipresent "buddy lists". Their technology supports the construction of multiple social networks centered around various aspects of life (e.g., homework, sports, movies, cliques)—a trick that is harder to master in the real world of school-age social relationships. Designers might be uncomfortable with the seeming chaos and complexity of a teen's social structures, but it is a way of life for the Millennial audience. Failure to support it is likely to diminish the attractiveness of a technology or computer-mediated activity for this group.

User-created media is a central activity for the Millennial cohort. Mixes, photo collages, and increasingly movies become artifacts that help a teen to position themselves within their culture. These artifacts are critical pieces of the Millennial teen's identity construction, not only in terms of personal satisfaction, but also in terms of one's social credentials. Expertise in user-created media is aspirational.

Stereotypic portrayals of gender, race or culture are likely to smack of inauthenticity to the Millennial cohort because they do not accurately represent experienced life or popular media. Television has played a major role in reducing racial stereotyping and promoting mixed-race culture. Rapidly growing immigrant populations in large cities also tend to "mix it up" much more for the Millennial child than for the Boomer teen. Mixed-race identity and style is currently aspirational in this group.

Positive social interaction goes along with the collaborative behavior of the Millennial cohort. "Playing well with others" is a message that has evidently gotten through to them (with obvious exceptions such as urban gangs and other isolator subcultures). Milllennials have been entrained by their life experience to express and to expect more positive social behaviors, and antisocial or overly competitive behaviors are relatively more bizarre to them than to older generations.

Design Principles Related to Gender

The Playtime and Purple Moon research activities in which I participated took an exhaustive look at the issues surrounding gender, technology, and play. While these findings were produced between 1993 and 1996, subsequent research activities by myself and my students (as well as by Cheskin) suggest that they are still valid. The following principles take the form of statements of difference. As with all of the heuristics and principles in this section, these are based on averages. Especially in the realm of gender difference, by many social and biological measures, the distance between the peaks of the bell curves for boys and girls are closer

together than the ends of the individual curve for either gender—in other words, the average girl and the average boy have more in common than the girls or boys at opposite ends of the curve describing qualities as diverse as athletic ability and Stanford-Binet scores. What we are really talking about are overlapping Gaussian distributions. Given that caveat, the reader may find some value in these general statements of difference. They can be used to tailor products for boys, for girls, or for both groups.

Technology

– **Girls and boys tend to feel that game consoles are for boys while computers and mobile devices are for everybody.**

Computer Games

– **Boys place high value on speed and action, while girls place high value on character and story.**

– **Boys tend to like "superhero" characters, while girls tend to like characters with whom they can identify** (another way to say this is, somebody I might have a conversation with). Note that *Anime* and *Manga* forms, currently in vogue with teen and tween girls, tend to have superhero-type characters; however, the characters are typically kids as opposed to the adult Marvel-type hero.

– **Boys value winning or having achieved a high score, while girls tend to value exploration and experience.**

– **Boys will typically tolerate steeper and longer learning curves than girls.** Girls tend to need quick feedback and the ability to "do something" in a game in order to stay engaged.

The following finding comes from a recently conducted study by Carrie Heeter and colleagues at Michigan State University, funded by NSF to look at gender differences in interest in space exploration and in the kinds of space pioneer games male and female fifth and eight graders envision. At a space camp last summer, kids designed computer games to teach other kids about being astronauts.

– **All but one of the games designed by girls were judged by all of the kids to be "for anyone" while the majority of the games designed by boys were judged to be "for boys."**

This is a provocative finding that will require a great deal of investigation before it is fully understood. The Space Pioneer Learning Adventure project is still in the beginning stages of interpreting their findings. In the meantime, Dr. Heeter's proposal for a next step, entitled *Alien Games*, is attached in Appendix E. She is currently seeking funding to begin this project.

Brain-Based Differences of Note

These findings are based in part upon the research of Dr. Doreen Kimura. [22]

- **Girls tend to perform less well than boys in activities involving mental rotation when under time pressure.** When time pressure is not a factor, performance tends to equalize.

- **Girls tend to rely more than boys on landmarks for navigation.**

- **Girls tend to navigate in more body-centric ways than boys.**

This latter finding is fundamentally related to the first two. Girls and women, when giving directions, are more likely to turn their bodies to indicate directions in which someone would travel and are likewise more likely to rotate maps so that the direction they are heading is "forward" or "up." In the case of mental rotation, girls are more likely to imagine themselves in a different position in relation to the object than to imagine the object moving around. The reliance upon landmarks comes from direct sensory experience. All of these findings suggest that girls are more "embodied" when thinking about navigation and rotation. On an interesting side note, the side-scrolling games of yore required both a mental rotation (in order to utilize body-centric navigation strategies) and a translation from the plane of the keyboard to the plane of the screen. This suggests that the canonical form of videogames contained a fundamental gender bias.

Social Relationships and Social Status

- **In same-sex peer groups, boys tend to establish social status through explicit competition with direct measures** (e.g., sports, special expertise).

- **In same-sex peer groups, girls tend to establish social status through affiliation and exclusion**. Competition, while present, tends to be covert.

Both boys and girls use both social methods, but overt competition tends to be judged negatively by girls, while boys tend to find the webs of affiliation and exclusion to be bewilderingly complex.

Differences Related to Play

- **Both boys and girls favor constructive play; however, boys' constructive play tends to be more physical and girls' constructive play tends to be more narrative.**

- **Forms of play are likely to be gendered.**

Some forms of play tend to be acceptable for both boys and girls of the same ages (e.g., tag); some forms tend to be acceptable for boys at one age and for girls at another (e.g., tetherball); and some forms tend to be acceptable only to boys (e.g., playing with trucks) or to girls (e.g., clapping games).

Conclusions

I hope that the foregoing sections and the appendices will give the reader a better understanding of the nature of design research, the state of research as historically and currently conducted in the computer game industry, and the sorts of design heuristics and principles that can guide designers in tailoring interactive media according to social segmentation, age, gender, attitudes toward technology, and play preferences. I have foregrounded the Mars Founders project and the Alien Games project as research initiatives that would advance the Macarthur Foundation's agenda in deploying research funding to bring about positive change in the domain of informal learning for kids with technology.

While I am no expert in terms of policy considerations, I would offer the observation that the most attractive interactive learning tools have traditionally made their way into the classroom by way of the consumer market. Adoption policies and the vicissitudes of particular curricula—especially now that testing plays a much greater role in curriculum design—make it very difficult to design interactive media that will please both kids and school administrators. However, if an interactive system or product achieves popularity among kids outside of school and can also be seen as a learning tool by teachers, it is more likely to make its way into the classroom through an informal route. Certainly it is possible to create companion materials for teachers to promote and

facilitate the use of informal learning materials in classrooms. In my view, this is a big part of the agenda if we are to create learning materials that also feed into the school environment.

At the end of the day, every kid comes into the world wired to be curious, playful, social, and purposeful. In the past, these characteristics have been exploited by consumer product companies purely for profit. Rhetoric about developmental or educational value is part of the marketing but very rarely part of the design research for toys, games, and personal technologies. With the help of the Macarthur Foundation and other such institutions, creative individuals and groups devoted to the well-being and development of young people can be freed from the tyranny of the bottom line—at least long enough to create viable proofs of concept. As a veteran of the computer game industry and a career-long crusader for pro-social values in interactive media, I have seen many worthy attempts die long before the seeds were able to sprout. I look forward to the planting of new seeds and hope to see at least some of them grow and bloom in my lifetime.

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APPENDIX A

"Narrative Construction as Play"
by Brenda Laurel
Interactions Magazine
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Forthcoming, September 2004

Narrative Construction as Play

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Narrative construction as a kind of play is highly underrated in the design of interactive media. I began to uncover evidence of this during my dissertation research. That quest led to my first book, *Computers as Theatre* [2]. I learned more about the powers of narrative construction from the research on gender and play that I conducted between 1992 and 1996 at Interval Research.

In academic taxonomies of play, "constructive play" is most often framed as play that utilizes objects (real or virtual) to construct other objects, mechanisms, or environments. When defined in this way, constructive play is predominately engaged in by boys. But when you include *stories* as something that may be constructed, you find that girls engage in constructive play with at least the same frequency and relish.

My research at Interval led to the founding of Purple Moon (a transmedia company for girls) in 1996. As we set about to discover or invent computer games that would be attractive to girls, we were tempted, at first, to look at what girls thought of existing games. We did explore that path, but it gave us limited results simply because most girls were not playing computer games at the time and there were few examples of games that they really liked, (Nintendo's *Mario* games and *Ecco the Dolphin* were the favorites). By far the more fruitful research approach was our exploration of how girls play in general. Through interviews with over 1,000 children, our research indicated that narrative construction was the largest category of play for girls ages eight to12. Stories were made up about existing narratives or from whole cloth. Stories could be told, written, drawn, theatrically performed, or improvised. How can this finding be translated into computer-based game-play?

First and foremost, materials for narrative construction take the form of characters—characters that are drawn with enough depth and potential to engage the player in imaginative construction of their motivations and thought processes. In other words, players should be enticed and enabled to create the backstory for characters that appear in the action of the game. During the course of our research, we queried girls about games that were popular at the time. In the context of the videogame *X-Men*, one subject (a 12-year-old girl) complained that "these characters are so boring you can't even *make up* stories about them." The history of the audience for the *X-Men* property is relevant in this context. As a comic book series, the characters had plenty of narrative potential, but the medium of comic books was culturally gendered. As a result, girls were not a significant audience for the property. In its videogame incarnation, *X-Men* characters were stripped of most of their narrative qualities and placed in a flat action context. Both the game genre and the character construction discouraged female participation. But when the property was transformed into a film, the

characters and backstory elements were plumped up to the point that girls formed a significant segment of the audience and fan community.

