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## EcoScience + Art initiative: Designing a New Paradigm for College Education, Scholarship, and Service

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# EcoScience + Art initiative: Designing a New Paradigm for College Education, Scholarship, and Service

## Abstract

The paper presents a new initiative, *EcoScience + Art*, which blooms at George Mason University. The creator explains the background, history, and recent activities of the initiative, and also introduces an on-going special project called “*The Rain Project*”, a student participatory project to design, construct, and monitor a green infrastructure (i.e., floating wetland) for sustainable stormwater management on campus. The special project is geared to design and present a new paradigm to integrate college education, scholarship, and service. The relevance of the initiative and the special project to STEAM education is discussed.

## Author/Artist Bio

Ahn is currently an Associate Professor in Environmental Science and Policy, and an affiliated faculty member with Civil, Environmental, and Infrastructure Engineering and Biology. Ahn is a wetland ecosystem ecologist and an ecological engineer. He teaches Wetland Ecology and Management, Ecosystem Modeling and Analysis, Ecological Sustainability, Ecological Engineering and Ecosystem Restoration. Ecological Sustainability is a relatively new course that is a green course sponsored by sustainability office and also a research and scholarship (R&S) intensive course for undergraduates designated by Students as Scholars program at the university. Ahn is dedicated to developing and innovating methods of teaching that will incorporate strong research experiences into undergraduate science education. To date, Ahn has published over 100 peer-reviewed abstracts and journal articles, authored several book chapters. He is also a book review editor for Ecological Engineering-the Journal of Ecosystem Restoration. In 2013, Ahn created the EcoScience + Art, a new initiative to develop innovative ways of integrating teaching, research, and community service that can be adopted for designing college STEAM education.

## Keywords

EcoScience + Art, Ecological Sustainability, The Rain Project, STEAM, College General Education, Undergraduate Research and Scholarship

## Cover Page Footnote

I sincerely thank my co-director, professor Mark Cooley from School of Art for working with me on the EcoScience + Art initiative. Thanks also go to a number of parties including college administrators, faculty members, and volunteer students on the campus, and collaborators off campus for their help, support, and valuable inputs so far. Thanks also go to University Life for its financial support that has made possible the speaker series of the initiative. Thanks to Daniel Lauchu for his help with the EcoScience + Art website, Ghotbee Lim for her assistance with logistics, and to Danielle Rigley for helping me evaluate event attendance and questionnaire for the first two events.

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# ***EcoScience + Art initiative: Designing a New Paradigm for College Education, Scholarship, and Service***

*Changwoo Ahn*

## **Introduction**

Ecologists study many types of ecosystems for their patterns and processes to understand ecosystem functions that are critical to create, maintain, and deliver ecosystem services. They learn and report how nature works through their both observational and experimental works that involve in a variety of field conditions and settings. They are often further driven to work with engineers, landscape architects, and/or restoration practitioners to tease out a piece of knowledge that may involve mimicking natural patterns and processes (Benyus, 1997) in *designing* human infrastructure for sustainability. It is not much different in the works of artists, especially eco-artists who are interested and concerned about local and global environmental conditions, and who take their art-making to creating and providing functional insights and solutions to real-world problems. Both approaches from ecologists and eco-artists are intended to improve the human relationship with the natural world. Ecologists and eco-artists often work on the same topic that is about the relationship between “structure and function”, which is a critical part of both studying and creating ecosystems and eco-art product and experience. Understanding science or scientific processes are necessary for artists to design functional processes, systems, and landscapes that provide socio-economically valuable solutions for challenges of sustainability we face these days. Ecosystem scientist’s laboratory, both indoor and outdoor, is not much different from the artist’s studio where open-ended inquiries constantly occur by a feedback loop between thinking and doing (Maeda, 2013).

I strongly believe holistic approaches in education can reinforce students' learning experience and help them foster innovation, collaboration, and persistence. We need to make conscious efforts on creating and nurturing more interdisciplinary programs on the campus. Currently, there is a lack of an interdisciplinary student-faculty and faculty-faculty interactions outside the classroom. There is a great lack for college students in their early academic training of an opportunity to experience, learn, and actively participate in interdisciplinary works and novel ideas across the disciplinary boundaries. There are currently not enough resources that can be easily accessible and made available for student and faculty looking to reach out for collaboration across traditional academic boundaries, especially among science, arts, and engineering. Many undergraduate students may not be aware of the vast number of environmental fields/projects that are interdisciplinary. There is a need to exposure students to diverse, collaborative areas of arts and science, informing them of career options outside of their own disciplines.

I created a new initiative called "*EcoScience + Art*" at George Mason University in 2013. The initiative supports student-faculty and faculty-faculty interactions across the campus, while bringing the environmental sciences, arts, engineering, and humanities together with the intention of finding an innovative approach for college general education and university research. This paper reviews the progress of the *EcoScience + Art* at GMU thus far, and introduces a special project titled "*The Rain Project*" I designed under the initiative that starts fall semester in 2014 for a year to explore and showcase what the initiative can do in terms of college education, scholarship, and service. In addition, the paper briefly reviews the content of first two events and the upcoming one (i.e., fall 2014), and ponders future directions of the *EcoScience + Art* initiative.

