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Deep Learning: Outreach to a Submarine Museum by Students, Librarians, and Professors

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Abstract: University faculty and students worked with the director of education at a submarine museum to provide outreach to an economically challenged area through enhanced visitor experience using interactive educational content. Located on the south side of the Muskegon Lake Channel, the USS Silversides Museum is host to the USS Silversides, a World War II submarine, and the McLane, a U.S. Coast Guard Cutter. Content included: the interactive "Shipmate & Remotely Operated Vehicles Oceanographer Programs", quick response codes and increased technology.

Keywords: Quick Response Codes (QR codes), Mobile Technology, Educational Technology, Visitor Experience, Interactive Education, Museum Education, Remotely Operated Vehicle Program, Submarine

Issue Being Addressed

The USS Silversides, a Gato class submarine, was built in California and commissioned December 15, 1941. Fourteen active patrols aboard this vessel occurred from April 1942 to July 1945 in the South Pacific and East China Sea. This highly successful surviving submarine of World War II received four Presidential Unit Citations. The USS Silversides is 312 feet long, 27 feet wide and it displaces 2400 tons submerged. "A Guided Tour: USS Silversides SS 236" in DVD format provides a comprehensive technical description of the equipment and operations onboard the submarine. The DVD is sold at the museum store.

The Mission of the USS Silversides Submarine Museum is to honor the men and women of the military, preserve military history and provide experiences that educate the public about past and present military history and technology (USS Silversides 2013, Current). Since 1987 the USS Silversides Submarine Museum, formerly the Great Lakes Naval Memorial and Museum (GLNMM), located on the south side of the Muskegon Michigan Lake Channel, has provided extensive information regarding World War II, submarines, the Cold War, and Great Lakes shipping. The museum has a wide range of exhibits and displays which relate to marine technology and the role of the U.S. Navy Submarine Service (USS Silversides 2012, Museum).

This nonprofit museum is unique because it is home to the USS Silversides and the McLane, a US Coast Guard Cutter. The museum allows visitors a chance to explore and stay on either of these vessels. Groups and individuals can take advantage of the USS Silversides Submarine Museum Overnight Encampment Program and stay aboard both the USS Silversides Submarine and USCGC McLane. Furthermore, the museum provides an underwater robotics program which provides children and adults with an opportunity to build, design and operate fully functional Remotely Operated Vehicles (ROV). This class requires no past experience with robotics, offering an option for both schools and families (USS Silversides 2012, ROVs).

An energetic, very involved management professor at Grand Valley State University recognizes and encourages talents in her students. Trevor has an interest in psychology of business; Emily shows talent with using technology and has a special interest in robots; Jesse, another technologically proficient student, likes museums. In a conversation with the director of education for the USS Silversides Museum about current and expanded museum activities, the management professor could see opportunities for all three of these stand-out students in a collaborative summer project with the museum. As library liaison to the business college and as the liaison to the Honors College, two librarians were invited to be part of this collaboration. The librarians visited the museum and toured the submarine. A follow-up visit occurred when a class

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of young students was in attendance for a lecture and hands on building of remotely operated vehicles. The librarians saw potential for ways to assist the university students and to provide educational content for the museum in the creation of two science activity booklets featuring submarines and remotely operated vehicles (ROV's).

For the university students this project was part of their final grade in a management course. One of the students even interned with the museum during the summer. Two of the students, accompanied by the librarians, presented project results at an international conference.

With current research pointing to the benefits of interactive learning (TED.com 2012) the museum saw the need to offer new applications to their current educational offerings. Students learn through creativity and engagement. In Denmark, which has one of the best school systems, play with a purpose is promoted (Friedman and Mandelbaum 2011, 141). "Most traditional approaches overlook learning through hands-on activities, although it requires a deep and practical knowledge of the thing one is trying to create, and it can alter one's personal investment in learning considerably" (Thomas and Brown 2011, 94). Furthermore, the museum looked to broaden its reach and offer these educational experiences to visitors not only in the brick and mortar location, but also online (TED.com 2012).

Learning Objectives

To significantly address the issues faced by the USS Silversides Submarine Museum in regard to improving the educational components of the visitor experience, it was discovered that a single solution was inadequate. In fact, a comprehensive three-pronged approach seemed to be the best means of addressing the issue at hand. The three prongs include creating a "Shipmate & ROV Oceanographer Program" that would provide both surface and deep level interactive learning (Higher Education Academy Engineering Subject Centre n.d.) for students; designing QR Codes to be placed around the museum; and delivering the newly created educational components to a larger audience through web technologies.

