Public Education in Invasive Species Management

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Contents

Project Overview

Mid-Term Summary: Environmental Education Models and Approaches

The mid-term report assessed three environmental education frameworks, exploring how they function and the results of their application to invasive species management or general environmental issues. These frameworks are the public-based learning method, the social learning framework and the identity-based environmental education model.

The key idea of the public-based learning method, which is described in Melard's 2015 research, is that different public viewpoints are crucial for environmental controversies such as invasive species management because they can provide new insights for managers; integrating these viewpoints into management strategies can help solve the problems of these environmental issues. Researchers noted that based on this method, environmental managers should assess various public points of view and the different dimensions that these viewpoints create, then integrate them into their decision making process.

The second framework is the social learning framework addressed in Krasny and Lee's study. It emphasizes collaborative learning communities where information is exchanged and innovations are created through discussion among individuals who have different knowledge and experience. This collaborative learning can be in the form of a workshop where the public can be actively engaged. The study found that through a collective learning process, communities can enhance their educational practices in an effective way.

The identity-based environmental education model addressed in McGuire's 2015 study seeks to encourage less environmentally dangerous behaviors. The model's final goal is to help the public generate environmental self-identities through public education. Based on one engagement strategy, simply sharing concrete environmental knowledge with students will not change their beliefs and behaviors toward the environment issues. The findings suggest that educators should connect concrete environmental knowledge with students' own experience regarding the local environment.

Environmental education approaches include the focus group methodology used in Howle's study. Basically, it is field-based focus group interview to obtain qualitative data about public perceptions and motivations. It was used to study public opinions about the effectiveness of control methods for an invasive species in South Carolina. This method proved to be effective and accepted by the public.

A second approach is integrating mobile technology into field-based environmental education used in the Anderson study. This approach enabled participants to take notes about their ecological experiences and ask questions, using available apps on electronic devices while they are in the field. Compared to traditional approach, without the implementation of mobile technology, this approach enables the public to better understand environmental concepts. It also assesses some practical approaches and public engagement strategies concerning invasive species management, such as focus groups, invasive species workshops, and urban ecology programs.

Furthermore, this report provides overall ideas of how to educate the public about invasive species and how to enhance their environmental stewardship through engaging learning process.

Final Product Summary: Precedents for Invasive Species Education

This final product mainly focuses on providing precedents of invasive species education, including engagement activities, guidelines, curriculums, or lesson plans for educational use. It provides a brief description of each precedent and URLs for further reading.

Precedents

Invasive Plant Species Curriculums, Lesson Plans, and Educational Materials

- Invasive weed curriculum for grades K-12, Oregon State University

This curriculum is designed for teachers who want to bring the topic of invasive weeds into classrooms and develop awareness of K-12 students from grade K to grade 12 regarding invasive species. The curriculum provides students with an understanding of the problems of invasive weeds.

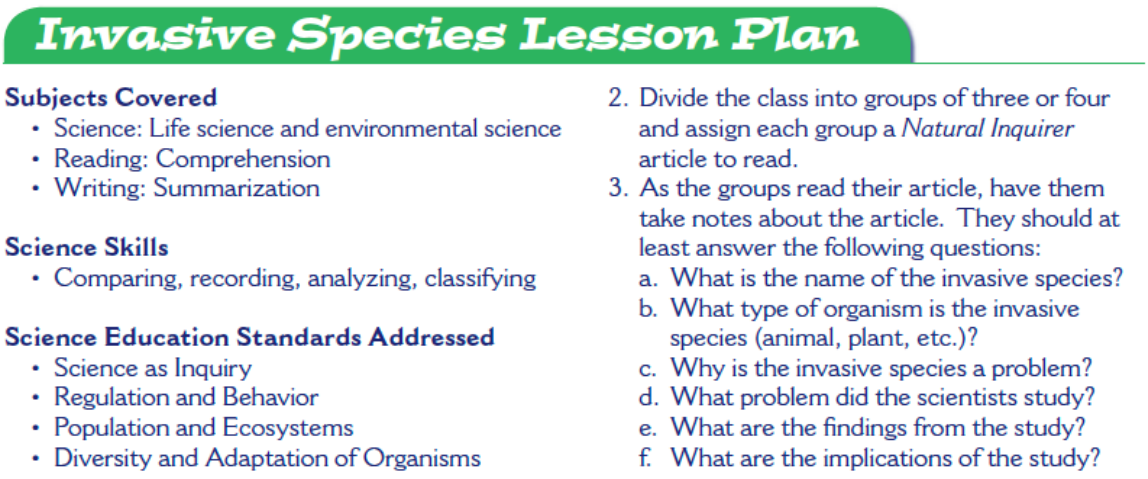
It organizes the course content into seven units. Each unit contains different lesson plans for elementary schools, middle schools, and high schools. Each lesson plan consists of several sections such as subjects, topics, activities, conclusion, and evaluation. These seven units include weed facts, identification, prevention, inventory, mapping, control, and community involvement. Each lesson plan is made into PDF file attached available on their the website, making it. It is very easy for educators to view and download.

