

ON THE HORIZON

FUTURE OF EDUCATION
MUSEUMS & THE FUTURE OF EDUCATION

ABSTRACT

PURPOSE

The U.S. educational system is on the cusp of transformational change. Signals that the current educational structure has been destabilized include rising dissatisfaction with the formal educational system and the proliferation of non-traditional forms of primary education. In the coming era, museums will play a key role in the new educational landscape. A broad and shared understanding among policy makers, reformers and practitioners of the unique capabilities of museums will ensure that the new educational infrastructure takes full advantage of these strengths.

DESIGN/METHODOLOGY/APPROACH

This paper provides an overview of educational innovation in a broad cross section of U.S. museums, citing selected examples.

FINDINGS

There is an emerging consensus that whatever the new educational era looks like, it will focus on the development of a core set of skills. This paper reviews some ways in which museums are helping learners develop the core skills of critical thinking, synthesizing information, ability to innovate and think creatively, and collaboration. The U.S. needs to scale up the educational resources and skills provided by its museums via online access, better indexing of online resources, physically incorporating museums into schools and schools into museums, and making museums central points for teacher training. This will ensure museums can provide equitable access to their unique resources and fulfill their potential in the new educational landscape.

ORIGINALITY/VALUE

By applying the techniques of forecasting to the field of education, this paper provides glimpses of potential futures as seen in the vibrant innovations in education currently taking place outside traditional schools.

Keywords: Museums; Innovation; 21st Century Skills; Experiential Learning; Self-directed Learning; Personal Learning Communities

Paper type: Conceptual paper

The U.S. is on the cusp of transformational change in its educational system. Two types of change—incremental and disruptive—interact to weave the landscape of the future. Typically, any field of endeavor (medicine, for example, or transportation) is characterized by “eras” that start and end with transformative, innovative change. Within an era, people experiment with variations on the era’s dominant theme and change tends to be incremental. An era ends when the next great innovative leap leaves the last dominant innovation gasping in the dust.

Incremental signals that the current educational structure has been destabilized include rising dissatisfaction with the formal educational system and the proliferation of non-traditional forms of primary education. The pervasive funding crises at state and local levels arising from the recent financial crisis may prove the disruptive change that tips the old educational era over the brink. At the same time, technological advances in communications, content sharing as well as changing cultural expectations regarding access, authority and personalization may lay the groundwork for innovations that define the next educational era.

The waning era, which might be called “institutional/teacher era,” was characterized by public schools, professional teachers and a standardized core curriculum. For decades this educational pedagogy includes teachers dispensing content in a one-way direction—instructor to student. We forecast that the next era may be driven by life-long learners drawing on a variety of resources, traditional and non-traditional, and based on diverse methods of sharing, collaboration and use of educational resources. In coming decades, innovation from the periphery will redefine how learning is organized, what network of resources comprises the broad “school community” and what the actual experiences of learners will be like. Because of the vital, experiential, multi-modal and trans-disciplinary educational opportunities they provide, museums will play a key role in this new era more than the ancillary field trip. Early glimpses of this future can be seen in the vibrant innovations in education currently taking place outside traditional schools. This paper provides a brief overview of educational innovation in museums, and examines trends for clues to which innovations may become the new mainstream.

There is an emerging consensus that whatever the new educational era looks like, it will focus on the development of a core set of skills (independent of specific content). This skill set has been identified in the [Framework for 21st Century Learning developed by the Partnership for 21st Century Skills](#) (Trilling and Fadel, 2009). As adapted by the Institute of Museum and Library Services ([IMLS, 2009](#)), these skills include:

- Critical Thinking
- Synthesizing Information
- Being able to apply lessons to the Real World
- Innovation and Creativity
- Teamwork and Collaboration

This paper takes a brief look at some of the ways in which museums are tackling the challenge of helping learners develop these skills.

