National Park System Advisory Board

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National Park System Advisory Board

Education Committee

Technology Subcommittee White Paper

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NATIONAL EDUCATION COUNCIL/
NATIONAL PARK SYSTEM ADVISORY BOARD EDUCATION COMMITTEE

Technology Subcommittee White Paper

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BRIEF DESCRIPTION

Over the past year the Technology Subcommittee focused on answering three questions related to technology deployment, use, and/or development within the educational context and mission of the National Park Service (NPS):

1. What is the current state of technology within NPS?
2. What should be the basic virtual services for NPS?
3. What should be the aspirational virtual services for NPS?

It is the subcommittee's hope that this work can contribute to the development of a NPS roadmap that considers how technology can enhance the learning experience in all National Parks over the next three years.

CONTENTS

1.0 Technology Values

Based on the brainstorming activities and research of the sub-committee, the following values were identified that suggest our philosophical point of view related to the use of technology in the context of the learning and the U.S. National Park Service

SUMMARY

We value technologies that...

1.1 Deepen and extend place-based learning.
1.2 Give voice to diverse communities and perspectives.
1.3 Provide many paths to access the park experience.
1.4 Deepen personal connections and connectivity.
1.5 Visualize abstract concepts.
1.6 Give users the "power down" moment.

WE VALUE TECHNOLOGIES THAT...

1.1 Deepen and extend place-based learning—Technologies need to enhance the visitor experience all people have in parks across our nation. From pre-visit websites, that can prepare visitors for the park experience they will be exploring; to in-park technology experiences that add value to the interactive physical experience; to post-visit digital repositories that can give access to and store self-reported visitor experiences.

1.2 Give voice to diverse communities and perspectives—New technologies and content are needed that can help to reach a broader audience for national park experiences. When multiple perspectives on a historical event or a natural resource are provided, deeper learning can occur, more respect for diverse perspectives can happen, and more learners may become stewards of their national parks. By leveraging mobile tools and social media, place-based learning can also be extended in powerful ways to support international collaborations.

1.3 Provide many paths to access the park experience— The spectrum of learners is highly diverse and therefore the opportunities for learning need to be broad. Therefore, by extension, numerous technology tools should be offered to support people with all abilities. This could facilitate opportunities for members of the public that could not experience the park in traditional ways. Digital libraries, mobile devices, sensor-driven experiences, are just some examples of technologies that can support people with diverse mobility, varying cognitive abilities, and at all age levels.

1.4 Deepen personal connections and connectivity—We need to enable national park visitors to connect not just to the information around them, but the people they visit the park with, the NPS rangers, and the greater public who may want to learn more about

the parks. Sharing photos, blogging about in-park experiences, asking questions online of experts, all can be important paths to connecting with the shared stories and natural resources of the national parks.

1.5 Visualize abstract concepts—Complex concepts have always been difficult to share when visitors spend only a limited time at a national park. Pre- and post-visitor information can help to visualize historical information in timelines, animate changes in the natural resources, and give additional video footage about a time period. In-park experiences can be supported by additional technological as well. Sensors that can trigger additional audio information, QR codes that scanned by mobile phones can add to the historical data, video archives that can be explored are all possibilities.

1.6 Give users the "power down" moment—Technologies are important and powerful tools, but they should be used when they can really add to the experience. It is also important to present in-park experiences without digital technologies. There are times when the natural environment or historical experience should not be added to.

These values described above are based upon the assumption that technology has a role to play in learning and education. This is based on extensive research with students, adults, including individuals with special needs, e.g., Burgstahler, S. (2008) ; Chen, M. (2010) ; Christensen, C., et.al. ; Gray, T., et. al, (2011) ; Means, et. al (2010); Stacker, H. (2011) ; Zhao

In the sections that follow these values will be further exemplified and more deeply explored in subsequent sections of this white paper on the baseline and aspirational virtual services. Before these are presented, a summary of the current state of technology within NPS will be discussed. It should be noted that this is a "snapshot" in time. The subcommittee acknowledges that the technology landscape is always changing. It is important to periodically assess where the NPS is to better understand where the future might lead.

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[1] Burgstahler, S. (2008b). Universal design of technological environments: From principles to practice. In Universal design in higher education: From principles to practice (pp. 213–224). Boston: Harvard Education Press

[2] Chen, M. (2010). Education Nation: Six Leading Edges of Innovation in Our Schools. San Francisco: Jossey Bass.

[3] Christensen, C., Johnson, C.W., & Horn, M.B. (2008). Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns. New York: McGraw Hill.

[4] Gray, T., Silver-Pacuilla, H., Brann, A., Overton, C., Reynolds, R. (2011). Converging trends in educational and assistive technology. In T. Gray & H. Silver-Pacuilla, Breakthrough teaching and learning: How educational and assistive technologies are driving innovation. New York: Springer Publishing..

2.0 Current State of Technology within NPS

Based on the research of the Interpretive Design Center for the National Park Service, the following is known as of October 2012 about the current state of technology use/deployment in the National Park System.

SUMMARY

We value technologies that...

2.1 Social Media use in parks
2.2 National Park Service website
2.3 Mobile Internet Access, WiFi and cellular connections
2.4 Mobile App
2.5 Distance and Online Learning
2.6 Training

WE VALUE TECHNOLOGIES THAT...

2.1 Social Media use in parks— Social Media is a powerful tool for parks and programs if used strategically. The Interim Directors Order for Social Media was released on December 16, 2011 and included the use of Facebook, Twitter, Flickr, and YouTube. It also required parks to submit a strategy. As of October 2012 about 170 parks and programs have submitted their strategies.

Facebook. As of October 2012 the NPS maintains over 240 pages with over 800,000 likes. The top ten NPS pages on Facebook make up 70% of the likes, these pages are National Park Service, Statue of Liberty, Glacier, Yosemite, Yellowstone, Grand Teton, Denali, Arches, Zion, and Rocky Mountain. NPS Facebook pages content includes interpretive posts, photos, history questions, caption this photo, park personalities, events posts, sharing partner stories, quizzes, linking back to nps.gov content, etc.

Twitter is the second most used social media network in the NPS with over 210 NPS Twitter feeds as of July 2012 with 168 that are currently active. Parks have tweeted over 134,000 times as July 2012 to over 550,000 followers. Many park twitter feeds are used for this day in history posts, ranger program feeds, live event feeds, road conditions, and fire information. Because of that many feeds only become active during certain times of the year.

YouTube. The NPS has over 70 channels with over 7 million views. Most of those views come from a handful of viral videos including the Yosemite Nature Notes episode Frazil Ice (4.1 million) and WWII Valor in the Pacific video Eternal Peace (1.2 million). The park service mainly uses YouTube to post videos with comments and ratings turned off making YouTube more of a content holder leaving social commenting and sharing to Facebook and Twitter. This is a common practice as YouTube has not proven to be that social by itself.

Flickr is used by parks to share high-resolution photos for the public, educators, students, and news media to use and share. The park service has over 76 accounts with over 36,000 photos posted. The vast majority of photos on park flickr pages are in the public domain and are free to use by the public.

2.2 National Park Service website, nps.gov— is the largest digital media presence the National Park Service with over 94 million visits. Most parts of the site are run by a Coldfusion based Content Management System(CMS) this includes all parks, main site features, and the new subject pages (www.nps.gov/civilwar. All national programs and organizations are currently in non-cms based sites, but a plan is being created to transition most content on nps.gov to the CMS. The National Park Service website is made of over a hundred thousand pages including plan-your-visit information, educational pages, webcams, interactives, kids activities, lesson plans, static maps, and park maintained blogs. The most significant liability for a place based organization like the NPS is that it is not optimized for the mobile web.

2.3 Mobile Internet Access, WiFi and cellular connections— are limited in most parks. If free WiFi exists in a park it is provided by a partner, either a cooperating association, or friends group bookstore. Some concessioners with large hotels and other facilities also provide WiFi coverage for their guests, while others like do not; for example, Shenandoah Lodging includes this statement, "The absence of in-room phones and WIFI enhances the historical quietness of the surroundings." Other parks have created wireless and radio policies that define access in terms of impacts. For example the Yellowstone National Park's Wireless policy (http://www.nps.gov/yell/parknews/09023.htm). In urban parks spill over WiFi from free public networks is available, such as Washington, D.C.'s free Wifi on the east end of the National Mall. These networks can be unreliable and may not be upgraded overtime to match the internet speeds needed for modern devices.