http://www.weedinvasion.org/index.php

- Invasive plant educational modules, Florida Invasive Plant Education Initiative

The website offers three modules focusing on invasive species. Module one is "Silent Invaders." Module two is "A Fish Tale." Module three is "Why Manage Invasive Species." The modules are suitable for educating students from in upper elementary schools, middle, and high schools. All three modules begin with audio-visual presentations, making the topic fun and easy to understand. Each module provides various useful education materials such as teacher guides, concept maps, and a plant data chart. The key objective of these modules is to help educators to enhance students' understanding of invasive species, their ability to identify species, and change their environmental behavior.

1. Lesson plan, Natural Inquirer's Invasive Species Edition



This lesson plan provides teachers with a complete and detailed format for educating the student about invasive species and consists of following sections:

- Subjects covered
- Science skills

- Science Education Standards Addressed
- Objectives
- Materials
- Procedures
- Assessment
- Modifications

The procedure consists of group discussions, readings, and a presentation. These activities can all actively engage students in learning about invasive species. Modifications include class changes either for students who want to challenge themselves on research or students who cannot keep up with the class.

- Educational activity on invasive species, National Geographic Society

Through this activity, students learn about the concept of invasive species, why species are introduced to local areas, and how they harm our ecosystems. It is a forty-five-minute activity aimed at students from grades six to eight. As described on the website, it provides educators with a clear direction of how to educate the students about invasive species to achieve the objectives. It also provides some important tips for educators such as making sure students understand that not all non-native species are invasive and harmful.

- Invasive species website, The Nature Conservancy

This website establishes simple guidelines for the public to prevent the spread of invasive plant species:

WHAT YOU CAN DO

You can help stop the introduction and spread of invasive species. Protect native plants and animals by following these six easy guidelines:

1. Ask your local nursery staff for help to ensure the plants you are buying for your yard are not invasive. Replace invasive plants with non-invasive alternatives. Better yet, go native!
2. When boating, clean your boat thoroughly before transporting it to a different body of water.
3. Clean your boots before you hike in a new area to get rid of hitchhiking weed seeds and pathogens.
4. Don't "pack a pest" when traveling. Fruits and vegetables, plants, insects and animals can carry pests or become invasive themselves.
5. Don't move firewood. It can harbor forest pests.
6. Don't release aquarium fish and plants, live bait or other exotic animals into the wild. If you plan to own an exotic pet, do your research and plan ahead to make sure you can commit to looking after it.
7. Volunteer at your local park, refuge or other wildlife area to help remove invasive species. Help educate others about the threat.