Children entering first grade today will begin entering the workforce in 2025. It is crucial that educators instill the needed skills to succeed in a global economy. Employers are already describing to researchers the kind of employees they seek—they want candidates who can do

more than simply regurgitate facts. In 2009, the Association of American Colleges and Universities commissioned a survey asking employers to identify the key attributes they look for in potential hires. Businesses today are searching for people who possess critical thinking and analytical reasoning skills; the ability to sift through a tremendous amount of data and synthesize information; to connect abstract concepts with real world relevancy; solve complex problems that apply to real world issues; communicate effectively; and collaborate with a diverse group of co-workers. These are the skills taught every day by museum educators as they engage visitors and school children alike. With their expertise in providing experiential hands-on activities, role play, dynamic programming and community outreach, museums are a model for transforming the traditional in-classroom learning environment into one better able to foster these skills.

CRITICAL THINKING AND COLLABORATION

Long gone are the days of merely learning division tables and a chronological list of English royalty in the classroom. Students today need to be able to quickly identify the issues at hand, experiment with possible solutions and evaluate results. This approach known as Design Education is embraced by educators at the National Building Museum. Founded by an act of Congress in 1980, this Washington, D.C. non-profit's mission is to explore the built environment and its impact on people's lives serving over 20,000 school children each year. In order to reach a more national audience, the museum has recently created a series of curricula for classroom use. Based on time-tested museum programs, these lesson plans address national standards of learning such science, technology, engineering and math while raising awareness about the careers in the built environment such as architecture, planning, construction and engineering.

The first national curricula kit developed by the National Building Museum is called "[Bridge Basics](#)" and explores the world of bridges through seven key lesson plans. Students in grades 5–9 learn about the different types of bridges and are presented with a challenge—they must cross a span by choosing the appropriate type of bridge. By using playing cards, wood sticks and string, students must work together by building arch, truss, cable-stay and suspension bridges. When complete, these models are tested with different weights. Some of the most valuable lessons occur when a bridge fails and students have to determine what went wrong, create possible solutions and then test those hypotheses. Failure can be a powerful tool for the educator if correctly harnessed to imagine alternate scenarios.

What makes this approach so effective is that these lesson plans are tied to real world examples. Students are not merely learning about abstract concepts of Euclidian geometry, but learning about the strength of a triangle while understanding the structural integrity of a truss bridge. On their way home from school, students see bridges around them and connect these lessons to the real world. This real world connection also includes greater awareness of possible careers. A key element of the program is to arrange for a structural engineer to visit the class to describe their job path, their daily tasks, and skills needed to succeed in their jobs.

National Building Museum educators have recently launched a [curriculum kit](#) teaching about the basics of sustainable planning and architecture. Students are introduced to the fictional town of "Grayville" that has been wiped out by a flood. Grayville had terrible traffic, no sidewalks or bike lanes and residents commuted long distances to work. Students learn the

basics of city planning and zoning as they work in teams to construct small models of green libraries, schools and housing which are then placed on a giant city street grid. Students need to defend their decisions and are graded on a scale that was inspired by the U.S. Green Building Council's LEED rating system. By working together in a team environment, these future planners successfully transform "Grayville" into "Greenville" while learning about energy use, storm water run-off and town planning. This process helps build public speaking skills, collaboration and raises the student's self-confidence.

SYNTHESIZING INFORMATION

The District of Columbia's Newseum opened the doors to its new facilities in 2008. While exploring over 250,000 of exhibition space visitors engage with five centuries of creating the news from the birth of the printing press to on-line bloggers. The institution bills itself as the "world's most interactive museum" and enables visitors to role-play real world decisions made by photographers, journalists and editors. In one particularly successful museum interactive called "Be a Reporter" a narrator asks participants to discover the "facts" of an incident that happened at the circus. The newspaper editor provides the set up—animals have escaped from the visiting circus—a subject that effectively engages a young museum visitor. The visitor has five minutes to interview participants—clowns, ringmaster, animal rights activists and the strong man - and determine the facts before the paper's deadline. At each interview, visitors choose which people to interview and which questions to ask. The editor often appears and highlights the difference between "fact" and "opinion." Students (and adults) learn that not all is what it appears. Participants are actively engaged in synthesizing content and learn to value critical questioning skills as they choose which answers to discount and which to focus on as they reassemble the story. In the 21st century, data comes at us like a fire hose through traditional news sources, social media and twitter, just to mention a few. It is crucial for students to learn which facts they can ignore and which are essential. Interactive activities at the Newseum help build these skills.

