

A Teacher Fellowship Program: Integrating Place-Based Sustainability Education into K-12 Classrooms

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May 1st 2020

A report submitted in partial fulfillment of the requirements for a degree of Master of Science (Environment and Sustainability) in The University of Michigan.

Acknowledgements: May we express gratitude to many who are supporting this work, but especially to Phil Schwedler, the Dow Innovation Teacher Fellowship participants, Delta College, University of Michigan's School for Environment and Sustainability, and the University of Michigan's Center for Education Design, Evaluation, and Research, the Saginaw Bay Land Conservancy, Ed Waisanen, Meghan Wagner and Bret Fickes from the Michigan Sustainability Cases Initiative.

Preface

The Dow Innovation Teacher Fellowship (DITF), sponsored by Dow Chemical, aims to provide educators with more support as they become stewards of the environment. DITF is implemented through the University of Michigan's Center for Education Design, Evaluation, and Research (CEDER). DITF supports professional development of teachers in the Saginaw-Midland-Bay tri-city area of Michigan on sustainability education methods, through professional development opportunities. The program integrates sustainability across school subjects, to support the execution of interdisciplinary sustainability learning units in middle and high school classrooms, using project and place-based pedagogical methods.

This project leveraged a targeted qualitative research process (under IRB exemption number HUM00165059) by UM School for Environment and Sustainability (UMSEAS) graduate students to enrich the pilot year of the DITF program. We began in Spring 2019, conducting an annotated literature review about place-based and environmental education, as well as other approaches to sustainability learning. The idea being to benchmark for professional development activities on best practices with incoming fellows in addition to professionals interested in this work. As the cohort embarked on designing sustainability learning units for their respective classrooms further research was conducted to monitor their progress. Research methods included:

- Documentation of Fellows early progress on developing learning units through semi structured entry interviews
- Track challenges and collaborative successes through participant observations and touchpoint interviews
- Evaluate learning experiences for educators, civic partners, and students through concept maps and exit interviews
- Analyze all observations, interviews, and media to design a case study on one Fellows experience with the program utilizing supportive information from other cohort members.

Interviews were transcribed and coded using *Dedoose* software. Interviews enabled us to elicit feedback, provide suggestions for future DITF growth, and recruit and train for a second cohort in Spring 2020. Interviews also allowed us to select from among the cohort a focal “case” from which other educators, school administrators and civic partners can learn about evolving best practices through the perspective of Phil Schwedler. An online case study is pertinent especially in the current time (we are currently in the global CoVid-19 pandemic) as shifts to online learning are becoming more prominent.

We scoped the resultant learning case through analysis of our qualitative data and a series of case conceptualization workshops alternately held in the gala platform offices at UMSEAS and at CEDER in the UM School of Education. The case, hosted on Gala, an open access platform www.learn gala.com, follows Phil, an eighth-grade teacher from Freeland Middle School in Bay City, Michigan from the summer professional development workshop through lesson creation and implementation, to mentoring others participating in similar work. Trying something new as a teacher is always risky but teaching in times of environmental crisis brings new challenges. The DITF Program offers supportive partnerships and professional development

experiences for educators; the collaboration between UM SEAS and CEDER displays how support can be paid forward through agile, responsively designed, learning tools for integrating modules on emerging fields of knowledge in environmental curricula.

A note to the reader:

The purpose of this research was to develop an inaugural CEDER Michigan Sustainability Case Study about how teachers develop and implement place-based sustainability education. The case is set up to narrate these experiences in order to reach a broad range of audiences with specific helpful insights to aid educators and other sustainability education organizations in their future endeavors with this work. Michigan Case Studies are one library of modules showcased on learngala.com. What follows is the main content of the case study, in text form. For a more interactive experience, follow this [link](#) to see our case study on the Gala platform.

Learning Questions

1. What is the importance of place-based learning in terms of sustainability education?
2. What methods and modalities can educators use for sustainability education?
3. How can we better support our educators as they help us learn more about the environments we live in?
4. How can place-based sustainability education inspire future environmental leaders?

Keywords: Sustainability education, place-based sustainability education, secondary education, environmentalism.