Cellular coverage is increasing nationwide as new wireless spectrums become available. Over the next 5 years cellular data technology will allow signals to penetrate deeper into parks but will likely remain spotty in remote parks. In urban and suburban parks cellular coverage is extensive and often provided by multiple networks.

2.4 Mobile App— creation for National Parks is being done by parks, partners, cooperating associations, Harpers Ferry Center, non-profits, universities, and third-party developers. Most of the current apps are focused on orientation, wayfinding, and activity planning rather than interpretation and education. Parks have independently created apps that include site information and audio guides and are published by developers or partners. Partners and cooperating associations have created apps with outside developers that are mainly commercial and charge for initial download or in-app purchases. The Harpers Ferry Center in partnership with individual parks has published National Park Service branded apps that include interpretive site information, wayfinding, and audio tours. Non-profits such as the National Geographic have created an award-winning app that provides photo and activity planning information for 20 National Parks. Universities have partnered with multiple parks on the creation of wayfinding and immersive augmented experience apps. Fort Vancouver working with the Washington State University and other partners have been developing an augmented experience app for the site that includes interactive videos, gps scavenger hunt, and exploration of collections. Third-party developers apps are mainly taking the form of enhanced tour books similar to what the print publishers have traditionally provided parks.

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[5] Means, B. ([2010]). Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies. Washington, DC: U.S. Department of Education.
[6] Stacker, H. ([2011]). The Rise of K-[12] Blended Learning: Profiles of Emerging Models. Mountain
[7]View, CA: Innosight Institute, Inc.
[8] Zhao, Y. ([2012]). World Class Learners: Educating Creative and Entrepreneurial Students. Thousand Oaks, CA: Corwin

The vast majority of these apps are released for iOS, the Apple iPhone and iPad operating systems, with a limited dual release on the Android OS. Park app downloads for iOS make up around 80% of downloads.

Mobile App creation is hindered by the needs to create wayfinding apps because the NPS lacks mobile websites that includes dynamic geolocated maps. Partners, universities, and third-party developers as well as the park service itself are held back by the need for feeds and API's from nps.gov.

2.5 Distance and Online Learning—Twenty-eight parks offer regular distance learning opportunities, using a variety of methods, platforms and media. These programs link students who might never have an opportunity to visit the parks to park stories and resources in compelling ways, while meeting learning standards. The National Park Foundation maintains a bank of 14 Electronic Field Trips, broadcast live in previous years, on demand in Flash format.

Because individual parks are creating distance learning opportunities to meet the needs of the schools to whom they are delivering programming, there is no overall standard for program delivery; not for platforms, formats, marketing or graphic identity. There is also no comprehensive means of evaluation. Right now parks are using everything from voice-only teleconferences and Skype to online video conferencing and networks set up by school districts or Educational Service Units. For this reason, access is not equal for all parks, quality is not consistent, and quality delivery is not always reliable. Parks like Homestead National Monument of America have long-established relationships with local ESUs and can provide a broad range of programming. Others without this access are left to find another way.

Thousands of lesson plans and other educational materials, access to field trips, guest speakers and professional development opportunities are available through nps.gov/learn, which will receive a major facelift in early 2013, allowing for greater searchability and teacher-rating of contents.

WebRangers, the on-line Junior Ranger program designed to engage children in their national parks continues to grow. It is used both at home and in classrooms, and increasingly at the college level. At the end of FY 12, there were 222,637 registered webrangers, and 11,121 had completed 45 of over 70 Flash-based activities to earn a WebRangers patch. In addition, 1.5 million others access the site to complete activities without registering. WebRangers continue to post their park stories and photos from their visits, and at least 60 children a week respond to the Question of the week. The site needs to be converted from its current Flash format to HTML 5 in order to be mobile-friendly and to function well in browsers that will no longer support Flash.

2.6 Training— Over 190 park service employees have participated in the Digital Media for Interpreters Course (#diginterp). The course has been offered three times with multiple offerings expected this upcoming year; each time the course has been greatly oversubscribed with 60 people on the waitlist for the last course. The course is given online over WebEx with video, chat, a Twitter feed, document sharing, and Facebook group so the students get to use the tools they are learning about. The course is divided into 4 days including strategy, micro-interpretation, audio/video interpretation, and mobile apps. The course has fostered a large active Facebook group with over 460 members including NPSNPS, DOI, and Forest Service employees.

The NPS also has a Web Community sharepoint page that provides policy, best practices, short training videos, and forums on social media and the web. This is the repository for official information on social media and the web CMS.

3.0 Baseline Virtual Services for NPS

Based on two full-committee phone meetings, one in-person chair meeting, and three phone chair-meetings, and revised from feedback from the full NPSAB, the following has been suggested FOR EACH PARK:

SUMMARY

We value technologies that...

3.1** Provide partial WIFI/cell phone access in parks.
3.2** Leverage the technology NPS already has, e.g., Web pages, Facebook pages.
3.3** Plan every project with mobile access and applications in mind.
3.4** Provide employee professional development opportunities via and regarding technology.
3.5** Maintain analytics and report technology statistics and exemplars.
3.6 Encourage the use of the new NPS education portal.
3.7 Designate Tweeting/social media Park Rangers (shared between parks).
3.8 Communicate regarding site-specific availability of technology resources to general public.

(**Notes a priority to be implemented)

WE VALUE TECHNOLOGIES THAT...

3.1 Provide partial WiFi/cell phone access in parks—The subcommittee strongly recommends that in-park visitors should be able to have WiFi and/or cell phone access within a specified area in all parks. Since each park has some visitor services zone where there may be an information desk, gift shop, bathroom facilities, this may be the logical place to have such WiFi or cell phone access. Today there are even WiFi services that provide cell phone access with the proper additions to the hardware. As a fundamental principle, parks should offer public services throughout the park as feasible. Using mobile technology effectively throughout the park can support important learning opportunities that can range from adding interpretation to enabling people to share their perspectives. However, if there is extensive WiFi coverage, then there should still be "no-tech zones" similar to a quiet car on a train. Then people can choose how they feel comfortable.

3.2 Leverage the technology NPS already has, e.g., Web pages, Facebook pages—The subcommittee strongly recommends that all park home pages and Facebook pages be considered an important entry point into the park. They should be updated frequently. They should be as interactive with the general public as is possible. They should be seen as tools for outreach, continuing engagement, and building community. These tools can be supplemented by leveraging non-Western social networks, such as QQ and Renren, which could draw greater attention by international visitors.

3.3 Plan every project with mobile access and applications in mind—Today consumers buy more mobile devices than traditional desktop or laptop computers. In urban, sub

urban, and rural areas, the general public is depending on mobile technologies for their work, for learning and skill development, and for entertainment experiences. This cannot be overlooked. Therefore, the subcommittee strongly recommends that all technology development projects be planned with mobile access and/or use in mind. Technologies that are utilized do not have to be exclusively mobile, but a website, for example, should have a version of it should be available that offers information and interactivity that is appropriate for viewing on a mobile device.

3.4 Provide employee professional development opportunities via and regarding technology—The subcommittee suggests that every employee have the opportunity to take at least one technology training webinar/course a year. Because the technology landscape is ever changing, it is just not sufficient to have only one course every "once in a while." The courses however, cannot be "button-pressing" courses that are only about the tools themselves. Courses must present the tools in-context, helping employees understand how to provide technology-enhanced interpretation experiences; how to build a community that supports learning through social media; and how to use mobile technologies to visualize abstract and complex concepts.

3.5 Maintain analytics and report technology statistics and exemplars— The subcommittee suggests that all parks collect and communicate to the National Office the aggregated data regarding technology services, usage, and programming within the parks. This data can be helpful in understanding how successful the use of new technologies has been at a park and suggest paths for change and further use.

3.6 Encourage the use of the new NPS education portal—As the new educational portal evolves, the subcommittee suggests that all parks explore the use of this tool. Feedback should be given to the developers of this technology to enhance its effectiveness in the future. By coming together to use and further refine the education portal, across-park resources can be strengthened and shared.