REAL WORLD APPLICABILITY

On any given day, visitors and school children can engage in over 400 science based experiments at San Francisco's Exploratorium. Using a trans-disciplinary approach to explore the connections between science, art and human perception, topics include everything from astronomy to nanotechnology. During school trips and teacher seminars, museum educators use an inquiry-based process to relate science topics to the world around their students. Perhaps their most popular (and at times stomach curling) experiment involves biology, demonstrating how a wonder of the animal world—the eyeball—translates light into perceptible images. Traditionally, a teacher would stand at the front of a class and show science book diagrams and assign reading assignments. A much more effective approach led by Exploratorium staff involves a dissection of a real cow eyeball—which happens several times a day and is featured via video, photos and a ["how-to" guide](#) on their website.

Holding an eyeball in their hands, a trained museum educator describes how muscles move the eye up and down, left and right. As they cut off the fat that surrounds the eye, the educator shows how this tissue cushions and protects. A cornea is sliced open to demonstrate how it

shields more delicate parts of the eye. Finally, holding a pupil in the hand, the educator demonstrates how an iris opens and closes to allow light inside. By connecting lessons to the world around them, educators provide a lesson that we guarantee will not be forgotten anytime soon.

INNOVATION AND CREATIVITY

Innovation has defined American business for the last century, and Henry Ford is a stellar example of an American innovator. Ford revolutionized the assembly line process to build millions of cars. It is less widely known that he was deeply interested in education. He was passionate about ensuring children share in real-world experiences, reaching beyond simple historical facts to understand the connected events that explain the mechanics of history. He founded the Edison Institute Schools bringing in such luminaries as Walt Disney and Thomas Edison's staff to inspire students. This spirit continues today as The Henry Ford launched the [Henry Ford Academy](#) in 1997, the first public charter school to partner with a company (Ford Motor Company), a nonprofit museum (The Henry Ford) and a public school (the Wayne County Regional Educational Service Agency.) Students might learn about the powerful actions of Rosa Parks through reading textbooks and then incorporate a visit to the actual bus where Rosa Park refused to give up her seat. Or students learn about birth of flight as they are introduced to the ground breaking work of the Wright Brothers and tour the actual workshop where the Wright brothers created their first plane.

The ability to connect school curricula with real world concepts is fundamental to inspiring curiosity about science, history and technology. Reaching over 250,000 students each year, the Henry Ford's multi-site institution continues to explore innovation with a new website, "[oninnovation.com](#)." Featuring a range of short but powerful interviews with Bill Gates, architect Toshiko Mori and founder of Apple Inc. Steve Wozniak among others, this website includes lesson plans that encourage students to compare today's innovators with great thinkers of the past such as Thomas Edison. Student teams work together to create their own definition of innovation. The goal is to inspire the next generation of innovators. The Academy teaches topics in an interdisciplinary fashion as students connect historic topics with current events and even projecting into the future. History does not happen in a vacuum. Discoveries in science, mathematics and technology change the course of history and by learning about the intersections of these once siloed topics, students will have a greater understanding of the world around them. Museum staff describe their experiential learning framework as being grounded in the "Four A's of Learning" that include Acquisition (knowledge), Association (relevancy), Application (hands-on learning) and Assimilation (critical thinking, problem-solving, and empowerment.)

As the examples above demonstrate, museums can be models for teaching 21st century skills and many are actively sharing these lessons with formal educators. For instance, in the 2007-8 year, museums hosted approximately 55 million students in school trips. These students explore history, art, science and technology through hands-on learning and inquiry based teaching.

In addition to these traditional field trips, museums are forging long term partnerships between cultural institutions and local school districts. One such innovative program is the "[Urban Advantage](#)" program, a collaboration between the Denver Museum of Nature and Science, the Denver Zoo, the Denver Botanic Gardens and three local school districts. Supported by a \$3.27

million National Science Foundation grant, this five-year collaboration is modeled on a partnership between the American Museum of Natural History and the New York City Department of Education.

The goal of the Denver collaboration is to improve science literacy among middle-school students in urban environments. School groups and families are encouraged to visit each partner institution to inspire long-term class experiments. For example, a recent project examined saber-tooth tigers using research from the Denver Museum of Nature and Science. This project and many others will be displayed at a 2011 Science Day. The museum engages the entire family in hands-on demonstrations such as learning about bird bones by building models of hollow bones and testing their strength. The project has also aggressively promoted communications between the partners, with the museum, zoo and gardens maintaining a help line that links teachers, students and parents directly to staff scientists. Email questions are routed directly to the scientist and researcher whose work is most closely aligned with a given project whether it is on horticulture or public health.