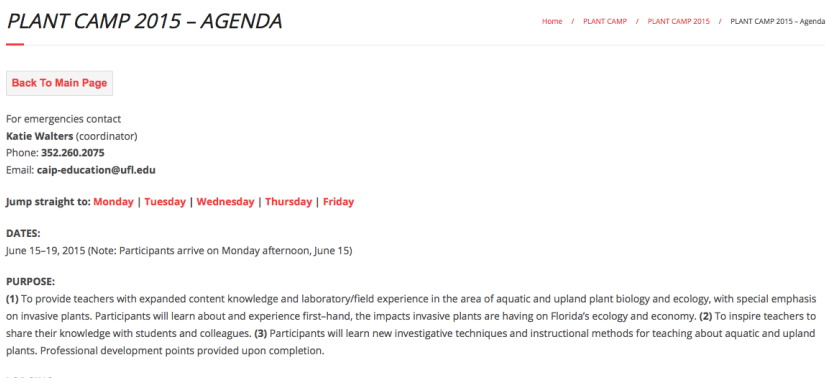
These guidelines can be valuable educational materials when used by managers to educate the public about invasive species.
http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/arkansas/explore/invasive-species-arkansas.xml

- Invasive species identification sheets, USDA, Natural Resources Conservation Service

This material is about invasive plant species along the forest edges in the Columbia area and provides basic characteristics and pictures to identify those plants. It covers Asiatic Bittersweet, Multiflora Rose, Porcelain Berry, Japanese Stilt Grass, Japanese Barberry, and Mile-a-minute Vine. These sheets can be used for reference when managers educate the public about these invasive species.

Invasive Species Education for Teachers and Educators

- Plant Camp for teachers, Florida Fish and Wildlife Conservation Commission



PLANT CAMP 2015 – AGENDA

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For emergencies contact
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Jump straight to: Monday | Tuesday | Wednesday | Thursday | Friday

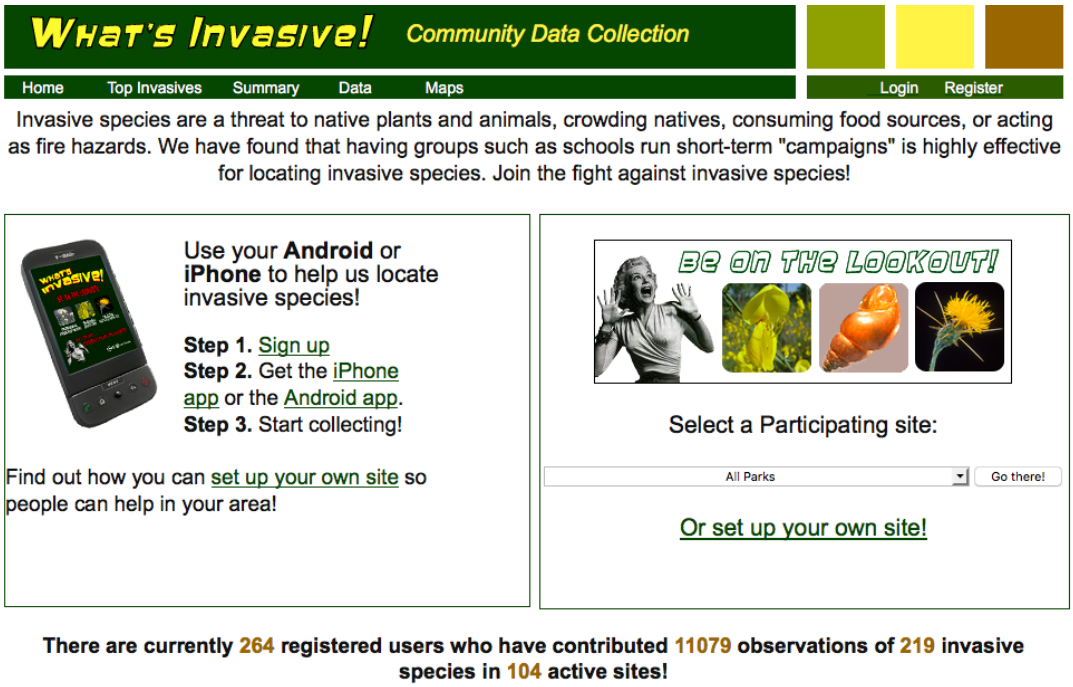
DATES:
June 15–19, 2015 (Note: Participants arrive on Monday afternoon, June 15)

PURPOSE:
(1) To provide teachers with expanded content knowledge and laboratory/field experience in the area of aquatic and upland plant biology and ecology, with special emphasis on invasive plants. Participants will learn about and experience first-hand, the impacts invasive plants are having on Florida's ecology and economy. **(2)** To inspire teachers to share their knowledge with students and colleagues. **(3)** Participants will learn new investigative techniques and instructional methods for teaching about aquatic and upland plants. Professional development points provided upon completion.