Shipmate AND ROV Oceanographer Programs

In conjunction with the workshops provided at the USS Silversides Submarine Museum, two new programs were developed for students ages 5 - 14. Junior Shipmates is a program to enhance learning about submarines in addition to the USS Silversides Submarine Museum workshops and instruction. The Junior ROV Oceanographer program promotes learning about how ROVs operate and how they are used. The program activity booklets were compiled with experiments, games, and facts to expand understanding of vocabulary and concepts such as buoyancy, water pressure, sonar, and communication systems. Some of the activities build on those taught at the museum; others provide further exploration of related topics to be completed in a classroom setting or individually by a student. Upon completion of a required number of activities, a student is eligible for a USS Silversides Submarine Museum Junior Shipmate certificate and/or a Junior ROV Oceanographer certificate recognizing their work. Each booklet has a resource list for further information (books, video clips) for students and teachers.

The museum has a lecture program in place to instruct students about submarines and remotely operated underwater vehicles with some historical content leading into current uses. The lecture is shared with classes of students before they build their own ROV as a group project and test it. Our contact with the museum is the Director of Education, Mark Gleason, who is also the Chief Marine Scientist for the museum. Mark discussed with us a need for more educational materials that could be used to enhance visitor experiences for children and youth. Classroom instructors were interested in expanding this one- time experience and introducing their students to related content. Activity booklets, patterned after junior ranger guides provided for children at numerous national parks in the United States, were created to meet this need. The booklets aim for a range of activities from an elementary school age child through more complex experiments

for older students up to the age of 14. Simple puzzles, word searches, scientific concepts such as buoyancy and sonar provide a greater understanding and familiarity with terms and ideas presented at the museum. The booklets can be used to reinforce and supplement a museum visit or as an enticement to come to the museum to view the exhibits. The booklets in pdf format were sent to the museum for their use.

QR Codes

Two-dimensional quick response codes have been used with great success since they were developed in the 1990s. QR codes can be used in a wide array of applications due to their ease of creation, wide range of encoding possibilities, confidentiality, anti-counterfeiting and error correcting capabilities (Furht 2011, 341). Initially QR codes were used in standard automotive manufacturing applications, but have since grown in use with mobile technology advancements. Museums and other public places of interest have a unique opportunity to harness the power of the QR code to create a heightened level of interactivity for their visitors (Kenton et al. 2007).

The museum identified QR codes as an opportunity to give visitors a heightened or deeper level of educational information instantaneously. Grand Valley State University management Professor Megan Luttenton-Knoll worked with students researching and developing QR codes to be used at the museum. University students carefully assessed the placement and the linked content of the codes. Located next to specific exhibits or artifacts the specially designed QR codes are to be scanned using a mobile internet accessible device. There are currently thirteen QR locations throughout the museum that any-age visitor can access through their mobile internet accessible device. Alongside the QR code, hyperlinks may be written down and accessed later. The practical technology behind the QR code directs the mobile device to interactive educational content (located on specifically chosen websites,) which drills deeper into an explanation or understanding of the exhibit or artifact located in the museum. The codes can connect users with videos, websites, and sound clips for more details about the item. This type of application has seen great success in museums worldwide (The Mobilists 2012). The primary benefit of this application is the ability for the museum to offer deep learning content for those visitors who would like to know more, while leaving the exhibit space free of textual clutter and focused on surface learning content (Higher Education Academy n.d.).

For the students, this was a real world project and it had an impact on them. Emily Wisniewski, one of the students working on this project, shared “the most successful experience with the project was seeing the codes all up. It was exhilarating to see the codes up and running… This was one of the first times on a school related project that I was able to see a useful tangible project and that was really exciting for me.” (Emily Wisniewski, pers.comm) Teamwork was a key learning from the project for Jesse Tackett, another business student on the project team. “Being able to work with many different people towards a single goal taught me patience. It also helped me understand how everyone’s input and hard work are necessary to complete the task at hand when working with a team.” (Jesse Tackett, pers.comm.)

Increased Technology

The need to reach a larger audience is a primary goal for the USS Silversides Submarine Museum and is in line with the work of Peter Norvig, who believes that education should be accessible to people where they are (TED.com 2012). The museum has the opportunity to enhance visitor experience with increased technology. For onsite visitors the QR codes are one way to do this. There is also an opportunity to do this by upgrading the museum web site. Currently the USS Silversides Submarine Museum has a website: www.silversidesmuseum.org that is accessible to the public, however to find the website in a search engine the “visitor” has to use specific search terms. If the goal of the museum is to increase the visibility of the website

one possibility is to use Google AdWords. Google AdWords are paid advertisements that are triggered by the terms a visitor submits into their search box. Using an algorithm, Google supplies suggested AdWords to augment and complement a search. This technique will help the visibility of the museum website to those visitors most interested (Cameron 2012, 21) Adwords have been used in the past at Grand Valley State University with auxiliary web sites such as the arbitrations site through Grand Valley State University <www.gvsu.edu/arbitrations> or electronic human resources <www.gvsu.edu/e-hr>.