Background

Setting the Stage

Teaching students about environmentalism is essential in providing groundwork for those who will face the future of climate change and global health challenges. It is 2020, and the earth needs our help: Sea levels are rising, temperatures are increasing, natural disasters are intensifying, and diseases with animal origins are causing a global crisis. While efforts to protect and restore our planet are increasing, there is still much left to do to decrease the negative impacts humans have on the earth. Communities worldwide must increase environmental efforts to prevent damage from extractive and high consumption practices, salvage remaining resources, and fight for the health of our world. The World Health Organization warns that a quarter of all human diseases are attributed to negative environmental conditions such as poor air quality and unsafe drinking water (Prüss-Üstün & Corvalán, 2006). As the global pandemic of 2020 teaches us, we cannot continue to destroy earth's resources, or it will come back to haunt us. The future of human health depends on the health of our planet—without the earth's resources, we will not be here.

Concern for a more sustainable society has gained urgency around the world, with younger populations leading high profile social movements demanding climate action. Young leaders around the world are standing up for the environment through rallies, protests, and policy recommendations like the Green New Deal, all of which help set an example for people around the world. The now famous Greta Thunberg, a 16-year old international activist who began fighting for the planet at her local school, now rallies millions of students in unison to strike for better treatment of the earth. Her global effort, along with the work of many young activists of all backgrounds, displays the urgency of the issues we are facing. These social and environmental movements inspire students to want to help the environment: students see the severity of the situation and know how important it is to accelerate our environmental efforts and eradicate excuses made on such issues (Haynes, Alter, & Worland, 2020). The increase in youth activism reflects the growing need for formal education to support learning processes on how to be better stewards of our environment.

Oftentimes, educators make the first introduction to environment-related topics for students. These educational experiences are crucial for developing a foundational understanding of environmental issues, as well as supporting students as they connect with the natural world. In today's world where climate change information infiltrates popular media, classroom communities can support students as they learn and cope with the information being thrown at them. If our educators were encouraged to support students in learning more about environmental challenges along with exploring and connecting to nature, it could encourage problem driven thinking, reinforcing K-12 curricula, while also contributing to creating future environmental protectors and leaders. If educators are going to provide that support, they need resources and strategies for teaching sustainability. Teaching sustainability will help better empower students to recognize environmental injustices, cope with the information, and effectively implement changes to our environmental and social systems.

Helpful Terms

Place-based education (PBE):

PBE works off of one's local environment to provide context for topics of interest.

“In place-based approaches, students learn to see themselves as members of civic and ecological communities who have a shared stake in improving the world around them. By emphasizing topics right outside their doors, community-based teaching provides immediate relevance—something that’s often missing when content is abstract or unrelated to students’ lives or cultures. Situating academics in a familiar context also provides a strong platform for students to study parallel issues at the global level. PBE is thus a geographically “expandable” approach that encourages systems thinking” (Santone, 2019).

Environmental Education (EE):

EE provides information on natural processes and ecosystems, setting the foundation for future engagement with the natural world.

“Today much EE research focuses on investigating the conditions and learning processes that enable citizens, young and old, to (i) develop their own capacity to think critically, ethically, and creatively in appraising environmental situations; (ii) make informed decisions about those situations; and (iii) develop the capacity and commitment to act individually and collectively in ways that sustain and enhance the environment” (Wals, Brody, Dillon, & Setevenson, 2014).

At the Tbilisi Intergovernmental Convergence in Georgia in 1977, three main goals for environmental education were outlined (Monroe, Andrews, & Biedenweg, 2007).

1. To foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas
2. To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment
3. To create new patterns of behavior of individuals, groups, and society as a whole toward the environment.

Sustainability Education (SE):

Sustainability education shows individuals ways in which they can become better stewards of the environment.

The primary goal of SE is to involve students in current issues surrounding the environment and potential problems that may arise. SE tackles issues surrounding; climatic change, depletion of natural resources, land use management, deforestation, desertification, waste disposal, water, air, land, and noise pollution, mass extinction of species, population growth, poverty, and famine (Fien, Scott, & Tilbury, 2001). These goals make SE the most diverse and influential, as it combines environmental education with direct tools for motivating positive eco-change.

Why teach place-based sustainability education?

At its most basic, sustainability means a way of thinking that is connected to the outcomes for future generations (Greenwood, 2010). However, sustainability is rapidly maturing into a technically and scientifically mature field which either tweaks our existing industries and infrastructures to make them more efficient, or designs and builds entirely new systems that do less damage to our planet’s current systems. Giving young learners grounding in basic problem frames, concepts, and approaches that will help them participate and innovate in such emerging sectors.