## ***EcoScience + Art initiative***

For the past few years I have deeply interested in and committed to finding ecological design principles applicable to land and water management and dedicated to developing and innovating methods of interdisciplinary teaching that will incorporate strong research experiences into undergraduate education. My research has centered on wetland ecosystem ecology, system ecology, and ecological engineering. I studied long-term biogeochemical processes of water quality functions in a human-created wetland complex at the Olentangy River Wetland Research Park, the 24<sup>th</sup> RAMSAR site in the United States (Mitsch et al., 2012). I also worked on planning, designing, and analyzing different scenarios-based restoration options for the Illinois large river-floodplain ecosystem, working with The Nature Conservancy, National Science Foundation, Corps of Engineers, USGS, and many other stakeholders, including economists, urban planners, landscape architects, and farmers (Ahn et al., 2006). When joining GMU in 2003, I launched a long-term study of functional development and design elements for created mitigation wetlands, specifically collaborating with a local company specializing in wetland mitigation. The work includes microtopography and hydrologic connectivity as *design elements* that can be created and managed to enhance the development of ecological functions in wetlands to restore ecosystem services (Moser et al., 2007, 2009; Wolf et al., 2013), which also involved in working with people from a variety of disciplines, including engineering (e.g., hydrology), landscape architecture, botany, soil sciences, film and media, communication, and/or arts. I have also been interested and practiced in combining teaching and research activities as a college scholar and teacher. My job as a professor has mainly three sides, teaching, research, and service that are the major cornerstones of academia. Thanks to the *student as scholars'* initiative (see <http://oscar.gmu.edu/>) at GMU that promotes and supports undergraduate research and scholarship I could create and teach “ecological sustainability” course that is research and

scholarship intensive. I combined research projects and experiences with classroom learning that required ecological literacy and considerations.

With all those experiences I created the *EcoScience + Art* initiative in 2013 at GMU. In order to create the initiative I needed a partner in crime. I found and approached a professor from School of Art who was an eco-artist himself and has taught Eco-Art class on the campus. Not long after we found our mutual interests and collaboration in the initiative and that is how the *EcoScience + Art* started. The main goal of the initiative is to provide students with an opportunity to experience, learn, and actively participate in creative interdisciplinary activities of education and scholarship that can come up with sustainable solutions for Mason. The fundamental idea is about collaborations between scientists and artists at both faculty and student levels that can result in research projects, pedagogical innovation, and learning experiences on the campus. Furthermore, the *EcoScience + Art* intends to bring together individuals working across the boundaries of ecosystem science, ecological restoration, the arts, engineering, and sustainability to provide not only Mason, but surrounding communities with the opportunity to share knowledge, understanding, and discussion concerning the pressing environmental and cultural issues we face in the pursuit of a sustainable future. A website for *EcoScience + Art* was created (<http://ecoscienceplusart.wordpress.com/>) and has served the community by providing useful resources, promoting events, and providing a venue for conversation in the effort to design a sustainable campus. The first year experience with two events of the initiative has led me to design an on-campus project (i.e., *The Rain Project*) that can promote participation and collaboration in the context of ecological literacy and campus sustainability.

## Speaker series

The *EcoScience + Art* initiative started as a speaker series which introduce innovative, original, and pioneering figures of the boundary of arts and ecological sciences to students and faculty to motivate and inspire their creative collaboration. The speaker series was also designed to bring together professionals working locally in the interdisciplinary area. We all know how challenging it is often to create and conduct interdisciplinary projects. The attempts for interdisciplinary efforts often drain out without structural and systemic support and encouragement from the administration. To host a speaker series I put together a proposal and applied for University Life Programming Fund which promote faculty/staff/student interaction, and increase collaboration across units within the university (<https://ulife.gmu.edu/university-life-programming-grant/>). The fund covered honorarium and travel costs for a speaker as well as a small miscellaneous cost for the event, including some foods for a reception. The speaker series is open to public. In designing the subject matter for speaker series, scientific methods and artistic design are considered in ecosystem restoration projects, including discussion on potential green infrastructure and environmentally-friendly developments on and off campus. During and after each seminar I had participants fill out a questionnaire to figure out their backgrounds and opinions about the initiative and the lecture series. The entire lecture part got also filmed and the media sources were uploaded onto our web blog, a place where students and faculty can express and exchange their opinions and ideas based on what they learn from each seminar. I believe this encourages further discussion on ideas and approaches that will become education resources to design more interdisciplinary courses and sustainable living on the campus.

The inaugural event and seminar was during the fall semester for 2013, and successful with a pioneer eco-artist, Patricia Johanson (Kelley, 2006) with her talk titled “Art, Ecology, and Infrastructure”. Attendance and participation of faculty and student came from a number of

different disciplines across the campus, including art, biology, environmental science, civil engineering, cultural studies, communication, film and media studies, women studies to a name a few.