3.7 Designate Tweeting/social media Park Rangers— As the new social media tools populate the landscape, it is important that at least one person at a site or between two sites become an expert in the care and feeding of online content. Studies have shown social media can only thrive if it continually used and content is added. These tools can serve as critical bridges for reaching out to visitors, understanding their interests, and applying lessons learned to improve all in-park services, including the learning experience. Since it will take some time for all NPS personnel to become proficient or even comfortable with these technologies, designating one person at a site or between several sites is important to consider.

3.8 Communicate regarding site-specific availability of technology resources to general public—The subcommittee suggests that technology resources at each park be communicated via signage, social media, and more to the general public. In this way, people will be less frustrated when visiting a park if they have only limited access to mobile phone service or WiFi. People will be excited to learn about new technology use at a park and might be more interested to try it out. Information transparency will lead to more awareness by the general public of what is available at each park and visitor expectations can be adjusted accordingly.

4.0 Aspirational Virtual Services for NPS

Based on subcommittee phone calls and meetings, as well as feedback from the full NPSAB, the following has been suggested as value-added additions to the baseline virtual services previously described:

SUMMARY

We value technologies that...

4.1 **Develop an NPS mobile learning strategy.
4.2 **Develop an exemplar of mobile technology tools for learning.
4.3 **Stimulate thematic collaboration across parks.
4.4 **Support technology development.
4.5 **Develop a framework for emerging technologies for learning.
4.6 Deploy technology that supports large-scale data collection from park users.

(**Notes a priority to be implemented)

The subcommittee suggests that beyond providing Baseline Services for all National Parks, there are Aspirational Virtual Services that merit investment—even though they may not be deployed across all the parks. For example, there already are some innovative park rangers deploying more advanced learning technologies, such as the video distance education capabilities seen at Homestead National Monument in Nebraska during the March 2012 NPSAB Education Committee site visit.

This type of innovative use of learning technologies requires considerable onsite expertise. Further, these innovations often depend on a ranger champion or local education partner to build and sustain this effort. While this decentralized model allows "a thousand flowers to blossom", it also means that the Park Service ends up with mostly "one-off" projects that are not scalable or sustainable.
There are some vital strategies that the NPS should pursue immediately that could have a larger potential impact. These efforts should be explored more in-depth by NPS staff to determine the cost, staffing and timeline for implementation:

4.1 Develop an NPS mobile learning strategy—The adoption and use of mobile devices is a game-changer for organizations, including NPS. It should change how NPS thinks about their technology efforts. The use of basic handsets, and increasingly smartphones, tablets, and other emerging mobile technologies is pervasive among members of the public of all ages. New survey data from Project Tomorrow highlights the opportunity for learning in our parks with mobile devices: over 75% of teenagers have a basic cell phone, over 50% of high school students have a smart phone; 26% of middle school students have a tablet – and those numbers are climbing; in fact, the latest survey ended on De

in fact, the latest survey ended on December 23 before the 2011 holiday gift-buying season. These devices are powerful learning tools, typically with Internet browser capabilities, email and texting, cameras, and the ability to connect to social networks. Most importantly, they are small, lightweight and fit in a pocket or backpack – making it easy to access anywhere in a park.

Given the increasing pervasiveness of mobile devices, it is imperative that NPS rethink how content/information is presented so it is both useable and readable on a range of mobile devices. It is important to note, that this is different from "converting" content from a traditional website to a mobile application/format. It requires starting with the mobile user in mind. It means simplifying the user interface and streamlining the content for easy understanding and readability. It also requires a willingness to ensure that content be up-to-date and engaging to sustain the interest of the user.

The Strategy should also focus on ways that park visitors can deepen and extend their learning experiences. For example, parks should enable visitors to share photos, blog about their experiences, ask questions of experts (Park Rangers as well as the larger community), and engage in discussion about key issues relevant to park themes. These experiences should all start from the perspective of a user accessing this capability with a mobile device.

4.2 Develop an exemplar of mobile technology tools for learning—Given the widespread use of mobile devices, NPS should develop a suite of easy-to-use tools to support park-based learning experiences. For example, NPS should support the development of one or more apps that work on multiple platforms and include: a Star Gazer chart to identify constellations, a magnifying glass, and flora, fauna, scat, track, animal call, and flight pattern identification tools. Many of these tools already exist, but they could be bundled into a free or low-cost application entitled The Mobile Ranger Backpack App. [Please see APPENDIX at the end of this White Paper which will give the reader more examples of mobile apps that have been developed by NPS and other outside organizations.

4.3 Stimulate thematic collaboration across parks—The subcommittee believes that a significant opportunity exists for NPS to create several collaborative partnerships between parks that address similar interpretive topics and themes. Efforts associated with the Civil War Sesquicentennial Series represent a great prototype which brings together parks related to the "Civil War to Civil Rights" theme under a web-based collaborative platform to share resources, stories, photos, etc. This web interface enables visitors to a specific battle site to better understand how site-specific history fits into the overall context of the entire Civil War. Similar thematic efforts could be launched around themes like: America & Civil Rights; Mountain Ecosystems and Cultures; Water (ocean, river, lake) Quality and Quantity; Immigration; and many opportunities around Flora and Fauna (including native and invasive species). The possibilities are endless. Thus, the subcommittee recommends identifying a few (perhaps 3-5) initial, high visibility themes that would leverage multiple parks and be of interest to visitors.

NPS or its affiliated NPS Foundation should encourage this approach by providing competitive funding for parks that are working collaboratively. These partnerships would identify resources that support the educational themes across the parks, and leverage collaborative tools to enable students, teachers and general park audiences to participate in the conversation and deepen their experience. Collaborative efforts like this move NPS beyond what can be achieved by one innovative park or a lone ranger. Collaboration builds capacity for the whole system. Opportunities for rich international collaborations should also be supported.

4.4 Support technology development—NPS needs to expand its capacity to be a tool builder not just a simple user or integrator of existing technologies. To truly address the learning needs of a wide variety of learners, it may be necessary to create new technologies (mostly software) that do not currently exist. It is not good enough to focus exclusively on mobile app development. It is critical to explore new sensor-driven technologies, new video conferencing possibilities, and new bundling of existing tools. NPS should learn from others who have developed exciting new applications, establishing partnerships to adapt these tools to meet park needs. In addition, NPS needs to have a strategic plan for technology that sets the course for these development activities. Without a viable plan, tools may reinvent what has already been developed elsewhere within the park system, or the tool may be too specialized to one site and not generalizable to a cross-section of sites.

4.5 Develop a framework for emerging technologies for learning—NPS should create a framework that illustrates how parks can integrate new technologies into learning opportunities. It should suggest paths and a timeline for how to get from very little technology to the suggested baseline services in this document. It should suggest how a park can move from the baseline services to aspirational services. It should even suggest how to expand the aspirational services over time. This framework should consider what personnel expertise, financial investments, technologies, and learning practices are needed. It should suggest challenges for the process and opportunities to leverage. This framework could live on an NPS website, could be downloadable for printouts, and professional development courses could be developed to support it.

4.6 Deploy technology that supports large-scale data collection from park users—NPS should partner with other nonprofits and government agencies that are creating educational efforts that use students and others to collect data. For example, National Geographic Kids organizes “Hands On” science experiments. Rather than having each park develop water quality experiments, it would be better to encourage collaborations with these national and international efforts and empower kids to collect data from parks as well as at school and home. This would create “big data.” Another example of this is how students are now using tools like Google maps to quantify deforestation in Borneo and other rainforests around the world. The students use authentic data to learn about specific topics and draw conclusions. These partnerships should be explored from NPS headquarters and promoted to relevant parks to encourage collaborations.

5.0 Summary Recommendations

The subcommittee has identified several key and emerging technologies that are directly relevant to enhance visitor national park experiences. Since these technology tools are ubiquitous, it is imperative that NPS consider how content and information can be presented to engage visitors during all stages of their park experience (e.g., prior, during, and after their visits). This content needs to be useable and readable on a diverse set of technologies. It also requires a willingness to keep content up-to-date and engaging to sustain the interest of the user. In addition, the integration of technology throughout NPS will require a comprehensive approach to ensure that the effort is both scalable and sustainable over time. It should be noted that addition to the education value, there are likely a range of other technological benefits coming from areas such as security, transportation, law enforcement, crowd control, ticketing, etc.

