

The Ohio State University
Campus as a Living Laboratory

Reinventing Electronic Education at the Ohio State Wetlands

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Executive Summary

The Wilma H. Schiermeier Olentangy River Wetland Research Park is an invaluable asset to The Ohio State University. It is a designated Ramsar Wetland of International Importance in recognition of the Wetland's diverse flora and fauna, as well as the research that has taken and continues to take place there. Currently, there are not many ways for public visitors to learn about the Wetlands and the Research Park wants to fix this, along with increasing foot traffic. The closest thing to a visitor's center, the Heffner Wetland Research and Education Building, is not open to the public. However, in the coming years, the management of the Wetlands wants to open the building to schoolchildren and the public. We think that the electronic display board in the Heffner Building would be a fantastic way to entertain and educate those potential guests, thus meeting their goal to increase foot traffic at the Wetlands. Currently, the board is not being used to its full potential, and needs updates in order to function at its best. Every day, the television screens display the same pictures and data, and the computer monitors are completely blank. To improve the functionality and popularity of the board, we believe that the televisions and computer monitors should be used to display documentaries and interactive presentations of different aspects of the Research Park and wetlands in general. This also means that said equipment must be made more energy efficient. This will be done with new Light Emitting Diode computer screens and the turning off of devices when they are not in use. The number of visual learners in school systems is increasing. Additionally, auditory stimuli in documentary films can further solidify the students' learning. These are important factors because the electronic board will have the ability to combine these different learning styles in the most efficient and entertaining manner. Updates to the board would make it more accessible and entertaining to the public who visit the wetlands including birdwatchers, families, and other members of the community. The Ohio State University will contribute to the rise of environmental education by reconfiguring this electronic information board at its home at the Wetlands Research Center.

Introduction

The Wetlands Research Park has been continuously growing as a valuable asset to the Ohio State University since its creation in 1992. The Wetlands is home to the School of Environment and Natural Resources' Aquatics Program and is a gateway to research, teaching, and outreach related to water resources at the university (McCready, 2013). The Wetlands has a history of promoting ethics, green engineering, and sustainable practices. We believe that an update to the electronic board is a great way to further the Wetland's goals of being a sustainable source for environmental learning at Ohio State.

The Heffner Wetland Research and Education Building was built in 2003, providing labs for the Wetland's researchers and spaces for groups and college classes to meet. As part of the Wetland's new phase of development, the management of the Wetlands is hoping to open the Heffner building to secondary schools. Our group wants to update the electronic education board at the Wetlands so that it can be used to teach incoming students. The Wetlands is also considering opening the Heffner building to the public during warmer months. The opening of the Heffner building to secondary school students and the general public will be a huge step requiring changes to how the Wetlands operates. The board would be a great way to educate the public about different aspects of wetland ecosystems while representing the Wetlands' dedication to sustainability. We believe the Wetlands management should optimize the electronic education board so it can be used as a form of education and entertainment for Wetlands visitors, no matter their age or background.

While the board needs to undergo a few drastic changes, there are many aspects about its current setup (Figure 1) that should remain. The board includes photographs on the far left side, a data control center that displays up-to-date information about the state of the wetlands on the television screen to the left, three computer monitors on the top right, a large map of the world and the state of Ohio in the center, and a large television screen at the bottom right (See Fig. 1). At the moment, the framework of the board is in good condition. The metal surrounding the boards is spotless and undamaged and the maps themselves are interesting, although they would be more informative with some sort of labeling. The left map depicts the continents of the earth and all international Ramsar sites which are indicated with LED lights. The Convention of Wetlands, in Ramsar, Iran in 1971, was a treaty signed by many nations of the world to embody

these nations' commitments to the ecology of their most important wetlands. Today, 206,632,105 hectares of land are designated Ramsar Wetlands of International Importance (Mauverney, 2012). The map is the only indicator of the Wetland's Ramsar status in the Heffner building. While it is interesting, it could be improved by more detailed labeling describing what a Ramsar Site is and why it is important that our Wetlands is designated as one. The right map shows a map of Ohio and its wetlands represented by LEDs, similar to the Ramsar site map. All the LED lights are functioning and in good condition. Pictures on the far left side of the board are still bright and discernible. The televisions on the bottom shelf of the board both work appropriately. The electronic information board also has a good setup. Its screens being used are all fairly large, making the information they can display clearer. They are also at an eye level that is suitable for children. The screens are well below normal adult eye level, but this can be easily corrected by adding seating in front of the board. The computer monitor screens are also well placed, and have potential since they are each hooked up to a separate computer behind the board. This means that the screens display information in a familiar format: a PC's operating system. Further, it also means that normal file extensions like Powerpoints, Word documents, web pages, and pictures can all be accessed on the computers and displayed on the screens. It is obvious that the board has many good, useful features.