This teacher's workshop about invasive species provides them with expanded knowledge and lab/field experience in ecology. Participants learn about and experience the impact of invasive species on Florida's ecosystems. They also learn new investigative methods and techniques for teaching students about invasive species. This workshop also encourages participants to share their learning experience with colleagues.
http://plants.ifas.ufl.edu/education/plantcamp/

Implemented Technology Tools

- "What's invasive" mobile app



What's Invasive! Community Data Collection

Home | Top Invasives | Summary | Data | Maps | Login | Register

Invasive species are a threat to native plants and animals, crowding natives, consuming food sources, or acting as fire hazards. We have found that having groups such as schools run short-term "campaigns" is highly effective for locating invasive species. Join the fight against invasive species!

Use your **Android** or **iPhone** to help us locate invasive species!

Step 1. Sign up
Step 2. Get the iPhone app or the Android app.
Step 3. Start collecting!

Find out how you can set up your own site so people can help in your area!

Be on the Lookout!

Select a Participating site:

All Parks | Go there!

Or set up your own site!

There are currently 264 registered users who have contributed 11079 observations of 219 invasive species in 104 active sites!

This app is designed to help park visitors in the US find and track invasive plant species. It enables visitors to record and document the location of invasive species in a park. The information that visitors upload to the app's database is available to all people. This app not only promotes public awareness about invasive species, but can also provides scientists with data of invasive species.

Annotated Bibliography

Anderson, Carrie L., Brant G. Miller, Karla Bradley Eitel, George Veletsianos, Jan U. H. Eitel, and Robert J. Hougham. 2015. "Exploring Techniques for Integrating Mobile Technology into Field-Based Environmental Education." *Electronic Journal Of Science Education*, no. 6: 1-19. *Education Source*, EBSCO*host*.

The authors of this study are faculty at the University of Idaho, University of Wisconsin, and Royal Roads University in Canada. To discuss the idea of using mobile technology to connect children with the natural world, they compare two approaches: a traditional approach and a traditional-plus technological intervention approach. Through analysis of quantitative as well as qualitative data, they found that technology could improve the learning experience regarding the environment combined with the improved environmental education techniques. Their study provides us with a perspective to rethink how environmental education can be better taught better in a different way.

Bremner, Alison, and Kirsty Park. 2007. "Public Attitudes to the Management of Invasive Non-Native Species in Scotland." *Biological Conservation* 139 (3-4): 306-314. doi:10.1016/j.biocon.2007.07.005.

These researchers from University of Stirling, assess public attitudes to invasive species management in Scotland. Their data comes from questionnaires about participants' attitudes toward the level of support for invasive species control, the control method used, and control of fifteen invasive species. The questionnaire also asks about participants' involvement in outdoor activity, conservation, as well as basic demographic information. The result shows a high level of support for the eradication program. Researchers found that the socio-demographic factors affect participants' attitudes toward management, and that men are more likely to agree with the eradication program than women. Bremner and Park also state that conservation managers should better explain to the public the necessity for eradication programs.

Ferkany, Matt, and Kyle Powys Whyte. 2012. "The Importance of Participatory Virtues in the Future of Environmental Education." *Journal of Agricultural and Environmental Ethics* 25 (3): 419-434. doi:10.1007/s10806-011-9312-8.

In this research paper, the authors from Michigan State University review literature about environmental engagement strategies and discuss the importance of incorporating participatory virtues in future environmental education. They examine different theoretical research and cases that engaged deliberative activities as well as virtues in regards to environmental education. They found that if participants' own attributes hinder deliberation, even well structured participation processes can fail. They claim that environmental educators should refine these virtues when preparing the public to participate as responsible citizens for environmental issues.