Sustainability is a great complement to environmental studies, for it provides specific tools for aiding the current environmental crisis. For example, when thinking about the everyday environmental impacts we make on food consumption, we can adopt sustainable practices, such as shopping locally and growing some of our own food. Supporting, when educational information is place-based, students can take aspects of what is learned in the classroom and apply it to real-world contexts. For example, a lecture on food consumption can be enhanced with a trip to a local farm where students learn about where food comes from and have the chance to meet and connect with farmers. Place-based sustainability lessons can enhance the learning experience by making direct connections to the world that students are learning about. Also, it provides an opportunity for educators across disciplines to collaborate on field trips and other learning unit activities.

Place-based sustainability education can involve students in the process of identifying significant key issues, investigating said issues, and carrying out potential positive solutions to address climate change (Fien et al., 2001). Place-based sustainability educational experiences can help children to develop a sense of identity and purpose as environmental stewards. Place-based educational experiences outside of the classroom can make space for collaborative experiences where students become accountable for another's success, therefore, allowing for relationship building to occur amongst classmates, as well as between students and the spaces they're engaging with (Schlottmann, 2005). The DITF program offers educators an experience to learn how to incorporate these learning methods into their classrooms. Move along to the following section to learn about the DITF program!

Helpful Insights

Teachers:

- Before making a decision on what type of learning unit you're going to execute, take the time to research more into sustainability. Specifically, try to find out more information on how your community is working towards sustainable initiatives. Gaining this foundational understanding of what is going on in your community will help you to become more of a resource for your students.
- If you want to make your learning unit place-based, look into local environmental organizations that offer visitations. Nature centers, local non-profits, and local environmental councils could be great places to look into!
- Decide which PBE principles you are interested in implementing. Once you've made a decision, look into local organizations that could exemplify that type of work. Referenced below are some great resources for PBE principles.

Introduction: The DITF Program

The DITF Program

The Dow Innovation Teacher Fellowship (DITF) is an educational program created in partnership with the University of Michigan School of Education's Center for Education Design, Evaluation, and Research (CEDER), along with Dow Chemical Company, and Delta College. DITF is designed for secondary teachers across content areas located in the Great Lakes Bay Region of Michigan to assist in creating and implementing place-based, sustainability-focused learning units. DITF is also interdisciplinary, for the application process encourages teachers across different subject expertise to apply as teams. In addition, the program encourages co-

teaching and utilizing a community partner, which enriches the learning experience and allows students to make connections across subjects. It is the hope that the DITF program can make place-based sustainability more accessible for teachers.

For the inaugural 2019-2020 cohort, CEDER took on 16 teachers as Fellows. The 2019-2020 group includes eight science teachers, three English language arts, two math, one social studies, and one special education teacher. Also, ten Fellows teach in middle schools, while four teach high school, and two teach in a career center. With sustainability being an interdisciplinary topic, some teachers took advantage of co-teaching by applying to the fellowship as groups. This dynamic group of teachers from Michigan is CEDER's first DITF cohort!



Figure 1. The 2019 DITF cohort stands in front of the Delta College Planetarium in Bay City, MI during the first day of their professional development sessions in June 2019.

The Fellowship Experience

Fellows are expected to...

1. Participate in three days of professional development and networking in the summer of 2019, with two of these days being at the beginning of the summer and the third day near the beginning of the school year.
2. Commit at least three days over the summer researching a local sustainability issue, identifying and working with a local partner, and developing an instructional plan.
3. Develop, implement, and share a project and place-based instructional unit during the 2019-20 school year around a local sustainability issue. This unit can vary in length but should engage students for at least one week's worth of lessons, connect them with a local

partner, engage them in spaces outside the classroom, and result in a publicly shared presentation of an action project to help address the sustainability issue.

4. Document the implementation of the unit, collect artifacts (video, photos, student work) with appropriate student consents and releases, and share with other teachers and project participants.
5. Participate in remote and in person check in meetings scheduled with University of Michigan project staff to provide updates on progress and to request support as needed.
6. Secure building administrator's support for the above.