This subcommittee understands that to reach the services outlined in this report the following needs to be considered:

- more financial resources need to be allocated,
- more professional development opportunities need to be offered,
- more in-park technical support needs to be available to all parks, and
- technology leadership needs to be established at the highest level of the NPS.

6.0 Conclusion: Exemplar Scenarios

The following exemplars illustrate the committee's recommendations regarding baseline and aspirational virtual services for NPS. The scenarios presented are fictitious, but knowledge of current park issues and challenges were incorporated as feasible. The scenarios illustrate how parks could go from one level of technology use and development to another. The exemplars are meant to be descriptive not prescriptive, illustrating sample pathways NPS sites could take in the future.

EXAMPLE SCENARIO 1: GLEN CANYON NATIONAL RECREATION AREA (GLCA)

- Lake Powell makes up 13% of GLCA's 1.2 million acres.
- The lake's shoreline—all 1,900 miles of it—provides boaters, anglers and campers with access to unparalleled outdoor recreation opportunities.
- Cultural sites like Defiance House attract as many as 60,000 visitors per year.
- Three Roof Ruin has been closed to the public, yet it is clearly marked on all maps. This site continues to experience damage to structures, the destabilization of rock walls, poor sanitation, and ubiquitous graffiti.
- Max King, the former chief of interpretation, indicated that once boaters are "on the lake with their camp set up, they are extraordinarily welcoming. Catching them at the boat launch is another story…"
- Managers have expressed concern that the prevailing "public mindset" about what the park experience is all about hinders the park's ability to protect cultural resources. Redefining the "visitor experience" in new ways may be an important first step.
- GLCA is at the top of the list of NPS sites due to commence work on a new General Management Plan (GMP).
- Park employees conduct scheduled and opportunistic monitoring of cultural resource and paleontological sites. Partners like GRIT (a graffiti removal team) and the Old Spanish Trail Association provide site monitoring and restoration support.
- The LAKE Rangers program, first piloted in summer 2011, placed interpretive rangers on the water in a houseboat retrofitted as a "floating visitor center."
- The park is exploring how best to communicate resource protection messages to concessioners, boat renters and private boat owners.
- In 2010, the park celebrated the 100th anniversary of the establishment of Rainbow Bridge National Monument. In conjunction with this event, members of the five affiliated tribes gave presentations and provided oral history interviews.
- In 2012, David Rankin, a park intern, scripted, filmed and produced a video highlighting the significance of GLCA cultural resources and the need to protect them.

GLEN CANYON: NO TECHNOLOGY TO BASELINE

Page, Arizona, serves as the gateway to Glen Canyon National Recreation Area, Rainbow Bridge National Monument, Glen Canyon dam, and Lake Powell. Page provides park visitors with retail, restaurant and hotel accommodations. Access to big city amenities, however, including technology resources, is limited. WiFi and cell phone reception is poor in this area. Visitors to Carl Hayden, Wahweap and Bullfrog Visitor Centers may encounter spotty cellular service, low bandwidth, and limited access to online resources.

Boat owners frequently find themselves waiting in line at zebra mussel inspection stations. There's no hiding the fact that they are eager to launch their boat and claim their favorite campsite. As the wait drags on, these bored boat owners could tune into the park radio station, but using the Internet to access park videos, maps, lake condition reports, or interpretive content isn't an option. Truth be told, even if these virtual information scouts were sitting at home in front of their computer, they wouldn't find much online content to increase their understanding and appreciation for Glen Canyon resources or to help them with their trip planning efforts. The boat launch represents the official start of their voyage. These visitors will spend one week or two weeks on Lake Powell, but they cannot take pictures, upload them to Facebook, and share the excitement with their friends. They are in a virtual black hole, and the park knows it.

With leadership from the superintendent's office, the park undertakes an inventory of their communication technology infrastructure, products and services. They assess visitor access to park-sponsored social media, webpages, Facebook, Twitter, blogs, podcasts, YouTube videos and video-conferencing opportunities. They map out cellular and WiFi availability in Page, in surrounding communities, and throughout the park. They conduct an inventory of GLCA's web footprint, categorizing the information that exists on the web and who's providing it. The park realizes that technology supports place-based learning, so the interpretive staff explore strategies to provide local students with technology-enhanced park experiences and service learning opportunities. The management team reaches out to local partners, historical associations, boat owners and diverse stakeholder groups to catalogue their technology needs and interests. Meanwhile, an in-house team of tech-savvy employees compiles a listing of existing and emerging technologies, including innovative hardware and software applications. They cross-check to see which technologies Glen Canyon is currently using. Since the list of unused and under-utilized technologies is lengthy, they prioritize technologies for possible adoption, cite pros and cons for each, outline selection criteria, and make recommendations for a phased-implementation approach.

There are somber moments during this technology assessment—moments when the whole team takes a deep breath and gulps hard. Glen Canyon seems impossibly remote, impossibly spread out, and impossibly behind the curve. How can they bridge the gap and emerge as a model of innovative technology use for the 21st century? Well, that's a problem for another day. For now, Glen Canyon earns recognition as the first NPS site to include a comprehensive technology inventory in their GMP planning process! Way to go, Glen Canyon.

GLEN CANYON: BASELINE TO ASPIRATIONAL

Building upon their successful technology assessment, Glen Canyon is now compiling data like a fiend. Information about technology services, usage and programming within the park and in park-proximate areas is stacking up. They are exploring how baby boomers and millennials (and everyone in-between) use park technology. Having made a "GMP pledge" to increase the role of technology in park operations and outreach, they tackle this challenge using a multi-pronged approach:

• They create "virtual visitor services zones" at all visitor centers, marinas, lake access points, and community portals, extending the reach of cellular and WiFi services, and increasing bandwidth. In their minds, all of this is prelude to eventually providing Internet access at various "uplake" and "downlake" hotspot locations. They envision "on the water" Internet access that radiates outward from the LAKE Ranger houseboat(s). By providing the only place to check email, access Facebook, and get baseball scores for miles around, they will increase opportunities for interpretive outreach—come for the link up, stay for the program! Knowing how important WiFi access is to visitors, Glen Canyon also takes great pains to inform visitors—especially boaters—about what's available where technology-wise within the park and in park-proximate areas.

• They provide technology-enhanced interpretive experiences—using technology to make the meanings and significance of park resources come to life for onsite and offsite audiences. Glen Canyon also produces a technology-based "welcome mat" for those visitors (e.g., boaters and backcountry users) who bypass visitor centers and information desks.

• They provide technology-enhanced educational experiences—using technology to facilitate place-based learning while helping learners of all ages grasp abstract concepts related to ecology, hydrology, energy production/consumption, cultural landscapes, and cultural resources.

• They designate a Social Media Park Ranger (whom they lovingly refer to as the Tweetster) to facilitate park engagement with "web 2.0" content and capabilities.

• They produce a steady flow of articles, blog postings, webinars, images, videos, podcasts, lesson plans, announcements, oral histories, interactive maps, and related content to "beam out to the world"—yes—but they also use this content as the basis for two-way dialogue, community engagement, and community building efforts. The more they adopt the "post and engage" approach, the more their content is "liked" and responded to. Interestingly, user-generated content seems to increase in proportion to the amount of "liking" going on.

• They use technology to build a stewardship coalition among concessioners, tour operators, boat owners, boat rental companies, marina owners, and corporate sponsors like Cabelas, Bass Pro Shop, and Outdoor World.

• They launch a social media campaign, calling attention to the need for cultural resource protection, recognizing businesses and organizations that implement targeted education and outreach initiatives, and eliciting stewardship commitments through a culturally-themed Leave No Trace campaign.

• They engage repeat visitors and local audiences in meaningful ways, using technology to deepen their connection to park stories and themes, to provide a forum where they can share their own Glen Canyon experiences, and to mobilize participation in citizen science initiatives.

• They produce a mobile app to assist with wayfinding and navigation on Lake Powell. Since they're on a roll, they produce another app—this one interactive! ResourceTrackr facilitates the compilation of monitoring data for cultural and paleontological resource sites. Since the app is a free download, all interested visitors can conduct field assessments and share their data with the park. The app taps into a latent desire. As it turns out, visitors want to give back to the park. They want to make a difference for visitors today AND for their grandkids tomorrow! The app is wildly successful. So much so that the park now offers 15-minute app training sessions at various boat launches several times a

day. Maybe the app's popularity is further fueled by the fun incentives that were built in for the various levels of participation? Collect more data, get more clues to solve this week's puzzler. Solve the puzzle and win!