Hashimoto-Martell, Erin A., Katherine L. McNeill, and Emily M. Hoffman. 2012. "Connecting Urban Youth with Their Environment: The Impact of an Urban Ecology

Course on Student Content Knowledge, Environmental Attitudes and Responsible Behaviors." *Research in Science Education* 42 (5): 1007-1026. doi:10.1007/s11165-011-9233-6.

The authors, from Boston College and the Urban Ecology Institute, studied the impact of an urban ecology program on a middle school students' perception of environment and environmental friendly behaviors. They collected pre and post survey data in four classes and also interviewed 12 students to better understand their beliefs. The study framework had three goals: "content knowledge, environmental attitudes and environmentally responsible behaviors"(1008). Through data measurement and analysis, they found that most students gained scientific knowledge but there were no significant changes in their beliefs and behaviors regarding the environment after they participated in the program. The authors conclude that if the broader goal is to promote environmentally friendly behaviors, environmental education programs have to focus more on the ecological correlations in the local environment.

Howle, Matthew B., Thomas J. Straka, and Mathew C. Nespeca. 2010. "Family Forest Owners' Perceptions on Chemical Methods for Invasive Species Control." *Invasive Plant Science and Management* 3 (3): 253-261. doi:10.1614/IPSM-D-09-00012.1.

The authors, faculty at Clemson University, use focus group methodology to assess how family forest owners perceive the chemical and mechanical control methods for a specific invasive species—Chinese privet. They also try to obtain a control method that is perceived to be the most effective based on the encountered factors when there are various treatment methods. Through interviews with selected participants in South Carolina and analysis of the results, the authors conclude that most owners are concerned about the probability for re-growth. Owners also raised issues such as how to select chemicals for treatment without killing non-target species. The authors also assert that owners have economic and environmental concerns and that managers should be aware of these concerns when recommending management approaches to family forest owners.

Kollmuss, Anja, and Julian Agyeman. 2002. "Mind the Gap: Why Do People Act Environmentally and What Are the Barriers to Pro-Environmental Behavior?" *Environmental Education Research* 8 (3): 239-60.

The authors from the Tufts University who specialize in environmental policy, describe several models commonly used to explain the gaps between environmental knowledge, environmental awareness, and pro-environmental behaviors. Based on these models, they develop their own model to categorize all the factors behind pro-environmental behaviors. The model defines a new term: pro-environmental consciousness, which comprises environmental knowledge, values, attitudes, and emotional involvement. They also found that more education does not mean increased pro-environmental behaviors. The goal is not constraining but helping environmental educators find ways to most effectively develop pro-environmental behaviors .

Krasny, Marianne, and Sun-Kyung Lee. 2002. "Social Learning As an Approach to Environmental Education: Lessons from a Program Focusing on Non-Indigenous, Invasive Species." *Environmental Education Research* 8 (2): 101-119.

In this research study, the authors from Cornell University and the Chongju National University of Education in Korea use a social learning model to evaluate a New York State environmental education program focused on invasive species. They found that the educators applied knowledge to develop programs suited to local needs. But they also found that educators did not share program results with the public, which is an important part of social learning. The authors claim that future environmental education programs should be sufficient in sustaining environmental practices in communities.

McGuire, Nicholas M., 2015. "Environmental Education and Behavioral Change: An Identity-Based Environmental Education Model." *International Journal Of Environmental & Science Education*, no. 5: 695-715. *Education Source*, EBSCO*host*.

The author of this study, who is from New York University, discusses why many environmental education programs have different results. McGuire presents the theoretical foundation for applying identity research. He claims that this research is also applied to the establishment of a new program for developing ecologically responsible behaviors through environmental education. In his research, he provides different information and attitudes towards environmental education based on previous literature. He redefines pro-environmental behavior within the Identity-Based Environmental Education model (IBEE model) and concludes that the challenges faced by environmental education are creating new solutions. He believes that all environmental problems originate from consumption and the IBEE model provides approaches addressing environmental issues.