Figure 1: The current setup of the electronic education board.

We aim to improve several aspects of the electronic education board. We have three main goals in mind for this transformation. First, we want the board to be sustainable by optimizing its energy use. Energy use is also the focus of our second goal: to make the board more economical by reducing the amount of electricity it uses. Our final and most important goal is to ensure that the board is educational. We want it to be an interactive and entertaining way for the Wetlands' visitors to learn more about the area and its importance.

Goals and Purposes

Sustainability and Economic Efficiency

We want the electronic board to be an example of Ohio State's dedication to sustainable energy practices. This involves purchasing new, energy-saving LED computer monitors to replace the current LCD screens. LED monitors use less energy while providing a clearer picture than their LCD counterparts (EU Board of Energy, 2011). The LED screens also provide more reliability than the current LCDs because if one individual light goes out, the rest of the screen is not affected and the burnt out light manifests itself as a tiny, barely noticeable blank spot on the screen. We are also proposing that the entire display, including all screens, computers, and lights be turned off while not in use. Currently, the TV screens, a computer monitor, and all associated computers are left on constantly. Our plans will ensure that the board operates sustainably.

Currently, the right-hand television is ineffective and visually unappealing. The screen constantly displays the desktop background of the computer it is hooked up to. Computers and large TV screens such as those in the Wetlands are not inexpensive pieces of technology. If these technologies are being used, they should be utilized to their full potential. We have a plan for the television to be used more efficiently. As previously stated, both televisions are never turned off. This is not energy efficient. LCD televisions left on emit 195 grams of CO₂ per hour (European Union Board of Energy, 2011). The Wetland Research Park is open from 8:00am to 5:00pm daily (McCready, 2013). These nine hours of television use result in 1755 grams of CO₂ released per day. If the televisions were turned off when not in use, the Research Park could reduce its CO₂ emissions. That being said, the electronic information board has much potential that we plan to make use of when updating the contents of the board.

Educational Effectiveness

The board should be redesigned so that it can help educate the students visiting the Wetlands Research Park in a way that results in a long-term takeaway of knowledge. Environmental education is largely based on environmental literacy. Environmental literacy stresses the importance of seeing the many different facets of the environment and how they function together (Athman & Monroe, 2001). Thus, it is essential that children understand the importance of wetlands in the larger environmental picture. The children will be learning hands-on lessons in the wetland's outdoor area, but the most effective environmental literacy teachings appeal to multiple cognitive developments, intelligences, and learning styles (Athman & Monroe, 2001). Hands-on learning is not the preferred mode of learning for some students, and multimedia is an effective way of reaching students who prefer either visual learning or audio teachings (Mayer & Moreno, 2002a). Audiences have a better memory of educational displays when a visual aid is paired with audio, rather than presenting it alone or with text (Mayer & Moreno, 1998). Also, students take away more information after both viewing a film and listening to a lecture in succession rather than learning each individually or at separate times. (Fortner, 1985). The combined learning styles result in a better use of time, focusing on visual and audio learners together. The electronic board will display both visual scenes of the Wetlands and coordinating audio. The audio will explain the visuals and add complementing knowledge that will be better understood when presented alongside the visual aid.

We anticipate that each documentary will be about five minutes in length. Cognitive load theory states that the individual memories of verbal and visual processes are limited. However, when the delivery of the multimedia information is presented at a constant, comprehensible pace, an overload of information can be prevented (Mayer & Moreno, 2002b) and result in a better takeaway of knowledge by the students. By making short videos we can better keep children's attention, and any visitors from the general public will not get bored or uncomfortable while watching the documentaries.

Even though five minutes is a fairly short time, we think visitors would appreciate having a place to sit while they navigate the board. By providing bench seating, visitors will have a place to sit and rest without getting too comfortable and loitering or falling asleep inside the Heffner building. The bench will be simple in design, preferably like a common garden bench

and will cost between \$50 and \$300 (Home Depot, 2013). The wetland's management is considering demolishing the secretary's desk in the lobby in front of the education board. This would provide optimal room for several benches in front of the board that can be used by visitors and small groups that may utilize the board.