- Finally, they make full use of professional development opportunities—signing park employees up for technology training every chance they get. They also ferret out fabulous online tutorials and discussion forums. And, in all honesty, they dabble a bit. Their foray into the web 2.0 world elicited an initial rapid response. No one did a bigger double-take than Glen Canyon when lake users who, until now, were silent constituents 11½ months a year, participated in park social media year-round. There is a burgeoning sense of good will. It is palpable.

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To make good on their GMP pledge, Glen Canyon did not shy away from a single technology challenge. At first they were intimidated by the steep learning curve. But now they realize that if they lack the technology know-how in-house, there are 20-somethings galore with the needed expertise. Building on the success of their 2012 videographer intern, David Rankin, they recruit more seasonal employees with technology skills.

Looking back, there was an awful lot of hand-holding. The Tweetster has the patience of a saint. In fact, the management team dubbed him "Saint Tweet." It caught on. Gradually the "social media way of communicating" became second nature, just like the informal contacts they engaged in so readily at the beach, the marinas, and the overlook. Even more amazing, before their technology renaissance, they faced a nagging problem related to the "prevailing public mindset." Some visitors seemed more interested in carousing and drunkenness—as evidenced by the boat at the marina named "Sotally Tober." Managers didn't have effective strategies for reaching lake users with resource protective messages. That was the rub. Amidst the technology changes, almost unlooked for, park culture changed. Now the prevailing public mindset is one of engagement. Maybe it's because the Tweetster got everyone thinking about Hoover Adam's newspaper…

During a staff meeting, the Tweetster took five minutes to tell a story: "Hoover Adams runs a small town newspaper in Dunn, North Carolina. I read about him in Heath and Heath's book, Made to Stick. His paper serves up local news to 14,000 residents. Amazingly it boasts the highest market penetration of any newspaper in the country (112%) with 15,680 subscribers. Think about it. More people subscribe to the Daily Record than live in the town where the paper is printed." The Tweetster pauses, then voices the question on everyone's mind: "How does Adams do it?" He continues, "The Heath brothers attribute his success to his unwavering pursuit of his mantra: 'Names, names, and names.' In fact, according to Adams, 'The main reason anybody reads a local newspaper is for local names and pictures. That's the one thing we do better than anyone else.'"

Somehow, without quite expecting that it would happen in this way, Glen Canyon's technology improvements created a new way for people to connect to the park, a new way for people to connect with each other, and a new way to foster ownership and empowerment. Pictures and stories and tweets and blogs and re-tweets and Facebook postings and Flickr photo uploads and, you name it, user-generated content about people doing fun things at Glen

Canyon appeared everywhere. The park captured a huge amount of the boating, hiking, sunbathing, swimming, paddling, camping, lounging, toasting, hugging, smiling—and even the bedhead shots with one-eyed grimaces—on its social media sites. Increasingly, cultural resource monitoring was featured in smiling photographs! Decreasingly, pictures of freshly inscribed graffiti appeared online. That was just what the park needed to change the prevailing mindset, to foster culture change. Glen Canyon is thrilled with these positive outcomes. At the risk of being a bore, they want all their partners, indeed, they want every-one in the whole park system, to share in their success. They are giving this one a good run…

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GLEN CANYON: BEYOND ASPIRATIONAL

At a regional meeting of superintendents, following an outstanding presentation by the Glen Canyon superintendent and deputy superintendents, someone in the audience asks, “What was the key to your success?” Without hesitating the superintendent replies, “The change happened when we began to plan every project with mobile access and applications in mind. Admittedly we didn’t do this at first. But after a while we noticed how much communication was happening between visitors about the park. Ninety percent of the postings related to their personal experiences onsite, but a steady 10% of a growing number of posts could be linked directly to park interpretive themes. The word was getting out about our resources—their pricelessness and their imperiled state.”

The superintendent explains, “We reasoned that if we could get enough activity on these technology channels, then the 10% of resource-relevant posts might just hit a threshold, a tipping point where enough people cared enough to say and do something that the momentum would shift in our direction.” He paused, remembering the day when the whole technology team sat down. They poured over every aspect of the park’s infrastructure, operations, programs and services, looking for ways to do what they did using technology devices and technology partners.

“There was a eureka moment. We realized we could develop a mobile technology tool to foster learning and stewardship. We could engage visitors and local residents in citizen science and make it fun and interactive! The positive local response has enabled us to strengthen our education and outreach partnerships with schools and numerous commercial service providers.” He further warms to his topic, “It’s like a positive feedback loop—that one app created a tremendous shift in our internal thinking, while also opening doors for collaboration at the local level and beyond. In fact, our app is being customized for use at other Colorado plateau parks. They’re using our app, but we’re using some of their educational products that tie in with our park themes. There’s more collaboration than ever before, perhaps because these technologies are so portable and adaptable. Come to think of it, it’s not just the visitors who are talking more, park managers are talking more too. It took an app to do it.”

After this meeting, the superintendent heads east to attend a meeting in Washington D.C. convened by the National Park Foundation. Technology innovators were being brought in from around the country to discuss "an NPS mobile learning strategy." The superintendent knew that a successful mobile learning strategy could not emerge if the focus was on revam ping existing products for use in a cross-platform environment. Nope. Mobile technology was a game-changer. The crux would be to always start with the mobile user in mind. Then again, maybe that wouldn't be the crux. He felt certain the conversation would get real interesting when they discussed developing a framework that illustrates how best to combine technology and learning.

The superintendent knew that building the framework would require a thorough grounding in learning theory. They'd also have to consider what expertise, technologies, learning practices and financial investments were needed. The framework would have to be clear, concise and free of jargon; after all, they wanted it to be downloadable and suitable for printouts. In the end, there would be no way around it. Embedded in the framework would be a learning curve. He gingerly recalled his own experiences with that learning curve. It wouldn't be easy, but with coaching, professional development opportunities, and numerous helpful examples, he was confident the agency would make the transition to today's and tomorrow's technology. It's rewarding, he thought, to be part of something that "peoples the landscape" and fosters more and better collaboration. With adequate technology leadership at the highest levels in the NPS, he knew this shift would happen. We just need to reach the threshold…

BROWN V BOARD OF EDUCATION & CENTRAL HIGH SCHOOL: NO TECHNOLOGY TO BASELINE

It's true, one visitor did make a powerful distinction between "history" and "legacy" when she said: "We tend to simplify things, and with an exhibit like this, it helps explain things… This is part of our history in Little Rock, but it doesn't have to be our legacy. Our legacy is that we move forward, but we need to always remember that this is part of our history" (Focus Group 10). Even so, the superintendent frowned. It's not so much that the evaluation results are a surprise. The pursuit of civil rights is evidenced on every panel in that 3000 square foot exhibit hall, from the Jim Crow South to those initial lawsuits, from separate but equal to Brown v Board of Education, from the Little Rock Nine to the 101st Airborne, from sit-ins and freedom rides to mob violence and soldier escorts, from school closings to the Women's Education Committee, from Daisy Bates to Congressman John Lewis. But all the touch screens, exhibit panels, interactives, listening stations, oral history recordings, historic photos, media clips and artifacts funnel down to "Exhibit 19B." That lone touch screen signals a lost opportunity:

> I'm not leaving with [civic engagement know-how]—except for the far right panel near the desk. That's the one [place] I would say that 'This is to get people to change or to get active to change society.' The rest of the exhibit I took as historical reference. I'm still learning about something that took place in the past until that very last touch screen. 'Oh, so this is the interactive for the future: You can go out and change the world.' It wasn't a strong feeling. (Focus Group 7)

She did what she'd been doing a lot lately, she picked up the phone and dialed Topeka. "Hey Robin, what's up?" Dave's upbeat voice always fortified her resolve. "Dave, we've been talking about civic engagement. We agree that wrestling with historical realities is necessary but not sufficient to get folks engaged in citizenship behavior. Remember the distinction in Westheimer and Kahne (2004) about three types of development outcomes: personally responsible citizens, participatory citizens, and justice-oriented citizens? Our sites commemorate justice-oriented citizens—plaintiffs who challenged an oppressive legal system, students who acted courageously to attain equal educational opportunity, and activists who gave injustice a name and a face and a place on the map."