A similar story can be told about the *Star Trek* franchise. Almost from the beginning, females dominated the fan community, creating fanzines and slash videos galore [3]. Beginning as a geek-centric TV series that was explicitly pitched to males, *Star Trek* garnered a passionate female following primarily because of its social content. Through the lives of the various feature films and follow-on series as well as the hundreds of paperback books, Paramount slowly but surely recognized and responded to the gender makeup of its audience by morphing the genre from science fiction adventure to a soap opera in space.

That is *not* a slam—as a die-hard *Star Trek* fan myself, I have appreciated the transition toward stories that have more to do with characters and relationships than dogfights in space. As Jenkins' analysis shows, the heart of fan culture is the ability to relate to, appropriate, and repurpose characters and story materials in order to create personal meaning. Fan behavior provides an excellent example of narrative construction as play.

In the Purple Moon products (the *Rockett* and *Secret Paths* series of games), we concentrated on creating affordances for narrative play. We developed characters based on research of girls' descriptions of their own friends and foes, finding reliable patterns in our data that corresponded to character types. We modeled affiliation and exclusionary behavior and other social dynamics of our audiences in the structure of the game. Our research with our audience led us to develop a gameplay pattern we called "emotional navigation," where choices were made by the player in emotional rather than operational terms.

To encourage backstory creation, we populated the games with clues about the characters' inner lives, family situations, and histories by exposing journals, collections, and flashbacks. We gave our audience a publishing venue for their backstory constructions on our Web site. Girls played with the characters through contributions to the "school" newspaper, yearbook, journals, and bulletin boards. We learned Henry Jenkins' lessons well and made an environment that was all about supporting the sorts of things that fan communities do. The result was a site that beat disney.com for several months running in terms of both unique users and dwell-time per log-in. Although the site was closed down by Mattel after their acquisition of the company in 1999, I still get email every week or so from a fan who wants to know when the site will come up again. Boy, did Mattel miss the boat.

With the emergence of massively multiplayer online games like *Ultima Online* and *Everquest* we begin to recognize the construction of characters, habitats, social relationships, and economies as flavors of constructive play. These play patterns have made girls and women a reliable segment of players in the adventure and role-playing genres from the beginning of the computer game era. It is this sort of constructive play that invites women and girls to join the computer-game party. Will Wright's recognition of these important play patterns has resulted in a 65 percent female player demographic for *Sims Online*. As Will describes in his interview in *Design Research: Methods and Perspectives* [1],

aggressively incorporating female-inclusive play patterns has led to better game experiences for players in general.

Of course, games are not the only computer-based spaces in which narrative construction occurs! All but the most procedural activities can be seen to have a narrative arc. To re-cast the central observation of *Computers as Theatre*, good experience design provides affordances for narrative construction of a particular type: a story of a successful or delightful action with a beginning, middle and end, where the interactor is typically the central character.

In order to construct a good narrative about an interactive experience, causes and effects cannot be opaque. This does not mean that the process needs to be "transparent" in the sense of faithfully representing the operations of an application or a game; it may simply mean that serviceable representations of those operations are available. Nor does it mean that every story must be a success story; the story of a Google search that yields bizarre results can be a comic masterpiece. But it's only funny, like the man slipping on the banana, if no real damage or injury results. The sense of play, like comedy, depends upon the absence of potential harm.

Narrative construction is a wonderful research tool and benchmark as well. I was recently involved in consulting for a group that is designing a middle-school science curriculum in an online environment. They asked me if I could point to gameplay patterns that would enhance a student's enjoyment of online science activities. I suggested that they take a step back and ask students to tell them stories about their most delightful moments in learning about science. Forcing a gameplay pattern into an educational activity is dicey, precisely because the student/player knows that there is real risk involved—the risk of failure. Modeling a happy experience with science learning takes the student away from the world of tests and grades and back into the world of wonder and discovery. Designing online experiences that would prompt students to construct narratives filled with delight would be a mark of real design success.

As Mike Mateas and Phoebe Sengers point out in their book *Narrative Intelligence* [4], we understand the world largely through narrative construction. Researchers from Roger Shank to Jerome Bruner support this view. Story-making is a pleasurable activity because in a very deep way, we look at the world with storytelling brains. The designer of interactive systems should take our narrative predisposition into account in the same way that the designer of physical tools makes affordances for our opposable thumbs.

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APPENDIX B

"A Narrative Approach to Simulation Design"
Unpublished Project Proposal for Apple Vivarium
by Brenda Laurel and Rachel Strickland
December 1990

A Narrative Approach to Simulation Design

Brenda Laurel and Rachel Strickland
12 December 1990

> "Sometimes," said Arkady, "I'll be driving my 'old men' through the desert, and we'll come to a ridge of sandhills, and suddenly they'll start singing. 'What are you mob singing?' I'll ask, and they'll say, 'Singing up the country, boss. Makes the country come up quicker.'"
>
> Bruce Chatwin, *The Songlines*

Introduction

This paper proposes a research project focused on discovering ways in which people's knowledge about making stories might help them to conceptualize, build, and interpret computer simulations. Although many of our recommendations will likely not be implementable in Playground as it currently exists, we are adopting the constraints of the Playground programming language in order to force a bottom-up perspective on the problem of simulation design. Hopefully, the results of this project will be useful in the design of successors to Playground as well.

A narrative approach to simulation may be employed for any or all of the following purposes:

- to facilitate the process of authoring dramatically interesting simulations,

- to enrich the interpretation of simulations,

- to provide a familiar basis upon which to build an understanding of the simulation medium, and

- to use simulation as a way to expand people's understanding of the various forms, potentials, and powers of narrative arts.

Our approach presupposes an emphasis on the simulation itself — its content and generativity — rather than an emphasis on computer literacy, hence the drift may be appropriate for some educational purposes and not for others. Beyond its specific relevance to Playground, this project may provide information and insights for the design of interactive simulations in general. Interactivity and user-programmability are closely related concepts. The difference between them is contextual; that is, interaction ideally occurs in the context of the simulation itself, while programming occurs in the context of the computer. The effectiveness of many simulation-based applications (in entertainment or

learning, for example) depends upon a person's ability to become and remain immersed in the simulation world. Such applications are akin to drama in that they seem to entail a 'willing suspension of disbelief.' This crucial mindset is seriously undermined by explicit meta-level transactions with the system (parallel in some ways to 'the man behind the curtain). In simulation-based applications, a narrative approach may form a bridge between user-programmability and first-person interaction.

Story Sensibilities and Knowledge about Narrative

Certain leverage may be gained by employing story-oriented terminology in place of computer-oriented words and concepts in the design and construction of simulations; for instance, *character* for *player* and *trait* for *agent*. However, direct mapping of sophisticated narrative or dramatic theory onto the lexicon, syntax, and style of a programming language would probably contribute excess baggage unless those theoretical concepts were a natural part of the way ordinary people commonly think about stories. An initial task is to identify a set of basic story sensibilities that are either part of people's naive understanding of how stories work, or which can be intuitively grasped once they have been acknowledged and defined.

In order to determine how and when narrative techniques can be effectively employed, we need first to identify the activities involved in simulation-building. Initially, we have described those activities in terms of three overlapping or simultaneous processes: concept development, design and construction, and interpretation.

Concept Development

In Playground, people begin by encountering a blank screen and a programming environment. People may already have ideas about the content domain of the simulation they want to build. They may also begin by defining the task as 'making certain things happen,' but the constraints of the programming environment necessitate that the task be reconceptualized as the design of players (characters) who have the potential to produce such actions — a bottom-up process that has parallels in both storymaking and playwriting. Generating potential rather than a linear plot changes the procedures of design and construction and how the author thinks about them. We have learned from narrative and dramatic theory and technique, as well as from our direct observations of people creating and telling stories, that the process of designing and thinking through potential is in fact at the heart of storymaking. But when a simulation rather than a finished story is the desired result, the requirement of generativity gives the construction and orchestration of potential a sense which is far more dynamic, complex, and elusive. Paley observes that designing potential

(that is, stories that can turn out in different ways) has interesting implications in the realm of personal power and control:

> Since the children invent the premises, they can push further and further toward the logical consequences of their positions. They easily debate such questions as: What happens in a dream? What sort of magic protects the dreaming child? Does the fact that you can imagine different endings to a story mean that you have more control over a story than you do over a dream? But if you tell a story *about* a dream, what sort of control is that?
>
> Vivian Paley, *The Boy Who Would Be a Helicopter*

Narrative techniques can be employed in the concept stage to help people develop characters and conjure up the details of situations in a simulation world. Initial conceptualization may or may not involve the computer. One goal is to develop a narrative approach that will help people to keep track of (and maintain some control over) their ideas. Another is to enable people to use their projective ideas about what might happen to build potentialities into characters and situations. Interestingly, such an approach might employ people's linear concepts of causality and time to bootstrap a process that would transform those concepts themselves.

Design and Construction

The dynamic nature of design in Playground adds another transformational force. Because a person can continue to create and modify characters and situations as a simulation runs, the person's internal sense of time and causality is apt to depart from the mono-chronic perspective which typically frames the execution of preconceived plans. Likewise, the discrete categories of character, place, and time tend to collapse under the influence of Playground's affordances and constraints (and those of simulation in general). For instance, in our work with Playground so far, we have found that thinking of landscape features, environmental forces, and even time as a kinds of *characters* is often the most viable and/or generative strategy, and one which is predisposed by the Playground environment. These revelations relieve some of the stress that is produced when habits of linear thinking collide with the simulation medium.

Interpretation

We understand simulations by constructing stories about what happens in them. An important goal is that interesting material for narrative inference-making result from the way a simulation is conceptualized, designed, and constructed. One approach to meeting this goal is to emphasize story sensibilities having to do with the shape and structure of action itself. A notion of the primacy of action in stories is fairly pervasive, both in common understanding and critical theory. Stories are about things that happen; things happen through the interplay of characters and situations. An idea of what will or might happen defines the set of

potentials from which everything emerges. In storymaking, we embody these potentials in characters and situations to produce action; in understanding stories as we hear, see, or read them, we use the potentials invested in characters and situations to imagine what might happen. The interplay between our dynamically revised projections and what actually happens (or between what we guess and what we find out) is what makes the *experience* of stories engaging and pleasurable.