The National Science Foundation grant also enables educators to work with evaluators to study the long-term impact of this collaboration between formal and informal institutions. Focus groups, teacher observation and links to state testing will be provide data to help evaluate how projects such as this can contribute to the learning landscape.

TEAMWORK & COLLABORATION

The current educational era values independent work and, with the exception of explicit group assignments discouraged collaborative efforts. Soliciting the help and input of others was, in fact, castigated as plagiarism. But today's employers value team efforts, and not only encourage but expect employees to solicit the input others to produce the best possible result. While there are clearly still concerns about permissions and attributions, the culture of the internet, premised on wide-spread sharing, adaptation, mash up and reuse of materials, is transforming our expectations about how to get work done. The educational system needs to adapt to foster and recognize these new skills.

The Hirshhorn Museum and Sculpture Garden in Washington, D.C., is the Smithsonian Institution's museum devoted to contemporary art. Last year the Hirshhorn, recognizing the changing nature of artistic collaboration and the need to cultivate new audiences, partnered with the Mobile Learning Institute to found [ArtLab+](#). This digital media studio gives local teens the opportunity to become integral members of a design team, creating new visitor experiences at the Hirshhorn, inspired by the museum's permanent collection and temporary exhibitions. Targeted at DC-area and underserved youth, the program currently serves about 450 participants, and is ramping up to include 700–800 teens as it matures. The teen designers hone crucial twenty-first century skills as they work together to make videos, animations, wikis, games, podcasts, and work in other media. As with so many examples in this brief survey, this project could be filed under many headings, as the creative projects of each team are integrated into the museum, enriching the experience of other visitors and giving students the opportunity to do real-world work. And ArtLab+ is not the only museum program providing opportunities for teens to collaborate on creative work that is integrated into the museum. See, for example, the Getty's Villa [Teen Apprenticeship Program](#) and the Albright-Knox Art Gallery's [Future Curator's Teen Program](#). The

Chicago Teen Museum takes a comprehensive approach to creating such experiences drawing on the resources of the city's rich cultural community, resulting in projects such as [Teen Made Museum](#) (in which teams designed a whole museum, and the [Teen Chicago Curriculum](#), a set of 100 oral histories about growing up in Chicago, created as an educational resource for the Chicago History Museum.

SCALING UP AND BROADENING IMPACT

The examples listed above illustrate the core educational resources being provided by museums today. A key challenge in building the new educational era will be to scale up the resources and unique strengths of museums to enable them to provide these resources to all students in the U.S., not just a select few. 56 million students were projected to enroll in the nation's elementary through high schools (grades K-12) in fall 2010. They are supported by roughly 122,000 schools and 7 million teachers (U.S. Census Bureau, 2010). There are somewhere in the neighborhood of 24,000 museums in the US, with about 400,000 people working in them, only a fraction of whom are museum educators. Despite this disparity of resources, in the 2007-2008 school year, museums hosted approximately 55 million student visits in school trips (Merritt and Katz, 2009). Even assuming these visits are evenly distributed across the population, one museum visit per student per year will not create profound educational impact. Absent a huge explosion in the number of museums, what can museums do to provide meaningful resources to the entire population of young learners?

One way is for museums to extend their reach via the internet—providing substantive online resources. This can include rich caches of static information and curricula such as those provided by the University of California Museum of Paleontology or The Henry Ford. However, they can also encompass interactive virtual learning worlds such as the Tech Museum of Innovation's virtual world where the avatar [Polly Positron](#) serves as a science role model for students, leading them through educational games on themes such as water conservation and renewable energy. This virtual learning environment lets the museum expand its reach far beyond the 150,000 school children it can accommodate in physical programs (30,000 in hands-on science labs).