Robin continued, "I've got a visitor center that chronicles events and tells inspirational stories, but it doesn't provide opportunities for personal development. As one visitor observed, it's all historical reference. In a sense, it's all preamble." Dave warmed to the topic, "You know, while you've been reading research reports, I've been devouring How Children Succeed. The author argues that scholastic achievement contributes less to future success than does good, old-fashioned character. He says perseverance, curiosity, conscientiousness, optimism and self-control—this is what success is made of." Robin perked up, "Well, our sites drip character—now we just have to drip it into their mouths." She recanted, knowing that wasn't how it worked. "No, it's really a matter of engaging audiences in a learning process, helping them gain the requisite experiences, skills, and character. But how?"

Dave and Robin did a mental inventory. What programs did CHSC provide to foster civic engagement? Did they facilitate immersive experiences, skill acquisition, and character development? What about BRVB? Robin highlighted their Youth Leadership Academy that provides leadership training for nine high schoolers each year. Robin noted the program is successful in part because the youth are active in planning and program implementation. Dave listed

their Dream Rocket Project that brings kids from local Boys and Girls Clubs to "Camp Brown v Board." The kids learn about the Civil War, think about the struggle for civil rights, and explore ways to "keep the dream alive." Also, both sites were engaging young people by hosting school fieldtrips, conducting school outreach programs, and providing a Junior Ranger curriculum for various age groups. They'd also had some success hosting poetry slams, challenging teenagers to crystallize their messages and hone their communication skills. Indeed, once these young men and women find their voice, they stop you in your tracks. They listed all the guest speakers, panel discussions and documentaries they had hosted onsite. In retrospect, it seems like it was the "facilitated dialogue" portion that engaged audiences the most.

They looked at their list. There was a lot happening, but it was disconnected. Then Dave suggested they make a second list, "Let's brainstorm the ways that technology connects audiences to our sites and to each other. Let's list what we currently do and what we could do…" Robin warmed to the task, "Well, we both have park-wide internet access, though bandwidth is a problem. We have audio description available for those with visual impairments." Robin reflected on her site's listening stations. Visitors would sit, ears intent upon the audio recordings, eyes glued to the video screen, totally absorbed in oral history content for 30-40 minutes at a stretch. They would gaze out the window to Central High School in the distance, reflecting on the experiences people shared about the past. "You know," she said, "we could make our oral history archives available 24/7 via hand-held devices. Since technology gives voice to diverse communities and perspectives, we could use technology to add more voices to the dialogue, to include more perspectives." Dave added, "We could also provide interactive forums for communication and exchange—get visitors talking with each other about their learning and how it's relevant to their lives." Robin worried about how messy all this dialogue could get. After all, people hide behind avatars. When they're online, they don't look each other in the eye. "We'll have to curate these e-discussions," she said. "It will require a whole new skill set for our staff."

Suddenly Dave's thoughts took him in a totally different direction, "You know, we can use technology to build on our strengths. We have thought-provoking exhibits, but in all honesty, it's not the job of exhibit panels to facilitate character development. Exhibits are static; character development is an experiential process. But what if we included a QR-code overlay to our exhibit areas? Why not provide a way for visitors to instantly access additional information for any topic they're interested in? Why not provide visitors with instant access to the flow of dialogue about a topic they find to be thought provoking or emotionally compelling? Why not give them a chance to share their thoughts and experiences at that moment?"

Robin suggested, "If visitors want to make a comment, snap a picture, or tweet about their experience to their friends, we could give them a park-sponsored route to Facebook, Twitter, or Flickr. They can beam their content out to their social networks, and we can capture it as part of the park's public engagement stream. This QR zone could plug into a hub for two-way communication. Visitors and partner organizations could dovetail their information into the mix, enriching the content." Dave added, "We can package all this functionality in an App that's easily downloadable onsite and offsite, giving them multiple points of access—the park's website, place-based QR codes, and an App that free floats across all these platforms. Through these mechanisms we can use technology to help people of all ages visualize abstract concepts like freedom, oppression and courage. We could also seed this dialogue platform with questions linked to our program goals and objectives. We can use technology to assess in what ways, to what extent, and under what circumstances our technology users demonstrate awareness, reflection, ownership, empowerment and civic engagement outcomes. We'd only capture a portion of our park audiences—but it would probably be an ever-increasing portion! Plus, we'd have a way to actively reach out to Millennials." Robin thought about the photo-sharing craze and wondered, "Maybe we can add a meta-data layer to the App's image sharing feature to capture who's sharing these images and why. We could use this information in focus groups to explore the precursors to and the impact of visitor experiences onsite,

focusing on experiences of both the networked and unplugged varieties."

They paused, grinning into opposite ends of the phone line. This was starting to sound like a robust strategy to enhance learning outcomes, strengthen public engagement, and integrate meaningful evaluation into day-to-day operations. It was also a bit overwhelming. But creative juices were flowing, and apparently there was no stemming the tide. Robin, reflecting on the potential of real-time engagement to be transformative, asked: "Why not provide visitors with virtual access to opportunities to gain skills and become civically involved? We host some developmental programs and activities, but our partner network hosts many more. Visitors could access these developmental opportunities through our virtual hub. Imagine if visitors could respond in real-time to all that rich oral history content and take an immediate next step toward public involvement..." A moment passed, then Dave articulated yet another transformative option: "Robin, we could link our sites. Not just our two sites, but all the sites that relate to civil rights or the African American experience. Through technology we can create something that transcends site boundaries. We can engage people more comprehensively with the broader set of people, places, events and ideas that characterize the whole civil rights movement, and by extension, America's quest for freedom, equality and community." Robin asked, "Are you suggesting we construct a virtual themescape—an electronic environment where geography and chronology are a piece of the story, but where ideas and influential factors and the indomitable human spirit are organizing frameworks too?" These ideas resonated. They realized that technology could unlock this potential. They knew they had to get started right away or lose the moment…

BROWN V BOARD OF EDUCATION & CENTRAL HIGH SCHOOL: BASELINE TO ASPIRATIONAL

After this impromptu brainstorming session, Central High School and Brown v Board of Education began compiling technology information. They documented technology infrastructure and virtual programming in their parks and in park-proximate areas. They mapped out their web footprint, compiling information that exists on the web, and pinpointing who was providing it. They established a baseline, and grimaced. It wasn't pretty. Wikipedia, nps.gov, about.com, law school and history websites, and a few class reunion pages—except for some cool historic video footage for Central High School, there wasn't much to draw in a digitally-oriented audience. Although park interpretive themes were relevant to all the school age kids they worked with, these digital natives were not engaging park-related content online. Even if they had wanted to, they couldn't. There was a dearth of it out there! Dearth sounds like dirge sounds like…

They snapped out of it. "We need another list," Robin urged. "We need to match up target audiences with core messages, innovative programs with leadership development strategies, and technology that's in place with technology that's itching to be developed. We need to figure out which threads run through all these match-ups." They pulled together a larger planning team that included staff, cooperating association, Harpers Ferry Center, non-profit and university partners. They updated the team about the deliberations thus far. They facilitated several rounds of large group brainstorming, clustering and prioritization. In the end, the team recommended that technology development proceed along three main tracks: the Dream Rocket Project, the Youth Leadership Academy, and the exhibit/web interface. The team also emphasized using mobile technology to enhance learning outcomes, promote civic engagement, and incorporate evaluation strategies. Robin and Dave grinned at each other when they saw the team roll up their sleeves in unison!