Certain patterns of action have been identified in the world of drama and narrative as being intrinsically interesting and evocative. These include:

- **conflict**: the most common technique for creating a story — character(s) encounter obstacles in attempts to fulfill particular goals, needs, or desires

- **suspense**: heightened anticipation, on the part of the audience and/or characters in the action, of significant events or actions, with either positive or negative effects

- **discovery**: finding out new information which has not been known (or in some cases, even suspected) before

- **reversal**: a specialized form of discovery in which what happens is contrary to what was expected

- **climax**: the moment at which a character's central need, goal, or desire is definitively achieved or not[1]

Similarly, certain techniques for staging the representation of action have proven quite effective in orchestrating our cognitive and emotional responses to them. These include:

- **exposition**: preliminary action which provides contextual information for interpreting the inciting incident (below)

- **inciting incident**: a turn of events which reveals the central action of the plot; serves to focus projective activities[2]

- **rising action**: action of sufficient duration, usually consisting of the revelation of multiple aspects of conflict, and creating suspense in relation to the climax

We propose to employ these (and possibly other) elements of knowledge about narrative to create a context for conceptualizing and designing simulations. People make inferences about causality on the basis of the represented action; this is the central process of story interpretation. The stories that emerge from

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[1]We have learned in the context of the Oz experiments at Carnegie Mellon University that beginning with a notion of the desired climax for an interactive story is an effective approach to generating multiple 'middles' (storylines). See Laurel [1991] (draft manuscript available).

[2]In Backyard Transformations, Jill Wright and Rachel Strickland describe the inciting incident as "what changes an ordinary day into an extraordinary one."

simulations have an added dimension, especially when the simulations are user-configurable or interactive. The inferences that are made about causality may exist on both or either of two levels: what is going on in the *story* (character, situation, and plot), and what is going on in the *simulation* (the internal representation or code). The author of a simulation builds in cause-and-effect relationships, but causality quickly becomes nonlinear, therefore the creator may also be surprised by outcomes. When the unexpected occurs, the author may wonder what is going on with the code; an external observer is more likely to ask what is going on with the character and/or situation and to come up with novel explanations. A positive result for our efforts would be to enable the author to interpret what happens on both technical and narrative levels.

Knowing the programming language in exhaustive depth and detail doesn't necessarily yield ideas about what to design or build. Also, a person must have some confidence in the code in order to switch to a narrative context for interpretation ("this is not a bug"). Thus, enabling people (including authors) to make narrative interpretations is a primary reason for our decision to pre-design some elements of the simulation world.

Coyote World: A Partially Preconstructed Simulation Context

The relationship between creativity and constraints has been considered by psychologist Rollo May. In his book, *The Courage to Create*, May asserts the need for limitations in creative activities:

> Creativity arises out of the tension between spontaneity and limitations, the latter (like river banks) forcing the spontaneity into the various forms which are essential to the work of art. . . . The significance of limits in art is seen most clearly when we consider the question of form. Form provides the essential boundaries and structure for the creative act [May, 1975].

A system in which people are encouraged to do whatever they want will probably not produce pleasant experiences. When a person is asked to "be creative" with no direction or constraints whatever, May maintains that the result is often a sense of powerlessness or even complete paralysis of the imagination. Limitations — constraints that focus creative efforts — paradoxically increase one's imaginative power by reducing the number of available possibilities. Limitations provide the security net that enables a person to take imaginative leaps:

> Imagination is casting off mooring ropes, taking one's chances that there will be new mooring posts in the vastness ahead. . . . How far can we let our imagination loose? . . . Will we lose the boundaries that enable us to orient ourselves to what we call reality? This again is the problem of form, or stated differently, the awareness of limits [May, 1975].[3]

---

[3]This section is adapted from Laurel [1991].

In the case of Playground, this 'security net' would ideally have the added dimension of increased confidence in the code.

Characters

We set out to identify a particular story universe that could provide a simple but generative context for Playground activities. We considered the world of fairy tales (primarily the Grimm's variety), Australian aboriginal tales, Japanese tales, and Native American tales. We chose the Native American Coyote stories for several reasons:

- **Simple characters and situations**: With the exception of Coyote himself, the characters in Coyote stories have few and simple traits. The plots are correspondingly simple, and involve relatively simple goal-obstacle plot constructs, usually with reversals supplied by trickery.

- **Place as character**: Coyote stories tend to treat the landscape and other spatial elements as animate (character-like), which makes them a good match for Playground implementation. These place-characters are also fairly simple and elemental.

- **The Shadow character**: Coyote stories sometimes feature a type of character that is the 'shadow' of another character. Shadows are liable to stray from their sources and take limited autonomous action while characters are asleep or unconscious. We suspect that Shadow characters may provide an interesting vehicle for helping people to understand the döppelganger aspect of certain Playground agents.

Our preliminary strategy is to pre-construct proto-characters (of both 'critter' and 'place' varieties) that can be expanded and modified by people playing with the simulation.

Places

In Coyote tales, action is deeply influenced by the place or landscape in which it occurs. The nature of characters and their actions evolve as they migrate from place to place. This aspect of the stories suggests the use of multiple playfields to represent different venues for action. Such a strategy would address the 'periscope' problem mentioned in Rachel's paper, "Coyote in the Playground" (attached).

An unusual and evocative characteristic of Coyote World spaces is the variety of ways in which they may be connected. Connections may reflect simple physical

adjacency or they may occur on the level of action — that is, a specific incident, action, or state of being may render certain spaces available to the character(s) irrespective of their Cartesian 'locations.' Linked playfields might also represent different times or points of view on the action that occurs in a single space. Since dynamically linking multiple playfields is not feasible in the current version of Playground, we propose to use the simple technique of cutting and pasting characters in order to move them from one locale to another.

Flexibility and Complexity

In our preliminary attempts to model several simple Coyote characters and narrative situations with Playground, we have discovered some interesting structural issues that should be addressed in the project. One involves an apparent trade-off between flexibility (generativity) and narrative detail. As we set out designing a simulation driven by a Shadow story, we seemed initially to do a good job of incorporating lots of potential — that is, shaping a flexible simulation context that spontaneously suggested a number of possibilities for stories involving Coyote and his Shadow. However, the incremental scripting process proceeded to backfire when we started expanding, embellishing, and amplifying individual incidents or scenes to yield a more vivid approximation of a *particular* story we had in mind; fleshing out the particular story had the effect of turning (constructive) potential into (disabling) complication. A central challenge of the project will be to learn more about the characteristics of this threshold and to accommodate people's desires to 'have it both ways' — to compose a 'movie' while simultaneously building an environment that can generate a variety of interesting scenarios. A strategy we have considered is to distinguish the activities surrounding *creation* of a story world from the *performance* of a particular story.

Off-Line Story Generation with Kindergarten Children

We have found an interesting resource for the project in Brenda's daughter's world. Anna Rainville is a kindergarten teacher in the Lakeside School in Los Gatos. Her educational philosophy and teaching methods are based on experience with Waldorf and British Infant School approaches, and her family has a long and rich theatrical tradition (they also have a narrow-gauge railway surrounding their home, complete with human-scale train station in the back yard, a throne room in the house, and a Greek amphitheatre near the garden). Mrs. Rainville's teaching approach reminds us of Vivian Paley's in her extensive use of storytelling, story-making, and dramatic enactment by the children. Paley has observed:

In Mrs. Rainville's class, every week is framed by a story that she has selected, tailored to the week's curricular objectives (a word or a letter of the alphabet, for example), the seasonal gestalt, key emotional events in individual childrens' lives, and the collective personality of the class. She insists that the children visualize these stories for themselves by drawing pictures. She also encourages the children to dictate stories of their own. The class employs theatrical improvisation, puppets, costumes, scenery, and props, not only in literary pursuits, but also in arithmetic, science, and penmanship.

Native American folklore is one of several wellsprings that Mrs. Rainville's students are exploring. We have proposed to collaborate with her on an off-line experiment involving the children in creating original Coyote stories based on the repertoire of characters and landscapes that they have accumulated from the Coyote stories she tells them. She is extraordinarily receptive to the research issues we expressed, and has influenced our sense of the mission with probing questions and observations of her own.

Mrs. Rainville plans to tell a different Coyote story every week for several months. She believes that the children need to "sleep on it" (and dream about it) for awhile in order to assimilate enough sense of Coyote's world to project their own stories there. She anticipates that the children will be ready for the story-making and enactment in early March (1991).

We will keep in touch with the classroom for the next few months to monitor the impact of the Coyote stories and to learn from Mrs. Rainville's insights. We propose to do a concentrated session with the class in March, when the children will make and act out new Coyote stories based on their familiarity with the Coyote world and characters. We will document these sessions on video. We believe that the results will provide substantial insights for this work.

Project Activities

We propose the following activities for the project:

1. Design of a context for concept development (as described above) that incorporates narrative knowledge and techniques.

2. Prefabrication of a "Proto-Coyote-World" to be used as a context for further simulation development by children and other designers. This will take the form of a set of playfields that can demonstrate the concept. However, because of the kludges that will inevitably be necessary, we do not anticipate that these playfields can be used in the classroom.

3. Design of a context for facilitating narrative interpretation of simulation results.

4. Production of a videotape documenting key aspects of storymaking, as described in the previous section. The results of this work will be incorporated into (1-3) above.

5. With Apple's permission, the videotape and a summary project paper will be presented at CHI '91 on the panel, "Interface and Narrative Arts" in April.

References

Chatwin, Bruce. *The Songlines*. New York: Penguin Books, 1987.