### ***The Rain Project* – a special project under the *EcoScience + Art* initiative**

I have very recently designed a project called “*The Rain Project*” as an experiment and case study of what *EcoScience + Art* holds for now and the future for college education, scholarship, and service. It is a student participatory project with a project-based learning approach aiming at developing innovative interdisciplinary education and scholarship. The goal of the project is to raise awareness of stormwater issues for Mason community that are currently critical, and carry out an interdisciplinary year-long (from Fall 2014 through Summer 2015) project by students and faculty through collaboration among science, engineering, arts, and humanities to design and implement green infrastructure (i.e., floating wetland, FW) on the campus pond.

We live in an era of climate change and climate change is a story of water, especially rainwater. The water is the way in which people feel the effects of climate change especially through cycles of droughts and floods. Stormwater issues and management along with an urgent need for being a storm-ready community demands our creative solutions with sustainable water management on the campus. Currently many US cities turn to green initiatives, looking out for some new techniques and innovative green infrastructure that mimics the way nature collects and cleanses water. Specific objectives of the Rain Projects are 1) to involve undergraduate students across the campus to build a FW over a year period to improve water quality and stormwater management in Mason ponds, and 2) to form a student leadership group campus-wide to work on

varying aspects of the project that require student participation in designing, implementing, documenting, and outreaching activities of the project.

### **Expected outcome of *the Rain Project***

The processes of this project will involve several steps in research inquiry and hands-on experiential learning to build a FW. The FW wetlands require structural rigidity with enough buoyancy and sturdiness structurally, yet flexibility that would harness a variety of ecological/biogeochemical processes that should be facilitated to clean the water by removing nutrients (e.g., nitrogen and phosphorus), too much of which often leads to algal bloom and degraded water quality in stormwater ponds. Therefore, artful design can be only functional when it is materialized based upon the understanding of scientific processes and patterns involved.

Each step of the activities of the project will be recorded and/or documented during the project to share the experience and information to be learned. The project outcome will test and showcase a new model curriculum incorporating arts, environmental science, and infrastructure engineering as research and scholarship intensive, green course for undergraduate capstone experiences that can start in the future semester as earliest (e.g., SP 2016). The course will be a new example and a showcase of project-based curriculum that can be taught with professors from different disciplines that would require a sort of coordination of academic administration. The new course may begin in a student's first year and/or culminates in a senior "general education and/or capstone" projects for a real-world environmental sustainability projects. Based on students' interests the new course can be a platform for self-designed and guided learning experience with a team of faculty members eventually enhancing academic performance.

The outcomes of the project may show how to tie activities of education and scholarship to service for campus community, addressing a timely issue of sustainable stormwater management in this case. In addition, establishing future collaboration among several departments along with the campus sustainability office, and *Students as Scholars* initiative at GMU will support efforts to creatively administer academic performance in the university. Some students from communication and film/media majors working on the project can also participate in documenting and videotaping major activities and processes during the project to build a ground for community-oriented environmental film and documentary for the university media and beyond. Not only scientific and technical learning outcomes, but also pedagogical and educational ones will be reviewed and evaluated, and made into peer-reviewed journal publications, which is a critical step for research and scholarship experience for undergraduates.

### **Future of the *EcoScience + Art* initiative**

I hope that the *EcoScience + Art* initiative at GMU will continue to grow engaging people working both on and off campus in the boundaries of the ecosystem science and the arts through a variety of events –seminar, exhibits, talks, tours, films, fairs, and more. I envision the initiative will grow to serve the campus and local community by providing useful resources and being the venue for further conversation and discussion of creative ways of education, scholarship, and university service. Once we start talking to one another across the academic boundaries, especially between sciences and arts it would be much easier to be creative in developing new ways of living and designing sustainable future, as well as of educational agenda and pedagogical framework. I really hope this small seed I have sowed with my co-director of the initiative will grow to become a beautiful, tall tree, and, along with other academic trees growing on the campus with folks making efforts in other sectors, to become a forest of ideas for

education that are *innovative, diverse, entrepreneurial and accessible* (i.e., The Mason *i.d.e.a.*), the core institutional characteristics of GMU (see <http://masonidea.gmu.edu/>). The holistic approach taken in the joint efforts between arts and ecological sciences will contribute to educating and preparing the next generation to better meet the challenges of sustainability science, hopefully presenting a cultural framework to be seriously discussed to design college STEAM education.

### **Acknowledgment**

I sincerely thank my co-director, professor Mark Cooley from School of Art for working with me on the *EcoScience + Art* initiative. Thanks also go to a number of parties including college administrators, faculty members, and volunteer students on the campus, and collaborators off campus for their help, support, and valuable inputs so far. Thanks also go to University Life for its financial support that has made possible the speaker series of the initiative. Thanks to Daniel Lauchu for his help with the *EcoScience + Art* website, Ghotbee Lim for her assistance with logistics, and to Danielle Rigley for helping me evaluate event attendance and questionnaire for the first two events.

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