Through Dream Rocket, the Youth Leadership Academy and the exhibit/web interface, the parks partnered with kids, teachers, schools, parents, and community groups. They partnered with teachers to develop flip lesson plans that had students delving into web-based, interacti

content in the evenings and discussing what they'd learned in the classroom during the day. Teachers actively probed for understanding, enlarging the students' frame of reference and challenging them to translate insights into action as feasible. Every lesson tied into state curriculum standards, so teachers began to freely experiment with the materials. The teacher-student-park partner team identified dozens of ways to integrate web 2.0 capabilities into programs, classroom lesson plans, and exhibits. They incorporated content, links and features available through the NPS education portal. The focus was on providing opportunities for young people to post and respond to user-generated content, to respectfully engage multiple points of view, to participate in give-and-take dialogue, to creatively address societal problems, and to reflect upon their learning and development. The focus was also on developing webpage, QR codes and App content—and then seamlessly integrating these elements to achieve multi-platform capability. The parks were buzzing…

In Topeka and Little Rock, youth took a leading role in developing programs that fostered yearlong, planned sequences of immersive experiences. Youth who had previously participated were recruited to serve as facilitators, mentors and role models for the next group, thus extending the learning and development timeline for these youth leaders. They ensured that learning encompassed in-class and outside of class experiences, that it included real-world and virtual components. Focus groups with youth and families revealed a progression from awareness to reflection, from reflection to behavioral intentions and commitments, from fledgling behaviors to a bourgeoning sense of ownership, and from ownership to empowerment. All this occurred despite the fact that these schools didn't have the 1:1 student-to-computer ratio that many school districts had been touting. Like Central High School, some of the schools banned cell phones, pagers and mp3 players during regular school hours. Nevertheless, through program participation—and participant outreach—students of all ages and backgrounds began using their mobile devices to engage park themes both onsite and offsite. Youth commentary appeared on Facebook postings, in blog entries, and via tweets, re-tweets and collaborative wikis. Youth participants uploaded photos to Flickr and videos to YouTube. More importantly, uploads captured through park-sponsored channels contained meta-data that revealed the who, what, where, when and why of the posting. The majority of student postings related to specific curriculum objectives, interpretive themes, and developmental sequences—and they had data to prove it!

BROWN V BOARD OF EDUCATION & CENTRAL HIGH SCHOOL: BEYOND ASPIRATIONAL

Dave and Robin were on the phone again. They were taking stock and planning next steps. They had a lot to be proud of. Their staff, partners, teachers and youth leaders had pulled together around a civic education/civic engagement theme. They had embraced a vision for technology-facilitated learning and development. They had experienced first-hand how technology could energize learning. They had seen technology transform the park experience for a whole generation. And they were keen on sharing this vision and the lessons learned with others.

The superintendents realized that an immediate next step was to expand their distance learning capability. They had done some research into on-demand electronic field trips. The National Park Foundation made these field trips available to schools, but currently there were only 14 of them archived on the NPF website. So, Dave and Robin decided to host several e-fieldtrips, making sure that the fieldtrip participants had full access to their web interface components. They worked with university partners to evaluate the on-demand electronic fieldtrips, paying particular attention to effectiveness of the web interactivity. Based on the research results they did some fine-tuning. It wasn't long before their on-demand fieldtrips were archived on the NPF website. At long last, they geared up to tackle their last big challenge!

Robin and Dave called more than twenty civil rights and African American experience parks. They came to understand each superintendent's desired future visitor experience. They learned about each site's partnership efforts, the challenges they faced to accomplish their management objectives, and the role technology played in their programming and outreach. These superintendents echoed many of the challenges that Robin and Dave had stewed over so long ago. Dave knew there was no magic wand. Robin knew there was no cookie cutter solution. But Robin and Dave shared their experiences with technology and education partnerships at their parks. They talked about teacher, school and youth involvement. They highlighted their career development, youth leadership and civic engagement focus areas. They shared how the exhibit/web interface approach had transformed the onsite visitor experience for those visitors who wanted to engage electronically. And they weren't shy to talk about their evaluation results either. Eventually they would mention the possibility of a virtual themescape that encompassed all the civil rights and African American experience parks. Each time they felt surprised and grateful when their colleagues expressed genuine enthusiasm and support. But they all knew this couldn't happen without high-level support and adequate levels of funding. A consensus began to emerge from these phone calls, and the dynamic duo got busy.

With mini-grant funding, Dave and Robin convened a scoping and planning meeting with representation from the parks, Harpers Ferry Center, the regional office, the Washington Office, and the National Park Foundation. They also worked with Harpers Ferry Center to create a professional networking site for their newly-enlarged team. They explored ways to provide networking capabilities beyond those available through Facebook and sharepoint pages, including, for example, sites with Ning-based platforms like Classroom 2.0, Museum3, and GovLoop. During phone conversations, everyone zeroed in on an initial obstacle to overcome if these parks and service centers were going to create a civil war to civil rights virtual themescape. To engage the public with web 2.0 capabilities, the parks needed first-hand experience and competence with these technologies. Not all superintendents and chiefs had to become tech-savvy, but they all had to understand the transformative power of this medium. Really understanding the transformative power of any phenomenon is an experiential process. To their credit, these superintendents said, "Sign me up!"

The phone rang. Dave answered, with usual good cheer. "Hey, Robin! What's up?" Robin had been reflecting a bit and wanted to share her thoughts. "You know, everything that has transpired, and that's about to transpire, is good news for park audiences. Our parks will be more accessible and more engaging to more people than ever before." Dave chimed in, "Yup! Our learning and development outcomes are at their highest levels ever. I talk to kids with sky-high career aspirations, a highly-developed character, and a whole-hearted pursuit of civic stewardship. They will need these qualities to succeed in the future; but more than that, society needs them to have these qualities for our future well-being." They had seen these results on the micro-scale. They could only imagine what the results would look like when youth and families had access to sequential, immersive, interactive, and cohesively developed opportunities that transcended park boundaries, indeed, opportunities that united large swaths of the park system.

Robin had been glancing through one of their lesson plans about the Little Rock Nine, "Dave, did you know that the Chinese have two meanings for the word 'crisis'? 'Opportunity' and 'dangerous opportunity.' Ha! I think we've weathered a crisis and discovered the power of dangerous opportunities."

APPENDIX- APPS CREATED BY NPS AND OTHER ORGANIZATIONS

NAME	PRODUCED	LINK	DESCRIPTION
Visit America's National Parks	Selectsoft Publishing (App - Jan 17, 2012)	http://www.amazon.com/Selectsoft-Publishing-Visit-Americas-National/dp/B006YW4NDI/ref=sr_1_19?s=mobile-apps&ie=UTF8&qid=1350673417&sr=1-19	Visit America's National Parks allows you to take a fun video tour of America's National Parks. Explore fantastic Niagara Falls, discover the Everglades by airboat, ride over the Grand Canyon, wander Monument Valley, and more. Read along with the text as you watch the videos and then take a fun quiz to find out what you've learned. The innovative videobook format is intuitive to use and lets you quickly navigate with the swipe of a finger. Whether you're planning a vacation or just want to take a virtual trip across the United States, this app is a fun way to see some of the nation's most popular places. Visit Niagara Falls, Everglades, Grand Canyon, Zion National Park, Bryce Canyon, Glen Canyon, Lake Powell, Monument Valley, Mesa Verde, Rocky Mountains, Colorado River, Yellowstone, Muir Woods, Yosemite, Waimea Canyon, and more
National Parks by National Geographic	National Geographic Society	https://itunes.apple.com/us/app/national-parks-by-national/id518426085?mt=8	National Geographic presents an award winning, new, beautiful, and interactive guide to twenty of the most-visited U.S. national parks with a new app for iPhone and iPad. Whether you are seeking inspiration and planning your next trip or you're looking for the ultimate in utility, National Geographic has everything you need to explore twenty of the most-visited U.S. national parks at your fingertips. Watch for updates as we continue to add more parks!
Fotopedia		https://itunes.apple.com/us/app/fotopedia-national-parks/id406969208?mt=8	See the US National Parks on your iPad, iPhone or iPod Touch. An extraordinary collection of 3,000 stunning photos by renowned professional photographer QT Luong.
National Parks Companion		https://itunes.apple.com/us/app/national-parks-companion/id343700430?mt=8	
National Park Finder	Tom Aude	https://itunes.apple.com/us/app/national-park-finder/id440438043?mt=8	Did you know that the National Park Service manages over 400 national parks, monuments, and historic sites? This handy application provides a directory of all of them as well as a graphical map (requires Internet access).
Your Guide To Hawai'i Volcanoes National park	MacroView Labs	https://itunes.apple.com/us/app/your-guide-to-hawaii-volcanoes/id354915289?mt=8	This handy travel companion gives you a world of information about Volcanoes National Park – use it before, during, or after your visit.
National Park Maps HD	National Geographic Society	https://itunes.apple.com/us/app/national-park-maps-hd/id407317095?mt=8	Explore 20 of the top U.S. National Parks with the best collection of trail maps available. National Geographic – THE place for maps – has opened up their best-selling, detailed Trails Illustrated National Parks Maps for download to your favorite Apple device. Plan your trip by browsing the maps and marking places you'd like to see. When visiting, use your iPhone or iPad to help you find your way around the park. A great gift app for your favorite outdoor adventurer, family trip planner or armchair explorer!