Laurel, Brenda. *Computers as Theatre*. Reading, MA: Addison-Wesley Publishing Company, in press.

May, Rollo. *The Courage to Create*. New York: W. W. Norton and Co., 1975.

Paley, Vivian. *The Boy Who Would Be a Helicopter: The Uses of Storytelling in the Classroom*. Cambridge: Harvard University Press, 1990.

Strickland, Rachel and Jill Wright. "Backyard Transformations: An Interim Project Report." Apple Vivarium Program, December 1989.

Strickland, Rachel. "Coyote in the Playground: Preliminary Notes." Apple Vivarium Program, December 1990.

APPENDIX C

Jeannie Novak Resume

JEANNIE NOVAK
P.O. Box 5458
Santa Monica, CA 90409

310-452-2459 (voice)
jeannie@indiespace.com
jeannie@jeannie.com

PROFESSIONAL EXPERIENCE

Founder & CEO
- *Indiespace (http://indiespace.com).* Santa Monica, CA. Founded in 1994.
- Created and supervised game development, education, web development, technology, marketing and design consulting company servicing game developers, filmmakers, musicians, authors and artists.
- Developed Indiespace Recordings and Indieflicks (monthly film series).
- Business development deals with Fox Interactive (Vivendi Universal Games), GarageGames, Santa Monica Film Festival, Dances With Films, Temecula Valley International Film Festival, Burbank International Childrens Film Festival, A&M Records/PolyGram, TVnet, France Online, Sony, and Getty Center for Education.

Lead Author / Series Editor
- *Game Development Essentials*. Lead author and series editor. Thomson/Delmar. 2004.
- "MMOGs as Online Distance Learning Applications." USC Teaching Learning & Technology Conference. 2003.
- *Creating Internet Entertainment, Maintaining & Updating Dynamic Web Sites* and *Producing Live Webcasts.* John Wiley & Sons/Wiley Technical Books. 1995-1998.
- Articles & columns for technology publications such as *Computer Currents* & *Internet World Magazine*. 1994-present.

Event Chair, Workshop Producer & Speaker (sample engagements; complete list upon request):
- The Art, Business & Technology of Composing Music for Games. *Film Music Network*. Universal City, CA. 2004.
- Game Music Seminar. *Los Angeles Music Productions*. West Hollywood, CA. 2004.
- MMOGs & Online Distance Learning. Teaching, Learning & Technology Conference. *USC*. Los Angeles, CA. 2003.
- Game Development Workshop; Online Multiplayer Game Design. (Workshop Development, Speaker & Advisory Board). *Macworld Expo*. San Francisco, CA & New York, NY. 2001-2004.
- Internet Entertainment Expo (Chair & Planning Committee). *IDG*, 2000.
- Internet Commerce Expo (Advisory Board & Speaker). 2000.
- Internet Panel of Experts. *CalTech/MIT Enterprise Forum*. Pasadena, CA. 1996 & 1999.
- Future of Entertainment – seminars on games, film, and music. *Indiespace*. Santa Monica, CA. 1994-present.

College Instructor / Course Development & Administration
- *UCLA Extension:* Course Development, Game Industry Series. Instructor: Careers in the Game Industry, Story Development for Games, Project Management for Games, Industry Convergence – Film, TV & Games, Music for Games (Los Angeles, CA. 2001-present).
- *Art Institute Online*: Subject Matter Expert, Game Art & Design Program. Course Author: Game Interface Design, History of Popular Culture. Instructor: Game Development Workshop, Introduction to Game Development, Story Development for Games (2003-present).
- *Santa Monica College/Academy of Entertainment & Technology:* Course Development, Game Certificate Program & Game Project Management Track. Instructor: Introduction to Game Development, Principles of Project Management, E-Business Usability, Models, Marketing, and Infrastructure. (Santa Monica, CA; 2001-present).
- *Art Center College of Design:* Course Development.   Game Visualization (2004-present).
- *Art Institute of California – Los Angeles:* Interactive Game Design, Information Design, Marketing (2001-present). Academic Chair: Interactive Design, Internet Marketing & Advertising, Video Production (Santa Monica, CA; 2001).

AWARDS/ACHIEVEMENTS/AFFILIATIONS
- Panelist, MMOG Award, *Academy of Interactive Arts & Sciences* (2003-04).
- Cover stories in *Los Angeles Times Calendar, The Zone News, My Business Magazine, San Diego Union, Boston Globe, Village Voice;* television coverage on *CNN* and *Sundance Channel.*
- Finalist, Interactive Digital Entertainment Award (IDEA) for Industry Achievement (2000).
- *MicroTimes '100 Most Influential People in High Technology'* (1996).
- Finalist (1995) & Judge (1996-97), Global Information Infrastructure awards.
- Member: International Game Developers Association (IGDA); Association of Internet Professionals; Independent Feature Project/West; LA Women in Music; Women in Film.
- Composer, performer, recording artist & music supervisor. Credits available upon request.

EDUCATION
MA, Communication Management. *University of Southern California (USC).* 2003.
Areas of Study: Game Development, Interactive Design, Collaborative Technologies, Marketing.
Awards & Honors: Graduate teaching assistantship (lecturer); College Honors.
Thesis: Games as Online Distance Learning Applications.

BA, Mass Communications. *University of California, Los Angeles (UCLA).* 1992.
Areas of Study: Human-Computer Communication, Education, Interface Design, Linguistics & Cognitive Science.
Awards & Honors: Summa Cum Laude; Phi Beta Kappa;
Thesis: Gender Role Representation in Toy Commercials.

APPENDIX D

Mars Founders Proposal
David Galiel
Public Interest Entertainment Corporation
August 2004
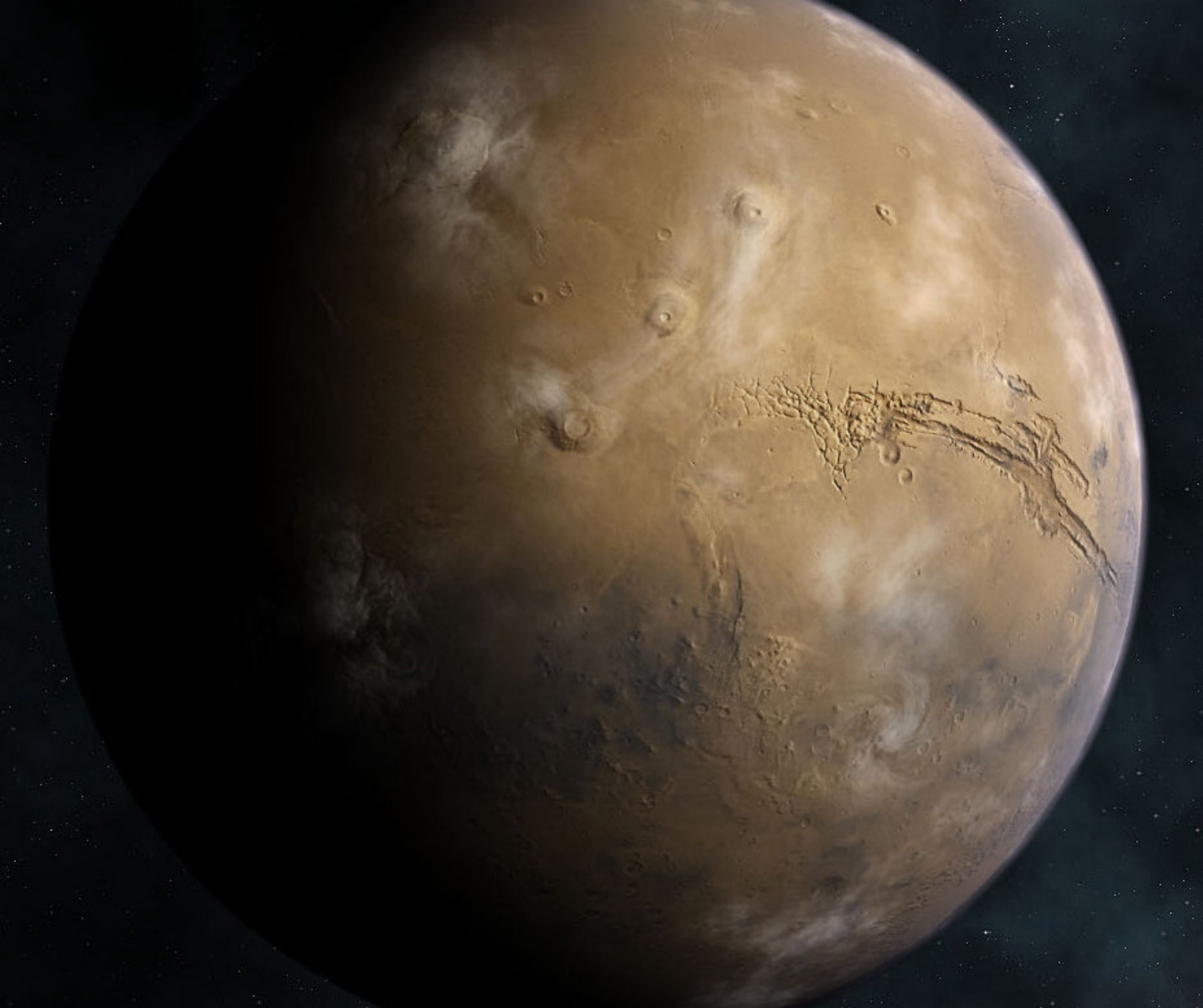
Proposal for

MARS FOUNDERS
An Online Community Research Project

David Galiel, Project Director
Brenda Laurel, Research Analyst

Public Interest Entertainment Corporation
http://www.piecorp.org/
Email: pie@galiel.com

Public Interest Entertainment Corporation (PIECORP) is a nonprofit creative studio
using popular culture and digital entertainment technologies to promote
civil society, non-violent conflict resolution and critical thinking.