Despite the wealth of museum resources available online, it is a challenge for a teacher or learner, to find these resources in a coordinated way. Sites like [Shmoop](#), the National Endowment for the Humanities [EDSITEment](#), [Best of History Web Sites](#) and the [Internet Public Library](#) aggregate, annotate and index a rich variety of resources, including museum content, often tying it to curricular frameworks. Museums can actively promote the use of their online resources by such sites, and/or work to create an integrated database of online museum resources.

Some museums intensify student engagement by bringing the school into the museum, thereby rendering the frequency of "school visits" moot. Some museums run limited student programs, typically preschools—notable examples include The [Indianapolis Children's Museum](#), the [Rochester Museum & Science Center](#) and the [Woodbury Preschool at the National Museum of Play](#). Some operate magnet schools, such as the [Brooks Museums Magnet Elementary School](#) in Raleigh, NC and the [Charles Drew Science Magnet Elementary School](#) of the Buffalo Museum of Science. Other museums open their buildings for traditional schools to use as expansions of their

space. For example, [School in the Park](#), an innovative program that shifts the location of "school" from a traditional classroom setting in an inner-city school, Rosa Parks Elementary School, to the resources and educational opportunities available at museums in Balboa Park, Calif.

Museums and communities should work together to facilitate such direct interactions. In 2008, museums collectively spent \$1.8 billion on construction and renovation (private construction) (Merritt and Katz, 2009). In the future, when museums plan new buildings, renovations and expansions, they should consider how to make these investments improve the overall educational infrastructure. So, for example, the California Science Center and the Los Angeles Unified School District are collaborating to build the Science Center School, an elementary school campus adjacent to the museum's [Amgen Center for Science Learning](#). For their part, as cities plan civic infrastructure, including schools and transportation, they should prioritize increasing accessibility to existing museums.

Another way museums can expand their influence is to train other educators in the skills of experiential learning. Many museums have teacher education programs—currently these most often focus on the museum's content. In the future, they might focus equally on process. How can educators in formal or alternate learning environments incorporate elements of museum education into their repertoire?

CONCLUSION

This survey illustrates the impressive scope of innovative educational experiences museums already contribute to the educational landscape. However, it is important to look beyond specific pedagogic functions provided by museums and acknowledge their greatest contribution to education—their ability to inspire people of all ages to learn more. In a recent interview in the journal *Museum*, Neil deGrasse Tyson, Frederick P. Rose Director of the Hayden Planetarium at the American Museum of Natural History, eloquently describes the capacity of museums to transform lives and ignite the flame of self-directed learning (Merritt, 2011). Offering a useful balance to the current emphases on measurement and testing, he observes that transformative museum exhibits are not the kind of experience you can give an exam on. "Success should be measured by the difference in ambition triggered by [the museum] encounter." In his case, a visit to the Hayden Planetarium at age nine triggered the ambition that led him to become an astrophysicist who, as host of NOVA Science NOW on PBS and media personality, works tirelessly to achieve his vision of a scientifically literate society.

The future of education may well be one characterized by self-directed, passion-based learning. [Some envision](#) a knowledge economy in which schools are supplanted by personal learning communities, teachers' role as facilitators is as important as their status as experts, and students and faculty engage in self-directed research and accomplish real work. In this future, museums can play a crucial role in helping learners discover their passion, providing resources and opportunities to pursue this passion and training educators in the skills of experiential learning.

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AUTHOR BIOS AND CONTACT INFORMATION

Scott Kratz skratz@nbm.org is the Vice President for Education at the National Building Museum in Washington, D.C., where he supervises the public programs and youth education departments which create academic symposia, film series, school programs, youth outreach and family events. Before joining the National Building Museum in 2006, Kratz served as director of programs at the Autry National Center and associate director of the Institute for the Study of the American West. There he supervised a staff that planned and implemented programs for the Autry including theater, film, music, family programs, lecture series and academic symposia. Kratz has been active in several boards including the American Association of Museum's Education Committee and Museum Educators of Southern California.

Elizabeth Merritt emerritt@aam-us.org is Founding Director of the Center for the Future of Museums (CFM), an initiative of the American Association of Museums. CFM is a think-tank and research and design lab for fostering creativity and helping museums transcend traditional boundaries to serve society in new ways. Ms. Merritt has 25 years experience working with and in museums, including administration, curation and collections management. Her areas of expertise include museum standards and best practices, ethics, collections management and planning, and assessment of nonprofit performance.