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Hiking Glacier National Park	TUA Outdoors LLC)	https://itunes.apple.com/us/app/hiking-glacier-national-park/id374769420?mt=8	For those who love the great outdoors and want to explore the amazing Glacier National Park, this application is for you. It provides easy-to-use day hike information for more than 70 hikes in the park.
Passport to your National Parks	Eastern National	https://itunes.apple.com/us/app/passport-to-your-national/id502307055?mt=8	A map feature provides easy access to the location of more than 1,000 Passport to Your National Park cancellation locations. Park listings identify the year and stamp type when featured on the annual Passport commemorative stamp sticker set.
National Park Foundation Photo Share	National Park Foundation	https://itunes.apple.com/us/app/national-park-foundation-photo/id551762236?mt=8	Share your pictures of the national parks on this app developed by the National Park Foundation. Our nearly 400 national parks stand, not only as a remarkable representation of America's natural and historical legacy, but also as a cherished playground for visitors young and old. A national park down the street or across the country, the land is yours to explore. Pictures uploaded from your device will be posted to the National Park Foundation website (www.nationalparks.org) for others to enjoy.
Camping to RV – Tenting to RV parks	Allstays llc	https://itunes.apple.com/us/app/camp-rv-tenting-to-rv-parks/id370820516?mt=8	Whether you're looking for RV grounds with full amenities or far-flung campsites for a rough getaway, Camp & RV has you covered."
Death Valley National Park – GPS Map Navigator	Flytomap	https://itunes.apple.com/us/app/death-valley-national-park/id322812036?mt=8	flytoMap provides complete, quick and easy to use map applications for navigation for iphone. Continues in the tradition of offering depth of information and functionality across expected places all over the world, exploring the map you get maximum details obtaining detailed information of each object on the map.
Canyon Country National Parks	Utah.com	https://itunes.apple.com/us/app/canyon-country-national-parks/id458028890?mt=8	Canyon Country is the region of America's West where you'll find some of the most scenic national parks in the world, and the Canyon Country National Parks App is your guide to discovering all that these national parks, monuments, and recreation areas have to offer.
GeoQuest National Zion Park	GeoQuest	https://itunes.apple.com/us/app/geoquest-zion-national-park/id312743122?mt=8	GeoQuest Zion National Park is the ultimate trip planner and guided tour for Utah's Zion. Use it to plan your trip, explore the park and remember your visit. GeoQuest Zion is a must-have for any Zion National Park explorer.
Chimani Great Smoky Mountains National Park	Chimani	https://itunes.apple.com/us/app/chimani-great-smoky-mountains/id438938488?mt=8	Over 270 unique points of interest (POIs) throughout Great Smoky Mountains National Park. A 60+ minute audio/auto tour, GPS-enabled/custom-made map which work without a cell/wifi connection, daily Ranger-Led events schedule, sunrise/sunsets data for over a year, 125+ photographs, 45 hiking trail descriptions, waterfalls guide, a special Safety section, and details on camping, bicycling, fishing, horse riding, restrooms, and picnicking.
Hiking Joshua Tree National Park	TUA Outdoors LLC	https://itunes.apple.com/us/app/hiking-joshua-tree-national/id402268827?mt=8	Joshua Tree National Park is a desert park in southern California. It includes amazing vistas, stark desert landscapes, and rugged mountains. For those wishing to hike in this beautiful park, this app is for you.

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Sierra Club Trail Explorer	Sierra Club	https://itunes.apple.com/us/app/sierra-club-trail-explorer/id513203949?mt=8	Sierra Club Trail Explorer is the only app you need to discover new places to enjoy the outdoors. Powered by AllTrails.com and building on the legacy of the Sierra Club's founder, John Muir, Trail Explorer provides an easy way to explore and enjoy the wilderness in your own backyard and across the country..
RV Park Finder	Waterfield Technologies	https://itunes.apple.com/us/app/rv-park-finder-powered-by/id449060020?mt=8	The RV Park Finder App is the perfect companion for your next trip. You can search RV parks and campgrounds for the specific details that every RVer wants to know– Wi-Fi, Pet Friendly, Hookups (water, sewer, & electric), Big Rig accessible and much more!
Geocaching	GroundSpeak	https://itunes.apple.com/us/app/geocaching/id292242503?mt=8	Unlock the exclusive coordinates and detailed information for nearly 2 million hidden geocache containers across the globe. Join the search for geocaches and the growing Geocaching.com community of families, urban explorers, and spontaneous outdoor adventurers.
Backpacking tips	Moonrise Labs	https://itunes.apple.com/us/app/backpacking-tips/id549736512?mt=8	Over 200 practical tips for wilderness backpacking from experienced hikers, backpackers, climbers, and mountaineers.
Shenandoah National Park – GPS maps navigator	Flytomap	https://itunes.apple.com/us/app/shenandoah-national-park-gps/id303986435?mt=8	FlytoMap provides complete, quick and easy to use map applications for navigation for iphone. Continues in the tradition of offering depth of information and functionality across expected places all over the world, exploring the map you get maximum details obtaining detailed information of each object on the map.
AAA Roadside Assistance	AAA	https://itunes.apple.com/us/app/aaa-roadside/id322490679?mt=8	AAA's legendary roadside assistance is available easily through this app. Avoid waiting on the phone and receive confirmation that the information sent to AAA is correct. Using the location of your iPhone a roadside assistance request is a few simple steps away. Select the type of breakdown and AAA assures your information is delivered to a local roadside problem-solving technician for quick response.
Nature viewing along the great Florida birding and wildlife trail	Natural Guides, LLC	https://itunes.apple.com/us/app/nature-viewing-along-great/id492774850?mt=8	Identify the birds, butterflies and flowering plants seen along the Great Florida Birding and Wildlife Viewing Trail and throughout Florida. Designed with non-experts in mind, this tool is perfect for young or novice nature lovers, visitors to Florida and more seasoned explorers. Child-friendly icons lead the user to beautiful color photographs
Wild Animal Quiz	Bremdal Radio & TV aps	https://itunes.apple.com/us/app/wild-animal-quiz/id395149387?mt=8	Wildlife Animal Quiz, is a guessing and learning game, where the goal is to select the right animal voice with the corresponding image. Wildlife Animal Quiz helps children to distinguish between the different animal voices and images and combine them.
Wikihow: how to and DIY survival guide	Wikihow, inc	https://itunes.apple.com/us/app/wikihow-how-to-diy-survival/id309209200?mt=8	Explore 140,000+ how-to articles from wikiHow, where you can learn "wikiHow" to do anything from the ordinary to the extraordinary

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MapMyHike+ GPS Hiking	MapMyFitness	https://itunes.apple.com/us/app/sierra-club-trail-explorer/id513203949?mt=8	Track and log your hikes, view elevation info, and build an online hike journal.
Nature Mobile	Alpha Blind Studio	http://naturemobile.org	Identify and explore Birds, cats, dogs, horses, trees, medicinal plants, wild berries & herbs, exotic fruits & vegetables, mushrooms
Compass Easy	EaseWare	http://www.easeware.net	Tools for exploring
iBird	What Bird	http://www.whatbird.com	Bird identification and information
Magnifying Glass with Light	Falcon in Motion	http://www.fivoca.com/itunes/app+developer/Falcon+In+Motion+LLC/402698692/	
NPS National Mall	National Park Service	https://itunes.apple.com/us/app/nps-national-mall/id447866739?mt=8	This is the official National Park Service app for the National Mall and Memorial Parks. On your next visit to Washington, D.C., use it to explore many of the most cherished cultural and historical sites in the United States—from the Lincoln Memorial to the White House. The app includes a total of 70 sites.
StarWalk / SolarWalk	Vito Technology	http://vitotechnology.com	Star gazing guide and 3D Solar System model
Survival	Wild Screen	http://www.wildscreen.org.uk	one or two player game app that will challenge and educate wildlife enthusiasts