The quality of life in the future will depend on the quality of our thinking.

Edward deBono,
"Future Positive"

Preface

The *Mars First!* Virtual World Project is a **three-phase,** non-profit research and development project of PIECORP, Public Interest Entertainment Corporation.

The Project seeks to answer the question: ***What do citizens need to enable sustainable, constructive democratic society?*** In particular, what do participants in online communities need, and what do citizens in the real-world need from their online interactions?

The Project's ultimate goal is the creation of a large-scale, self-sustaining, socially-constructive, online virtual world—and the development of generalized means to support democratic institutions, empower citizens, promote critical thinking and facilitate civil society online.

Mars First! uses the immersive, engaging and entertaining medium of *multiplayer online virtual-reality games,* to create the space for participatory exploration of the nature of civil society. Large-scale virtual-reality game environments provide three primary advantages:

1) They provide the *technological infrastructure* to support very large scale participation, allowing hundreds of thousands and even millions of simultaneous participants to interact and share experiences in "real-time". They are, at present, the only practical environment to safely explore the complexities of large-scale human societies.
2) Online game-worlds provide the *necessary suspension of disbelief* and *immersive narrative* that allows participants to "buy-in" to the premise that exploration of new, constructive ways for social organization is possible and necessary—in this case, in order to form a new human society on Mars.
3) Online games are *fun and lower resistance to being "taught."* Properly designed, online multiplayer games efficiently create the type of *"flow state" most conducive to learning* and exploring new ideas that is difficult to reproduce reliably and consistently in other media.

As a first step in creating the proper environment to facilitate experiential learning of civil society, we propose to explore, with a sample of prospective participants in *Mars First!,* what kind of online experiences, narrative and virtual environment they would find most immersive, engaging and fun.

This first step is the "**Mars Founders" Online Community Research Project.** It is the focus of this proposal.

MARS FOUNDERS
Online Community Research Project

Demographic: **Diverse teen, age 13-18**
Duration: **Five months (one-month design & development, three months running, and one-month analysis and report)**
Budget: **US $88,500**

In order to create an immersive and engaging environment to facilitate experiential learning, PIECORP proposes to ask prospective participants what they want to experience in a socially-constructive virtual world.

To accomplish this, we will use an open source Community Management System (CMS) to support constructive discussion, opinion-gathering and decision-making among a sample of 90 socio-politically diverse participants. *(A CMS is a development platform that affords the integration of discussion boards, email lists, weblogs, ad-hoc topical group discussions, and other forms of many-to-many, one-to-many and one-to-one conversations.)* The participants will engage in guided discussions to explore the basic rules and principles of a simulated society on Mars in the later half of this century and the type of experience they would like to have in the virtual world.

The project will be targeted towards teenage participants, age 13-18.
To encourage participation for the duration of the project, incentives valued at $25 will be offered to each subject.

The community management system will support opt-in (consensual) gathering of demographic and psychographic information, the tabulation of data, collection of activity logs and questionnaire responses. The aggregate research will be augmented by ethnographic study, consisting of interviews and home visits, of 8-12 individuals recruited from among the participants.

The Mars Founders project will take place over the course of five months (one month design and development, three months of active guided discussion, and a final month of data analysis and reporting), with an overall budget of US$88,500. The community tools developed during the course of Mars Founders will released for free public use and will be incorporated into the following phases of the *Mars First!* Virtual World Project, so that the investment in each phase will support and correspondingly reduce the costs of the overall development of *Mars First!*

Participation will be solicited via online notices in public discussion forums which tend to attract young people with a variety of political interests, social concerns, intellectual curiosity and constructive intent. The nature of this project requires that participants self-select, but controls will be implemented to ensure sufficient diversity to derive meaningful results.

"Perhaps instead of revolution through violence, or art, or music, or culture, maybe we could live to see a revolution through institutional design...?"
"Sayke", pseudonymous creator of *"Liquid Democracy"*

The context for the community discussion will be, essentially, the following narrative:

You have been selected to be one of the founders of a new human civilization on Mars in the latter half of this century. If you accept this assignment, you will work with the other Mars Founders to create the society you want to live in and design the experience you want to have.

Then, you will help build it. And, live it.

The outcomes will be translated into a series of essential capabilities, or "affordance" specifications. These specifications will then be generalized and implemented as a set of principles, operational recommendations, systems, tools and technologies to empower civic society in online communities (for example, user-friendly, secure voting systems for online societies and strongly constructive discussion systems for civil conflict resolution), and to support online expressions of civic society in the "real world" (for example, a robust electronic referendum system for municipal use, an efficient commenting tool for citizens, or a system supporting a virtual Constitutional Convention).

PIECORP will use existing Open-Source platforms and applications wherever available, and will release all original PIECORP-developed tools and technologies, as well as the entire record of this project, for free public use under Creative Commons, Open Source, and/or Public Domain licenses.

The lessons learned from the Mars Founders research project will be applied to the next phase of the overall development project: "MiniMars" a small-scale, duplicable, virtual world environment, where participants can apply the principles and use the systems that support democratic society, as "citizens" of a pioneering community, within the context of an immersive, fun, "virtual Mars". In turn, the lessons learned, as well as the tools and technologies developed in this phase, will be used for the creation final phase, the ultimate goal of this project: *Mars First!,* a fully-realized, large-scale, online virtual world, simulating a new human civilization on Mars in the future.

All intellectual property developed during this project, including data, findings, systems, tools and technologies, will released for free public use under Open Source, Creative Commons, and/or Public Domain licenses, as appropriate.

APPENDIX A

Summary Budget for "Mars Founders" Online Community Research Project

	First Month	Monthly Cost (for 3 months)	Final Month
	Design & Develop	*Implement Community*	*Analyze & Report*
Personnel			
Galiel - Project Director	$ 6,000	$ 6,000	$ 6,000
Laurel - Research Analyst	2,500	2,500	2,500
Moderator		1,000	
Moderator		1,000	
Expenses			
printing	250	250	1,000
subject fee		2,250	
promotion	1,500	500	
programming	5,000	2,500	1,000
Subtotal	15,250	16,000	10,500
Overhead @ 20%	3,050	3,200	2,100
Monthly Subtotal	**18,300**	**19,200**	**12,600**
Total each stage	$ **18,300**	$ **57,600**	$ **12,600**
Grand Total			$ **88,500**

NOTES: Subject fee assumes 90 subjects
incentives equal to $25 per month

Total project duration is 5 months, so monthly
cost is multiplied by 3 after first month
and the final month added to the total

APPENDIX B: Project Principals

Project Director David Galiel

David Galiel, Executive Director of PIECORP, is a community designer, game developer, trends analyst and entrepreneur-turned-social-activist.

From 1997–1999, he was Executive Producer of Terra™, Kaon Interactive's groundbreaking virtual world game. Galiel led the teams that developed Terra's story, in-game events and unique Web site, featuring a daily online newspaper, live maps and real-time game data. He fostered player-led customer support and in-game training systems, which minimized CSR costs and increased retention, customer loyalty and word-of-mouth promotion. The Terran player community Galiel created continues to thrive to this very day, years after the game ceased to exist.

This experience led directly Galiel to found Planetary Arts, to create socially-constructive virtual worlds. Recently, Galiel converted the company into a nonprofit, value-driven, public service company, Public Interest Entertainment Corporation. PIECORP's primary mission is the design, development, and support of the *Mars First!* Virtual World Project.

In 2001, as vice president of Venice Technologies, Galiel spearheaded development of a new retail distribution channel for independent game developers. In early 1995, he founded GALIEL, an Internet strategy and ecommerce consulting practice. Prior to his online work, Galiel co-founded and successfully sold multimedia firm Grand Design Interactive, developers of the advanced IRIS™ wireless, interactive, transactional kiosk. He worked in the early 1990's with the Fund for Public Interest Research on co-marketing partnerships between for-profit and nonprofit environmental enterprises. An accomplished musician, bandleader and composer, Galiel has extensive public performance experience in both music and immersive improvisational theater.

Former director and founding member of the Virtual Reality Group at the Boston Computer Society, Galiel also served as chairman of ArtWorks and its successor Digital Forum at the Massachusetts Interactive Media Council (MIMC). He has been a frequently requested speaker on online community and the future of collaborative entertainment environments and a recurring guest on the nationally syndicated radio show, "Into Tomorrow with David Graveline". Galiel has organized and hosted expert panels on online marketing, communities of interest, interface design and other topics for the American Marketing Association and MIMC.

He is a member of the Board of Directors of the *Rebel Shakespeare Company* in Salem, Massachusetts and is an advisor and planning committee member for the *Winter Island Center for Young Performing Artists.*

Galiel served in the Israeli Defense Forces, studied professionally at Berklee College of Music, and is a member of Mensa. He lives in a three hundred year-old Colonial house in the historic port town of Marblehead, Massachusetts, with his wife and two daughters.

Research Analyst Brenda Laurel

Brenda Laurel is a designer, writer, researcher, and performer. She chairs the graduate Media Design Program at the Art Center College of Design in Pasadena, CA. She is also active as a consultant in interaction design and research. Since 1976, her work has focused on experience design, interactive story, and the intersection of culture and technology.

Before coming to Art Center, Brenda co-founded Purple Moon to create interactive media for girls in 1996 (acquired by Mattel in 1999). The company was based on four years of research in gender and technology at Interval Research Corp. In 1990 she co-founded Telepresence Research, developing technology and applications for virtual reality and remote presence. Other employers include Atari, Activision, and Apple.

Brenda edited *The Art of Human-Computer Interface Design* (Addison-Wesley, 1990) and authored *Computers as Theatre* (Addison-Wesley, 1991 and 1993) and *Utopian Entrepreneur* (MIT Press, 2001). Her latest book is *Design Research: Methods and Perspectives* (MIT Press, 2004).