Melard, Francois, Dorothee Denayer, and Nathalie Semal. 2015. " 'Public-based-learning': The place of publics in exploring environmental controversies for pedagogical purposes." *International Journal of Environmental & Science Education* 10(6): 905-920. doi: 10.12973/ijese.2015.283a

These researchers of University of Liège, used a public-based-learning method to explore environmental controversies in public education. An environmental controversy such as invasive species management can involve stakeholders including public officials and local residents. The authors include these stakeholder points of view into a seminar course, and they define the learning experience, its conditions as well as consequences, as an approach called "Public-based-learning." Although their case study is local flood management in Belgium, the "Public-based-learning" method still provides managers with a different perspective by asking stakeholders for their experience and views about the problem rather than making stakeholders analyze the problem.

Tel, Sjoerd. 2014. "Involving teenagers in environmental citizenship." *Environmental Education* 105, 24-26. *Education Source*, EBSCO*host*

The author is an outdoor environmental educator with RSPB, a wildlife conservation organization with offices throughout Europe. In this article, he claims that a key challenge of environmental citizenship is engaging teenagers with the natural environment and sustainability issues. He established a project in Brighton that

enabled young people to create a forest garden and helped them realize how people can benefit from the garden. The result showed that these young people enjoyed the work and were satisfied with their efforts. However, their accomplishments were less promising in the areas of organizational creativity and group communication. The benefits they achieved were more limited to physical work. This result revealed that the real challenge of this program is how to balance initial ideas with limited time, resources, and goals. The author states the human-environment relationships can be a great starting point for exploring environment and sustainability.

Rawding, Charles. 2016 "The challenges of environmental education." *Teaching Geography* 41(1):10-12. http://web.b.ebscohost.com.proxy-um.researchport.umd.edu/ehost/detail/detail?sid=d19a57de-5c1f-4942-93c2-c14d9ef40ec4%40sessionmgr114&vid=0&hid=125&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d&preview=false#AN=113229938&db=eue

The author is on faculty at Edge Hill University and addresses the challenges of environmental education from an environmental geography standpoint. He explores the complexity and negative aspects of environmental geography and how environmental approaches might help educators teach environmental geography in an effective way.

Schreck Reis, Catarina, Hélia Marchante, Helena Freitas, and Elizabete Marchante. 2013. "Public Perception of Invasive Plant Species: Assessing the Impact of Workshop Activities to Promote Young Students' Awareness." *International Journal of Science Education* 35 (4): 690-712. doi:10.1080/09500693.2011.610379.

The authors of this research study are faculty members of the University of Coimbra, University of Aveiro and the Center for Studies of Natural Resources in Portugal. In this research paper, they claim that although Portuguese law identifies invasive species, most of the public is not aware of this problem. This article presents their aim to increase awareness among young students in regards to biological invasions. They describe a workshop that had activities including identification and control of invasive species. They distributed questionnaires to the participants after the workshop. Through data analysis, they concluded with two points. First, it is not easy for young students to recognize plants in general. Second, young students could actively acquire new information through these activities. They assert that promoting education and awareness on invasive species for these young students is worthwhile. The Portuguese Foundation for Science and Technology supported the workshop that was presented in this paper; this study is based on extensive scientific literature in regards to environmental education.

Works Cited—Precedents

"Florida Invasive Plant Education Initiative." *University of Florida.* last modified. 2016. http://plants.ifas.ufl.edu/education/

"Invasives: Plants on the Move." *Oregon State University*. Accessed April 28, 2016. http://www.weedinvasion.org/index.php

"Introduction to Invasive Species." *National Geographic.* Accessed April 28, 2016. http://education.nationalgeographic.org/activity/introduction-invasive-species/

"Invasive Species: What You Can do." *The Nature Conservancy.* Accessed April 28, 2016. http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/arkansas/explore/invasive-species-arkansas.xml

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"Invasive Species Identification Sheets." *USDA.* Accessed May 9, 2016. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/technical/ecoscience/invasive/?cid=nrcs142p2_011102