As an educating tool, multimedia should be part of a learning process, not something that is used on its own (Stemler, 1997). By bringing multimedia teaching to the Wetlands, we will be opening students up to a greater diversity of education. This increases confidence and strength in and outside the classroom. The electronic board uses technology to give students real-life knowledge of the surrounding Wetlands. When students are touring the Wetlands, they are using all of their senses. Typical teaching styles with a flat picture surrounded by text, or an educator lecturing in front of a blackboard, do not have the same ability to stimulate the learner's senses. Videos help keep children's attention, which can enhance their understanding as well as their ability to retain information (Stephens, 2006). With an electronic form of teaching, effective screen designs can hold an audience's attention and easily communicate the main points in a presentation (Stemler, 1997). Changes in color on the TV screens reflecting the natural, vibrant colors of the Wetlands are effective at keeping an audience's attention (Fortner, 1985). The electronic board will be a great supplement to the hands-on learning that children will participate in at the Wetlands. Children can go outside and interact with the Wetlands, then come and watch documentaries or presentations that will reinforce what they have learned and help create lasting memories. Multimedia can present knowledge in a life-like, colorful, and stimulating way, resulting in a better-educated group leaving the Wetlands Research Center. This can only be done when the current state of the electronic information board is changed.

Once the screens are replaced, fixed, and active they can be used for presentations. Teachers, lecturers, and guest speakers will be able to display PowerPoint presentations, via the computers in the back, on the right-hand television. They will also be able to play educational films. Should the Wetland Research Park open its doors to school groups and the general public, the staff at the park will also have the opportunity to show other films about wetlands and environmental education in general. In this case, the right-hand television can be used as an interactive menu for the Research Park as well since it is connected to the computers. Educational videos will also be displayed on this television. For example, an educational video

can explain what great tools wetlands are for removing large amounts of carbon from the atmosphere.

Instead of presenting complex numbers, the videos will introduce more basic knowledge of the carbon reduction resulting from wetlands. Though the amount of carbon absorbed by the atmosphere is an impressive number, the visiting students will not have an understanding of the magnitude of the Wetland's absorption. After a fifteen-year period, the two constructed wetlands at the Olentangy River Wetlands Research Park absorbed an annual rate of 2159 pounds per acre of carbon (Bernal & Mitsch, 2005). So, students will learn that constructed wetlands are just as effective, if not more effective, at reducing the amount of carbon in the atmosphere as wetlands that are naturally occurring (Bernal & Mitsch, 2013).

The educational videos will discuss the role of wetlands as habitats for many plant and animal species. The abundance of floral and faunal taxa provides for complex ecological interactions and a substantial food web that supports many different organisms (Mitsch, 2005). The large volume of water also helps support many unique plants and animals, especially early stages of insects and amphibians that go through metamorphosis, since the Wetlands lack piscine predators (Mitsch, 2005). The habitats of different wetlands vary. Some wetlands have a monoculture of plant species, while other wetlands have dozens of different plants growing on the grounds (Mitsch, 2005). The videos will provide examples of the many animals that live in wetlands all over the world and specific examples of the animals that live in the Ohio State Wetlands. Because of the numerous populations of animal and plant species, wetlands are also great outdoor laboratories. For example, plant distributions, growth rates and water quality can all be tested on the grounds of the Wetlands (Knight, 1997). Information such as this, both past and future, can further increase the material that can be used in our videos.

The videos will also explain the importance of the Wetlands to the community. One of the films will focus on how the Wetlands benefit people as well as the surrounding environment. The Wetlands serve as a natural oasis in an otherwise urban area. We think that it is important for people, especially students who come to visit the center, to understand why wetlands in general are such an invaluable asset to the environment. The films will also discuss recreational opportunities at wetlands such as bird watching, hiking, jogging, and learning from educational signage. Aside from their direct importance, wetlands provide many indirect benefits. One

example that pertains especially to the Olentangy Wetlands is that wetlands can be a source of peace and beauty in an otherwise fast-paced, concrete-filled urban area (Knight, 1997). People can enjoy many benefits provided to them by the Wetlands, and we want to ensure that this message is conveyed clearly in a film.

Our Plan

Physical Setup of the Board

Certain features of the board must remain untouched due to their scientific and honorary importance. The left-hand television displays the Yellow Springs Instruments (YSI) data that is being collected at the Wetland Research Park. This data includes water temperatures, nutrient levels, water level fluctuations, and other aquatic measurements. Due to the fact that YSI contributed over \$200,000 for the data collecting equipment and that their software monitors the Wetlands, this television screen must remain as is (McCready, 2013). This also means that YSI's nameplate on the board must remain as well. That being said, we wish to add a component to the interactive menu on the television screen to the right, which will explain what YSI is and what all the data represents.