In addition to public speaking and consulting, Brenda is a member of the Boards of Advisors of several companies and organizations, including Cheskin, the Communication Research Institute of Australia, and the Comparative Media Studies program at MIT. She serves on the Executive Committee of the Digital Storytelling Association and is active in the ACM, the International Game Developers' Association, and the American Institute for Graphic Arts.

Her personal interests include hiking, snorkeling, boogie-boarding and travel. She is active in environmental and human-rights organizations. Brenda lives in the Santa Cruz mountains with her husband, two cats, and, when lucky, at least one or another of their three adult female offspring.

APPENDIX C
MORE ABOUT THE *MARS FIRST!* VIRTUAL WORLD PROJECT

The Mars First! Virtual World Project explores what functional capabilities citizens need to facilitate civil society online. Those essential functions will be generalized as a set of principles, systems, tools and technologies for:

- Creating self-sustaining, constructive, democratic *online* societies, and
- Using online communication systems to support self-sustaining, constructive, democratic *"real-world"* societies.

We define *"self-sustaining"* societies as societies that are sufficiently self-governing—that is, not requiring outside, authoritarian intervention—and that maintain a critical-mass of member participation to support those self-governing systems and provide for community needs.

We define *"constructive"* societies as societies where the consistent majority of interactions between its members are constructive, where there are effective, well-understood means to support non-violent conflict resolutions, and where members of the society generally employ those means.

We define *"democratic"* societies as societies where government exercises power contingent on the consent of the governed; where there are continuously, universally available tools for citizens to communicate their desires to government and regularly vote on them; and where there are strong protections for individual liberties and social justice , including but not limited to the broadly accepted basic freedoms recognized in documents such as the Universal Declaration of Human Rights and the US Bill of Rights.

Virtual Worlds
There are many different forms of "virtual world" environments today. Virtual worlds are typically developed as a means to an end. In the case of *commercial games*, the end is the generation of profit; in the case of *amateur role-playing games*, the end is the realization of the hobbyist-designer's fantasies; in the case of *didactic virtual world environments,* the end is a specific educational lesson, for which the virtual world provides an immersive context.

All these are valid and successful ways of using virtual worlds. Our project, in contrast, is about the essence of society and civilization itself. We will help participants to rigorously and precisely identify their needs, we will translate those requirements into principles, systems tools and technologies that can be used by participants to satisfy those needs in a constructive manner, and we will empower participants with the means to sustainably self-govern.

We will seek, in every case, to:
- *Ask the right questions,* rather than assume the answers;

I know of no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion.

Thomas Jefferson (1820)

Take into account more than two-centuries of democratic experience—while taking into account the distinct dynamics that distinguish "real-world" from online, "virtual" interactions; and

- Let the *needs of ordinary participants* find expression in a democratic, open, guided process, rather than imposing our assumptions on them.

Ultimately, PIECORP is driven by a deep belief in the viability of democracy and the collective wisdom of "the masses"—adequately informed and sufficiently practiced in civic participation—as well as by the desire to empower ordinary citizens to self-govern. We intend to develop modern systems that can empower citizens to effectively face and meet modern society's challenges in a collaborative, constructive and sustainable way. We hope that good habits developed in our online virtual world will carry over into the "real-world", and produce more engaged, participatory citizens, practiced in non-violent conflict resolution, tolerance and critical thinking.

Conclusion

Today, more than ever, our world cries out for alternative models of interaction and for new ways to work together in collaboration, rather than confrontation, to solve our common problems. American society, in particular, is rapidly losing the traditions of public service, civic participation and shared social responsibility that have always been a fundamental part of the American fabric.

Virtual world games are powerfully immersive, interactive environments that bring together people from all over the world in an ongoing shared simulation. They can be designed to focus on collaboration or on conflict, on community or on combat, on construction or on destruction.

The networked simulation technology underlying these virtual worlds offers an effective platform for modeling social behavior, experiencing community interaction, and experimenting with new forms of social and political organization.
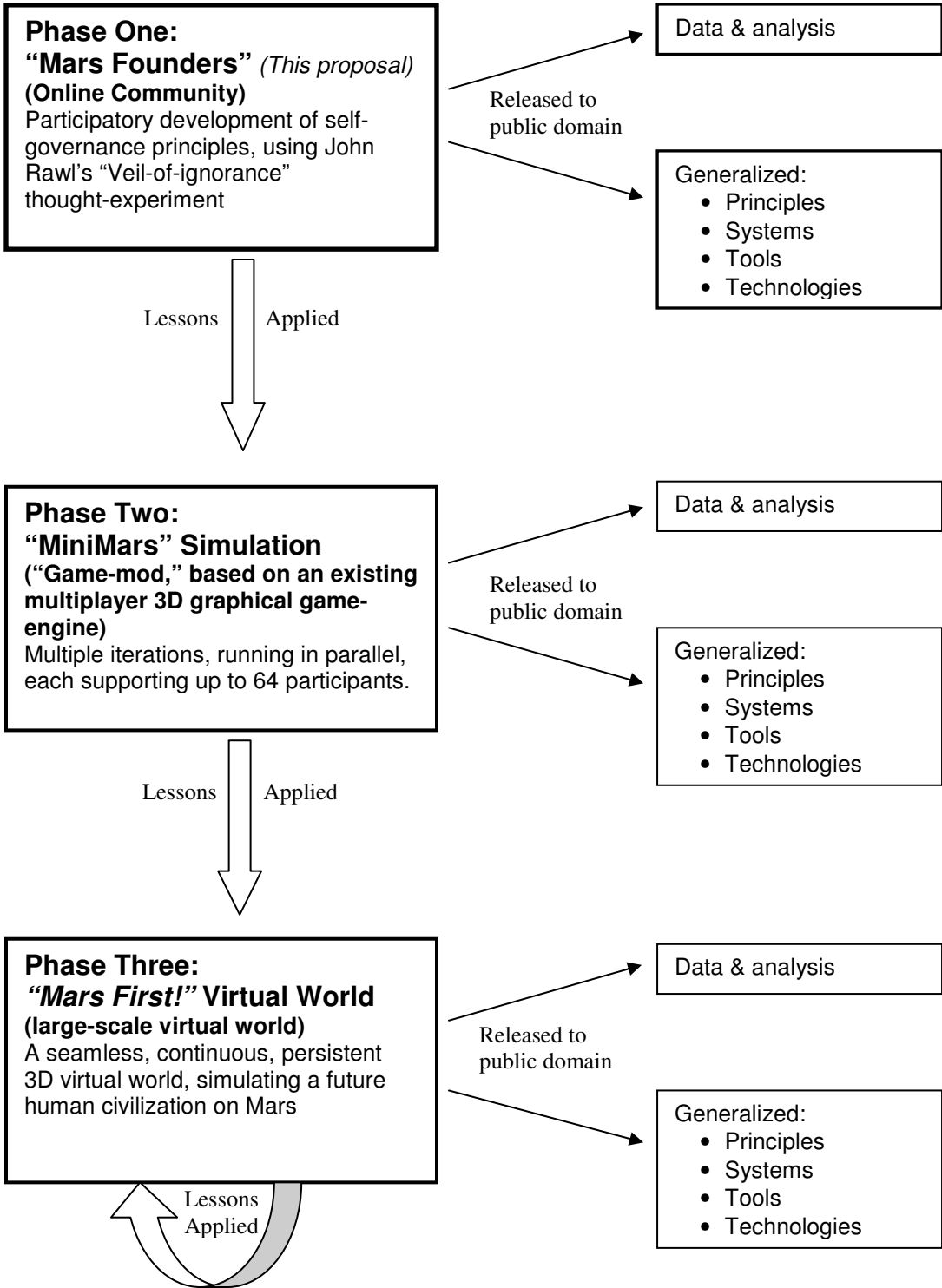
Sadly, this promising technology is used, almost exclusively, to create graphically rich, but emotionally impoverished, Malthusian games of conflict and domination. Game play focuses primarily on killing others and looting their corpses, in order to "win" status, power or wealth, within authoritarian, hostile environments. These game-worlds, by their very nature, cater to the worst impulses of popular culture; they have no provision to reward generosity, altruism, integrity or self-sacrifice.

Mars First! presents a contrast to these apocalyptic commercial games: a fun, inviting, accessible and immersive experience, where collaborating participants can create relationships, expand their horizons, exercise their minds, get excited about a common cause, and safely explore constructive alternatives to violent conflict.

WE CAN MANIFEST A DIFFERENT FUTURE, AND WE MUST.
BRENDA LAUREL, UTOPIAN ENTREPRENEUR

APPENDIX D
Long-Term Development Plans for *Mars First!* Virtual World Project

Phase One:
"Mars Founders" *(This proposal)*
(Online Community)
Participatory development of self-governance principles, using John Rawl's "Veil-of-ignorance" thought-experiment

Data & analysis

Released to public domain

Generalized:
- Principles
- Systems
- Tools
- Technologies

Lessons | Applied

Phase Two:
"MiniMars" Simulation
("Game-mod," based on an existing multiplayer 3D graphical game-engine)
Multiple iterations, running in parallel, each supporting up to 64 participants.

Data & analysis

Released to public domain

Generalized:
- Principles
- Systems
- Tools
- Technologies

Lessons | Applied

Phase Three:
"Mars First!" Virtual World
(large-scale virtual world)
A seamless, continuous, persistent 3D virtual world, simulating a future human civilization on Mars

Lessons Applied

Data & analysis

Released to public domain

Generalized:
- Principles
- Systems
- Tools
- Technologies

APPENDIX E

Alien Games Proposal
Dr. Carrie Heeter
Michigan State University
August 2004

Alien Games
for more information please contact:

Carrie Heeter, Ph.D.
Alien Games Project Director
Michigan State University in San Francisco
415-681-6473
heeter@msu.edu

When you see the title "Alien Games," do images of space aliens come to mind? That is an immediate connection to our topic—we have investigated how all-girl and all-boy teams would create a space learning game if they were in charge of the design elements.   We are, however, using a play on words here and another aspect of "alien" that we want to emphasize is that females are considered alien, somewhat "other worldly"/irrelevant, to the culture of producing computer games. That is a major problem in a reality where children use games to rehearse and develop skills for adult careers and where games are created overwhelmingly, by men for boys and men.