Using Google AdWords impacts the outreach of the website and increases the number of views for the website. Effective key words bring the site to the first page of the results listings. Google does not fund higher education, only nonprofit entities qualify. The web site must be a separate site from a college or university page. Accessibility is significant and Google supports this. In this project, Grand Valley students supplied the Silversides Museum with everything necessary to launch Google AdWords. Thus far the museum has not taken advantage of this opportunity.

As a complementary approach to reach additional museum visitors, an additional website is under consideration to focus on the specific educational components that are above and beyond what is offered on the main USS Silversides Submarine Museum website.

Anticipated Outcome

With the three-pronged approach to enhancing the visitor experience through interactive learning, the museum anticipates outcomes that look very different from component to component. With this in mind there are several ways the museum will monitor and measure the outcome. These measurement tools range from simple counts of participants and successful certificate earners to more detailed analytic tools to track responses of QR codes and AdWords clicks. At this time there is a presupposition that all three areas of implementation will offer differing levels of success for the museum, culminating in an enhanced visitor experience.

Challenges and Outcomes

Collaboration has great potential and a benefit to all parties when expected outcomes are understood before the project begins. When working on a collaborative project such as this, it is important to have complete understanding on both sides of what the project can accomplish and the expected outcomes –similar to a contract. Talented students put in hours of time on this summer project while going to school and holding down jobs. Their efforts deserve appreciation and follow through for a satisfying and successful experience. The collaboration needs to be engaging and meaningful for all involved.

The student experience did not match the vision of the project as anticipated from the initial meetings with the museum. Two of the business students, Jesse Tackett and Emily Wisniewski, put in considerable time researching links, facts, and videos to attach to QR codes. Emily was excited to see the codes in place and ready for use by museum visitors. At the same time it was frustrating for Emily and Jesse to experience resistance on the part of the museum to grant approvals for the project to go forward. Emily stated, “At one point in the project (after we had put in quite a few hours on the codes) we were doubting if the museum would even …put them up. “(Emily Wisniewski, pers. comm.) The third student participant,Trevor Spoelma, felt “it was frustrating that I did not understand fully what exactly the museum expected and wanted from our team…it would've been maximally beneficial and efficient to choose one or two [projects] and focus all of our efforts into them to do them well. I feel like the project kept expanding and branching into new areas.”(Trevor Spoelma, pers. comm.). A management professor, Maris Stella Swift, who took on a major role in communication, support and setting up the project with the museum had this to say,” Our original goal was to help the museum reach more students with

technology. We had experience doing this with two legal web sites and we were quite successful. We did not meet our goals with the museum however and this was disappointing. The experience taught me that in order to work with outside organizations there must be a written agreement about responsibilities and objectives. Verbal understandings are not enough; especially when you have students who are receiving credit hours" for their work on the project (Maris Stella Swift, pers. comm.) Trevor believes surveys or observations at the museum to set benchmarks for identifying specific focus for the project would have been helpful. The benchmarks would be useful in assessment of success of the project. Weekly team meetings were suggested by this student.

This collaborative project while not accomplishing all of the goals set forth, proved to be a good learning experience. For student, Trevor Spoelma, it was "exciting to work on a team of management faculty, librarians, motivated students, and museum staff. I really enjoyed collaborating with everyone and to see each member of the team use their strengths and experiences to benefit the group and work toward the end goal. I am glad to know the project had practicality and meaning and was beneficial to the community. I also enjoyed thinking outside the box of the classroom and applying the skills and knowledge I've learned to helping the museum engage visitors in a new way" (Trevor Spoelma, pers. comm.). We are encouraged by the increased participation of museum visitors and the definitive mission that the museum embraced. We appreciated the opportunity to enhance learning at the museum. Further collaborations between the university and museums would be welcomed if specifically defined process and outcomes are mutually beneficial and, most importantly, agreed upon before the project begins.

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The International Journal of the Inclusive Museum addresses a key issue: In this time of fundamental social change, what is the role of the museum, both as a creature of that change, and perhaps also as an agent of change? The journal brings together academics, curators, museum and public administrators, cultural policy makers, and research students to engage in discussions about the historic character and future shape of the museum. The fundamental question of the journal is: How can the institution of the museum become more inclusive?

In addition to traditional scholarly papers, this journal invites case studies that take the form of presentations of museum practice—including documentation of organizational curatorial and community outreach practices and exegeses analyzing the effects of those practices.

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