The computer screens in the top right-hand corner will be used for a different type of presentation. These screens, once replaced, will display a constant slide-show of pictures taken at the Ramsar sites displayed on the LED maps. The Wetlands Research Park currently has many photos of the Ramsar sites displayed on the maps, and we would like to go through and create informational slide-show presentations about the sites. Thanks to the connection between the electronic information board and the computers behind it, these improvements will be possible.

Visiting educators and professionals will also be able to use the electronic information board. Educators will be able to set up their own presentations using the available technology on the electronic board. In order to set up guests' presentations, the staff at the Wetlands Research Park will be educated on how to set up and run the technology. Overall, the electronic board will be put to better use by being more user-friendly and engaging. All of these factors will result in a better educational experience for visitors to the Olentangy River Wetland Research Park.

Initiating the Change

In order to improve the content of the electronic information board, we need to make the documentaries and informational presentations, acquire money for any technology upgrades, and ensure that the electronic board is energy efficient. While the Olentangy River Research Park has some money in its budget that can be used for our upgrades, we are still soliciting help from the university and various sponsors in an attempt to reduce the amount of money that the Wetlands must spend directly.

To create the documentaries, we will receive help from students in OSU's Film Studies Program. We have had several meetings with Matt Swift, the advisor for the film studies program. He is excited about our project and confident that students in the program will be interested in using it to get independent studies experience. Each documentary will be about five minutes in length and will focus on the many diverse benefits that wetlands have to offer. Several topics that we have planned to film include the benefits of wetlands (specifically focusing on CO₂ reduction and flood prevention), the wetlands as a vital ecosystem, the different types of wetlands, the specific animals that can be found in a wetland, and how it is a habitat for local and migrating species.

We have set up a general timeline and anticipate that we will begin filming in May when flowers and plants will return in bright colors and wildlife like birds, insects, reptiles, and mammals will be becoming more active (Mitsch & Gosselink, 2007). Later this year and into early 2014 we are going to organize researchers from the wetlands to give small talking head videos presenting the general aspects of their research. These videos will feature each student talking about their research over relevant videos, figures, and photographs. The researchers will also have the opportunity to talk about why they think the Wetlands is important to the university and the ecology of the surrounding area. By overlapping the voice and visual components, we are capitalizing on an audio-visual system of learning.

Additionally, we will seek help from students in OSU's Department of Computer Science and Engineering to improve the performance of the electronic board and to set up an automatic shut off. We would like the computers behind the board to run a program that will automatically shut off the computers and the screens at a certain time every night. This program will also send

the computers into a standby mode after a certain amount of time passes in which the screens are not being used. The screens and computers can easily return from standby mode to an active state once some sort of stimulus, such as a mouse click or movement, is provided by whoever wants to use the board. Once the standby mode is enabled on the displays, signage will be placed to the left of the board to let visitors know that the board is functional and interactive.

Financial Support

In order to support any upgrades to the technology associated with the electronic board, we are currently speaking with representatives from Staples. While lower management of the local Staples branch at Lennox Town Center has expressed interest in our project, they are still working on coordinating a meeting with higher up officials who can approve the donation of new computer screens. We have asked for two new LED computer monitors and offered to dedicate a small space next to the monitors to thank Staples for their generosity and help with our project. Should more funds be necessary, the Wetlands has some money in their budget to cover at least part of the upgrades. In either case, we will be extremely grateful to both entities for their support in furthering wetlands education.

Discussion

Gaps in Our Research

Although we did extensive research on the best ways to present educational videos and Powerpoints to visitors, there will be opportunities to continue our research. Our research informed us of the benefits of using an electronic screen in education (Stemler, 1997) and the importance of presenting combined audio and visual displays when teaching about the Wetlands (Mayer & Moreno, 1998); however, we do not have any first-hand knowledge on the efficacy of the practices, nor do we have professional teaching experience. Studies done by other scholars can inform us on the most helpful teaching practices they witnessed, but we have no proof if the teaching practices will be as effective for our educational purposes. The only way we will know the efficiency of the teaching practices is by using them with the electronic educational board. After a substantial amount of time showing the wetlands videos and using the hands-on educational style with students, our group can determine how effectively students take away the knowledge presented by the monitors on the board. This will be done by issuing surveys to

teachers two weeks after they test their students on the information they have learned at the Wetlands. When we know how much students are gleaning from the information presented, we can then adjust the presentations and documentaries to better teach visiting students and the public in general.