Using the motivational fun of play and the intrigue of extra-terrestrial life forms ALIEN GAMES will engage middle school and high school students and particularly girls in playing, learning and doing astrobiology and other planetary systems science.

Commercial games today are "hard fun." Kids often spend 50 to 60 hours just learning how to play enough to achieve level 2 of a game. Unfortunately what they learn has no meaning or applicability beyond the game itself, and perhaps other similar games in the same genre. But there tends to be no relationship to real life.

In a comparative analysis of commercial and educational games, Heeter et al. (2003) discovered that educational games are less fun, take less time to learn and less time to play, and are less likely to involved reading or typing than commercial games. Educational games (prior to Alien Games) fail to offer high stake motivations or opportunities for cooperation or competition.

Scholars studying learning from games are arriving at the realization that great learning is built into a great game. The game world and how play occur can have key learning concepts deeply embedded in their structure. Learning to play and playing both result in deepening understanding of important concepts and relationships.

It is time for high quality learning to merge with high quality games. Alien Games will be the next step in the evolution of what learning games can be.

Based on prior research including the current NSF-funded Girls as Designers project looking at 5th and 8th grader reactions to and design of learning games (http://spacepioneers.msu.edu/), ALIEN GAMES will be compelling, fun, and strongly appealing to girls, incorporating state of the art learning games bringing together top astrobiology and planetary system scientists, nationally known informal science educators, top education scholars, and leading game design experts.

High level content experts would help guide the direction of content to include. Advanced graduate students would be hired to help validate content of the site and the games.

High level game design experts from industry would help guide the "fun factor" of games. Producers from commercial companies would consult on the fun factor of individual games.

Games and content produced by groups outside of the initial project team would be welcome, after undergoing a content and fun review. Guidelines for designing and submitting games and science learning content would be published on the site.

A section of the site will encourage informal science groups and classes to envision their own alien games. Guided brainstorms and a game design document format will be provided, and contributions will be solicited. Suggestions for existing Alien Games and an opportunity to "ask the scientist" questions about astrobiology and to aide in game design will be provided online.

The site would serve as a research laboratory allowing research on learning games to be conducted (with human subjects protocol approvals). Games large and small can be launched for the public to play which also serve research goals.

The site will be infinitely expandable. Experts and game designers will be encouraged to submit "learning objects" (content modules or games) which fit with the site's goals and meet the site's standards for fun, accuracy, learning, and ease of use.

WHY ALIEN (SPACE LEARNING) GAMES?

In our research on gender differences in the kinds of space learning games 5th and 8th grade girls and boys envision, all of our child teams of every age and gender included aliens in their game. Extraterrestrial life and the search for life is a deep motivation for interest in space science, even if those interests ultimately extend beyond astrobiology.

All except one of the teams included impossible or improbably aliens which certainly do not exist. (One team included finding slime under the ocean on Europa, though this quickly morphed into a mysterious life form which most likely killed the initial team of scientists).

Games may include impossible aliens (they are fun) but they should also include realistic discussions of what aspects are fantasy and what elements might actually exist somewhere in the universe some day. Modern games do not distinguish between fantasy and reality. Star Wars Galaxy includes mining for elements. Some of the elements are real, some are not. Players have no idea which ones are real. A great disservice is done by not having a reality check section somewhere, to clarify reality and fantasy..

We held a brainstorm session on What Should Higher Education Learn from Games with 50 higher education professors. We included "provocations" expecting arguments from the group. To our surprise, the statement "it must first be a great game and only then a great teacher" resulted in no one taking the opposite perspective. The statement "it is OK to include fantasy aliens which could not possibly exist" yielded zero argument. The participants said, "of course, it has to be fun, doesn't it?"

The domains of astrobiology and planetary systems science are deeply appealing to kids of both genders.

WHY ALIEN (SPACE LEARNING) GAMES FOR GIRLS?

Game companies and gender equity researchers lament that girls are excluded from today's games, disadvantaging girls by turning them off to technology. Our research consistently shows girls really like LEARNING games, in fact, they like learning from games better than boys do. Learning games are a rich domain to entice girls to experience and become intrigued by science, games, and technology itself.

Heeter and her colleagues at MSU are nearing their second year of research on gender and science learning games. Here are conclusions from a newly minted manuscript (Heeter, Chu, Mishra, and Egidio, 2004):

There are both social and economic reasons to include the preferences of girls in the design of commercial AND educational computer-based games. Commercial games could potentially attract a larger female market engaging girls with computers and technology. Digital games for learning are a relatively new and underdeveloped genre that need to evolve in ways good for both genders and good for learning.

These key recommendations based upon our research should help the design of girl-friendly games:

- Create games which are easy to use, with clear instructions. Girls expect a game to be clear, friendly and helpful.
- Try a new approach to writing instructions and game support which expects players to actually use the instructions. Pretest them with girls who are not avid gamers.
- Focus on interesting and useful game PLAY rather than on competition and winning.
- Include consequences for winning (perhaps in later game play) which can be useful in subsequent play.
- Make games where players learn meaningful concepts by playing.
- Make games which include play elements in which players can nurture and take care of pets, humans, the environment, civilizations, or planets.
- Include the chance to choose pets or sidekicks to accompany the player on missions.
- Include social interaction in the game, in ways more meaningful than interaction about combat.
- Create characters which are cute and appealing rather than weird looking and scary.
- Allow extensive customization of characters and game worlds, including avatars which look like the player.
- Explore the market viability of a product line of learning games for girls.
- Include game strategies or mini-games which are viable nonviolent game experiences.

Girls more than boys want the time they spend to be meaningful and useful. Boys especially as they reach 8th grade and beyond increasingly resent a game which causes them to learn real things rather than just play. Girls welcome real learning.

Vision for the Alien Games Experience

The Alien Games experience would be primarily web-based, with CD-ROMs which could be ordered online offering more media rich game experiences not possible today over the web.

The site would be usable by guests but would encourage login, allowing visitors to customize their identity, communicate with scientists, keep track of where they have been and what they have played.

The Alien Games site would be welcoming and fun. Home page content would change frequently, with news updates from real world research and news updates from within the game worlds.

The Alien Games site will include Alien Games, Alien Science Explorations, Alien Science News, Alien Science Careers, and Alien Messages. In the teacher and parent view, lesson plans and links to national science learning standards will also appear.

Below is a rough, nongraphical first draft of potential first page content…

My Profile Summary

For players who create a profile and later return to the site, they will see how many alien game hours they have logged, how many science exploration badges they have earned, and whether they have any new "alien mail" (from the system or from scientists or gamers). They will have customized a graphical representation of themselves, and that will appear beside the profile summary. If they click on VIEW PROFILE they will see details on all game play activity, science exploration badges completed or in progress, and mail and they will be able to modify their profile.

Alien Science News

The NASA Astrobiology site and the SETI site currently post news stories on a regular basis. We will connect with those sources of "alien" news, selecting stories most appealing to middle school and high school audiences, and revising the stories to directly appeal to our audience while retaining science accuracy and links to more detail. Archives of all previous Alien Science News can be accessed.

Alien Games News

Borrowing from successful massively multiplayer online games, we will treat regular visitors to the site as a community, letting them know about events in the game worlds, new games, and features about existing games as a way of interesting them in game play and in returning to the site. Our games will NOT be multiplayer (the costs and time involved are vast) but the site will be a source of community.
Alien Job Board

Just at the idea stage now, a major motivation for the National Science Foundation and others concerned with the future of science in the U.S. is to attract kids to think about careers in science and to take the needed courses in high school that will enable them to pursue those careers. Alien Games may have a regularly updated banner ad featuring various job postings in science. The banner mentions job title, agency, and salary. Clicking gives more info including what the job entails and the necessary education to qualify, plus, where possible, a real life role model who is in this role now or some other human interest element.

Science Explorations

Educators thinking about teaching with games are quickly coming to the conclusion that games cannot and should not stand alone. Players can learn from a game but they will learn more if game play is preceded by preparatory discussions and learning and followed up by additional activities. The Teacher-Parent views of the site will offer teachers and parents tips on how to enhance the impact of the games and thoughts about integrating the games into lesson plans.

Even if kids are visiting the Alien Games site for fun, on their own, they will encounter games which are "scaffolded" by additional learning content in the form of interesting and fun science exploration modules. To retain the game-like feel, successful completion of each science exploration module results in being awarded a badge for that topic area. Completing the science explorations will help the games be more meaningful, and vice versa. The two content forms will enhance and support each other.

Many science concepts, at a broad range of size/distance and time scales, naturally come into play when discussing the possibility of (and potential forms of) life on a given planet of moon in a given solar/stellar/planetary system. This allows us to raise many science education topics: how stars and planetary systems and planets form and evolve; the history of our own solar system; the history of Earth, including the influence its place in the solar system, its size and composition, its orbital shape and axial tilt, etc., have had on its evolution and current state; the influences our atmosphere, oceans, climate, plate tectonics, etc. have had and continue to have on the sorts of ecosystems found currently and throughout history on our planet; the influence ecosystems have on the kinds of life one finds places and on evolution.

Badges could include each of the seven goals and objectives identified on the NASA Astrobiology Roadmap: Habitable Planets, Life in our Solar System, Origins of Life, Earth's Early Biosphere and its Environment, Evolution, Environment, and Limits of Life, Life's Future on Earth and Beyond, and Signatures of Life.

The Microbe Zoo is an award winning fun science learning web site developed by the Michigan State University Comm Tech Lab in 1994. We use the metaphor of a zoo to introduce fascinating microbial creatures. Rather than visiting the Lion House, one goes to Dirtland or to the Snack Bar (to see the microbes in the snacks, not to eat them!) Alien Games will be 10 years more advanced in content, style, and form. But the Microbe Zoo, still in use by millions of learners every year, still stands as an example of highly accessible and interesting science content, written to a middle school/high school audience and of broad appeal: http://commtechlab.msu.edu/sites/dlc-me/zoo/index.html

Finally, the core of the site. Here will be a growing list of games, some medium sized and some small, related to the search for life in the universe (and, of course, on Earth past, present, and future). We have evolved from an initial thought of a single very involved game to the idea of numerous small and medium-sized games. Smaller games require less of a learning curve and time commitment to play. They can be used in the classroom or after school club. A greater variety can be offered. More can be added. Games can begin as soon as they have been created rather than requiring multiple years of development.

Concepts for the games will continue to evolve as we bring experts on board and have more time to plan. Here are some initial game names:

Planet Builder
Alien Earths
Earth's Aliens
Alien Construction Kit
Alien Communication Challenge
Friend, Foe, or Slime?
Alien Pets
Moons Rock
Planet Hunter

Three Paragraphs of Breathless GameStorming from My Space Scientist, Dr. Randy Russell

Our alien worlds can be the equivalent of actual places in our solar system, some at different times. We can have the equivalent of current day Europa and Titan. We can have an earlier, wetter and warmer Mars. We can have a pre-photosynthesis Earth, with almost no oxygen in the atmosphere. We can have a snowball Earth (some think Earth may have frozen over completely for long stretches in the past). We can have an alternate Earth with steamy jungles extending to high latitudes (as has been the case in past eras) and an Earth with higher oxygen concentrations than today (creatures had smaller lungs, wildfires were common); an Earth-like world with all the land masses concentrated into a single continent (Pangea!); with the land masses clustered near the poles or near the equators. Most people don't really know much about our own planet's past, let alone the current or past conditions of other worlds in our own backyard; so we can teach about real situations while populating our game with a lot of variety of strange and exotic worlds.

Most people don't know much about some of the critters that live in Earth's deserts, cold environments, the deeps sea, and so on. There have also been many truly bizarre creatures on Earth in the past that have gone extinct (in many cases just due to bad luck of asteroid strikes or volcanic eruptions, not due to poor adaptation); we could populate alien worlds with some of them or with logical descendants of them (what if the dominant intelligent life on a world had arisen from an organism with five-fold symmetry like a starfish instead of bilateral symmetry like us).

We can use actual examples or very plausible examples drawn from reality to teach ideas that are realistic and applicable to the real world (as opposed to knowledge that is useless outside of the fantasy game world) while still being weird and exotic enough to be entertaining in a gaming scenario. We can teach about many topics, like evolution and weather/climate and oceanography, planetary science and stellar astrophysics in the process of creating and explaining plausible alien worlds based on real, known examples from our solar system,

present and past. Notions such as "there is a large desert on this world, with appropriately adapted creatures, because of the way the continents are arranged and the specific distance the planet is from the parent star and its axial tilt and the composition of greenhouse gases in the atmosphere" are very much Earth System Science lessons; but applied to making plausible and interestingly strange alien worlds.

Rough First Concept for Planet Builder Game

NASA scientists discovered an abandoned space ship from an ancient alien civilization. It was a ship used to search for life, and some of the controls have been deciphered.

There are databases of worlds throughout the solar system which had some form of life or else conditions where life might evolve someday. What kind of life and when the aliens visited each world is not known.

The huge ship (as big as a luxury cruise ship, a small city) has an unknown transport ability. If you enter the parameters of a world (a planet or moon), a list of worlds that match those parameters and either did or might have life comes up. Select one and you see it's location in the galaxy and then are instantly transported there.

You use remote sensing images to choose where to land. Pick a ship and what to bring (weapons to defend yourself if necessary, gifts to entice, intelligence test, containers to bring back plants or microbes, life support/protection…)

There are some limits on how many of each kind of world you can specify (it's too easy to just enter earth like parameters) or perhaps distance uses power and thus you need to look at both the most likely and somewhat likely worlds in any solar system you visit.

You are Earth's leading astrobiologist. Begin the game by customizing your appearance and abilities.

You are the person who will use the ship to begin Earth's search for life.

Some worlds may have no life. Others may have only plants. You are creating a conservatory aboard the ship (domes of controlled atmosphere housing plants from each planet) to show people of earth the diversity of plant ecosystems in the galaxy. You are also building a microbe zoo. When you encounter alien animal life, you need to determine whether it is intelligent or not, and whether it is predatory to humans. If an alien is intelligent and not predatory, you could try to make friends with it. Earth needs all the allies it can get! If an alien species is not intelligent and not predatory, you could try to entice it to become your pet and join you on the ship, if there is room. If the alien is predatory you need to escape and place a warning flag. You may leave a webcam and probe at each world you visit, to be galactic reality TV… There is a room in your ship where each planetcam is on a different screen.

The AI of the ship communicates with you by voice. NASA communicates by instant messaging, and as you make alien friends, they also communicate by instant messaging.
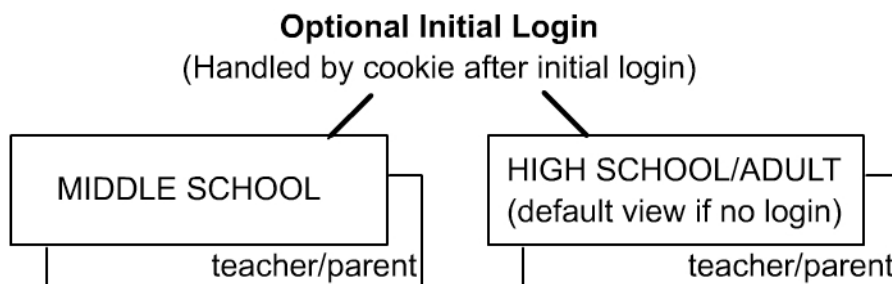
Lots of different ways of accumulating points. Each world you visit creates a post card of you (avatar you customized) on that world. It appears in Earth's newspapers and adds to your collection of photos.

<u>**Optimal Customization with Shared and Unique Content**</u>

Alien Games will have an optional initial login, enabling player-learners to create a profile including a nickname, gender, grade, whether they are a teacher or parent, whether they want to receive emails about Alien Games. Consistent with findings on what girls want, they can also customize their game identity, choosing appearance and other attributes which persist throughout the site over time.

Although the basic structure and much of the content of Alien Games is consistent regardless of user identity, web technologies will be used to selectively customize content based on grade level (easier to read for middle school) and to display curricular links and hints at the bottom of each page for teachers and parents.

Visitors can view the site and play the games without creating a login profile, but their game and learning behaviors will not be stored. The default view is high school/adult/non-teacher.

Optional Initial Login
(Handled by cookie after initial login)

MIDDLE SCHOOL		HIGH SCHOOL/ADULT (default view if no login)	
	teacher/parent		teacher/parent

After the initial login, future accesses to the site from the same computer will automatically retrieve the login profile (using a cookie), and the home page display will include custom profile information. It will be possible to log out and log in again as a new user. At the bottom of the site buttons will appear allowing the option of changing perspectives (middle school view; high school view; teacher-parent view).

Profiles will store GAME EXPERIENCE POINTS, LEARNING BADGES, and ALIEN MAIL. Your profile will remember which games you have played, for how long. Since girls don't like to lose, experience points (time spent playing) will be logged rather than high scores. The profile will keep track of which learning modules you have accessed. When you view all pages in a module including any animations or mini-simulations, you earn a LEARNING BADGE for that knowledge domain. If you want you can take a quiz (as many times as you want until you get a perfect score) to add a star to the badge. Alien mail to and from astrobiologists and planet system scientists as well as from the alien game master can be sent and received from within a profile.

Proof of Concept for Several Customized Views of Core Content

One recent curriculum-based project targeted to high school students and teachers was the Death Penalty Information web site. The Comm Tech Lab developed two parallel web sites (one for students and one for teachers) to serve as a high school curriculum about the death penalty. The teacher site includes two separate suggested ways of teaching with the web site – one for a social studies high school class and one for a writing class. Both classes rely on the same web site content, but approach it in different ways, with different assignments and follow discussions. We worked with content experts from the Death Penalty Information Center, an upper level graduate student in the college of education who designs history curricula, and a high school teacher to create the curriculum. The Death Penalty Information high school

curriculum site has received numerous awards and recognitions, for educational value, high quality content, and high quality site design.   Web Design Awards include Surfer's Choice, Cool Site of the Day, and Web Author's Choice.

The site was reviewed and selected as a member of the GEM Gateway Consortium of Internet-based educational materials, received a 5 star rating from Pacific Bell's Blue Web'n Library of Educational Resources, as well as a Lightspan StudyWeb award, and Awesome Library Editor's Choice recognition as being among the top 5% of educational sites on the web, and a Busy Educator Award. The site was selected by the American Bar Association Division for Public Education to use as the core curriculum for their 2001 annual National Online Summit for 50 participating high schools.   In 2003, the death penalty high school curriculum web sites served 1,812,640 pages of content to teachers and students worldwide.

PLAYERS (This list continues to grow):

Science Content Partners:
SETI, NASA, planet hunter Debra Fischer, Windows on the Universe web site, and the National Challenger Centers

National Science Curriculum Partners:
Michigan State University College of Education, National Challenger Centers, Windows on the Universe

Dissemination:
National Challenger Centers (500,000 kids/year), Space Camp (7,000 kids/year), X-Quest, Chabot Space and Science Center, National Girl Scouts, National 4-H

Game Industry Partners – Fun Consultation and Cross Marketing
Yahoo Games? EA? NeoPets?   Disney?

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APPENDIX F

Designing Digital Experiences for Youth
Cheskin Research Report
2002