Along with needing first-hand proof of the effectiveness of teaching styles, the publication dates of our cited journal articles also leave a gap in our research. Some of the research our group referenced when determining how best to present information using the electronic educational board was completed in the 1990's and the early 2000's. With years separating the education studies and the completion of our project, there is an uncertainty if what worked best for students in the past is still the most effective way of teaching today. There have been many technological advances in the past decade, resulting in more complex yet user-friendly technology available to the public. The increased availability and new forms of technology may have resulted in better and different conclusions formed by the scholars. The more modern conclusions would have likely changed the angle we took to complete our final proposal of the electronic board. Although we have some concern that auditory and visual teaching methods may go out of style in the future, we are confident that the electronic board will be able to keep up with any changes teaching may encounter.

Lastly, our project on the electronic educational board is one-of-a-kind. Although we are not the first group to want to present environmental education electronically, we are confident that our plan is the best for the Wetlands. Students have a better chance of learning different topics using varying teaching styles no matter if it is Mathematics, English, or Science, and our research helped conclude the way visiting students will be educated at the wetlands. However, the research was not taken from a wetlands center that presented the specific video topics we will or used an electronic educational board.

Future Works

The Wetlands is constantly changing, especially now in this time of transition. In a few years it may be advisable to update some of the documentaries, especially those focusing on research. We believe this to be a future works project because change is always on going and we must meet these changes when they arise. This would not be a very long or difficult process and

could be put together by the Wetlands' management staff. One specific change we would like to do is create a new documentary on the way the changing seasons affect the wetlands. This was kindly suggested to us by Kay Stefanik, a researcher at the Research Park.

Our project also offers continued collaboration between the School of Environment and Natural Resources and the School for Film Studies. If any students in the Film Studies programs are especially interested in nature documentaries, they can use the wetlands as a place to film and learn, then have their work displayed on the electronic board.

As the Research Park continues to communicate with its sister Ramsar sites, more research will be coming in from all over the world. This means that there will be new information to add into our interactive menu and more photos to add to our picture slide show displayed on the three computer monitors. To add information to the interactive menu, the programs in place will have to be rewritten to include the new information. This will be done by OSU's Department of Computer Science and Engineering. Adding new pictures to the slideshows will be done by adding more pictures slides to the PowerPoint slide show that will already be in place.

Upkeep for the board will be fairly simple. Since the screens will be operating for fewer total hours during the day, they will be able to function for a long time before they go dark. Should there be any technical issues such as computer bugs or glitches, a staff member at the wetlands can call Ohio State's IT service desk for assistance.

These future works are very important. They are the foundation of constantly improving the Wetland Research Park for future generations of students and visitors. We want to ensure that the Wetland Research Park and The Ohio State University are well represented in the world of Environmental Education and that is only possible if the research, teaching styles, technology, and content of the electronic educational board are up to date and are presented in an appealing way. We are committed to seeing this project through even when our time at Ohio State is done. To keep this project up and running, we will set up a blueprint from which future students will work. This blueprint will include our thoughts, struggles, and tips on how to deal with this project. Future students will be able to learn from this and hopefully add to it as the Wetlands

continue to change and grow. This is not a simple assignment; it is a labor of love that we intend to see through.

Conclusion

The Wilma H. Schiermeier Olentangy River Wetland Research Park is in a period of transition. It has opened new wet labs and is headed by an interim director (McCready, 2013). This means that changes are being made at the Research Park and its goals are being established. Its future goals include becoming more oriented toward school children and becoming a dynamic educational institution that will be frequently accessed by the public. An updated electronic information board with entertaining and easy-to-use applications will aid the Wetlands in becoming a state-of-the-art teaching and learning facility for people of all ages. The content of the board will be tailored to many different learning styles and will present many different facets of information about the wetlands. The new electronic setup will also serve as a great example of Ohio State's strong community because it involves the coordination of the school of Environment and Natural Resources, the Wetlands, and the School for Film Studies. Finally, the new electronic information board will be a sustainable electronic center. This project reflects the goals of the Wetlands: to become more eco-friendly, forward-thinking and outreaching. Its implementation will greatly benefit the Wetland Research Park, The Ohio State University and the public.

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