Why Teachers Join

The DITF program provides educators with a unique opportunity to engage with sustainability topics that are transient across content areas, therefore bringing in a wide range of educators. The fellowship program empowers teachers to become change agents in their communities by offering support in implementing environmentally sustainable focused units, through place and project-based learning, making it appealing for educators looking to enhance their teaching methods. In one of the Fellow's applications they wrote, "as a social studies teacher, I constantly preach good citizenship...The actions we take today as citizens regarding sustainability will have a direct impact on the future of humanity...I hope to get a project-based learning idea that will be highly relevant to my students. I also hope to meet and collaborate with colleagues and learn from their experiences." DITF supports teachers, such as this Fellow, who have never encountered environmental sustainability, but understand its importance and have the enthusiasm to teach it.

Many of the Fellows expressed a desire to find new ways of aiding student learning on environmental topics for their students. For example, one of the Fellows wrote, "I want students to understand how important sustainability is, so they will develop a passion for taking care of our earth... I'm interested in teaching children how to take care of our environment so that it will be available and beautiful for the future. I also want to teach them about this responsibility that we each have to do our part on a daily basis as a responsible human being. I feel this is an area that is lacking and missing in many of our young people today." The DITF program supports educators like this who desire to do more but are not readily equipped. Not only does the fellowship offer a summer workshop, but it also provides resources through articles, online support, and a \$2,000 stipend for classroom tools. Overall, the DITF is a great starting point for educators who need more support on their journey to teach place-based sustainability education.

Helpful Insights

Sustainability Education Organizations:

- If developing a similar program, consider expanding to develop a community action network where you have continuous support from community partners, academics, and other education organizations with similar goals. To start this type of network, first identify potential supports within your community to reach out to discuss potential partnerships and how each can benefit from this network.
- Working with other practitioners around the area can help expand the breadth of your program through collaboration of professional development opportunities, expansive resource availability, and expertise in specific content areas.

- Consider providing sustained professional development opportunities so teachers can continuously refine their place-based sustainability teaching methods.
- Consider setting up continuous community partner support for specific schools. A strong partnership between a school and local community partner can be beneficial by changing the school environment towards utilizing place-based education in all classrooms.

Summer Workshops

DITF Summer Professional Development Sessions

On a hot June day, outside the Delta College Planetarium in Bay City, Michigan, the first cohort of Dow Innovation Teacher Fellows hunt for litter around the Saginaw River for a "trash census" activity, inspired by the Alliance for the Great Lakes' Adopt-a-Beach program. As teachers explore the area, they search for trash to add to their five-gallon buckets while keeping track of what type of litter they find. Fellows use the data collected to conduct a quantitative analysis of the litter accumulation from around the river. The DITF program team conducted this activity as a way to simulate a "launch event," which is an example of a place-based sustainability field activity that teachers could then offer in their classes. This venture intends to give the Fellows a glimpse of how a place and project-based learning unit can seamlessly fit within a classroom setting using minimal funding and teacher workload.



Figure 2. DITF Fellows walk around the Delta College Planetarium to collect trash for the "trash census" activity.

The "trash census" activity was just one of many learning opportunities that teachers experienced throughout the professional development (PD) sessions. During the PD days, learning opportunities included a review of place-based and project-based learning,

understanding sustainability education, insight from guest speakers, collaborative workshopping periods, and opportunities for Fellows to develop their sustainability units. The purpose of these sessions is to provide teachers the experience to understand and practice place and project-based learning to support integrating sustainability topics into the subject(s) they currently teach. With some of the Fellows new to teaching sustainability, CEDER utilized these learning activities as a way to work towards fostering the idea that sustainability is not just a science topic but is an inherently interdisciplinary subject that can be leveraged across all disciplines.



Figure 3. DITF Fellows collaboratively work together on a “list, group, label” activity to explore definitions of sustainability.

Community Partner Connections

While many of the Fellows arrived at the fellowship with ideas for learning units, others came with little experience in teaching sustainability and even struggled with how to relate sustainability topics to their subject. In order to start everyone off on the same page, DITF provided a structured community partner introduction with Fellows. This piece of the PD session propelled both sets of Fellows toward further developing their learning unit through structured work sessions with community partners. For both place-based and project-based learning, finding a community partner with an authentic problem helps provide a more extensive student experience.

CEDER brought in eight different community partners located across the Great Lakes Bay Area to help Fellows develop and refine ideas for their learning units. These community partners include private businesses, non-profits, city municipalities, and nature learning centers.

Each community partner brought a unique and authentic task that could leverage student knowledge, creativity, and critical thinking skills for solving problems within their communities. As Fellows began to meet with each community partner, they started to not only see the development of their future learning unit but also how to utilize community resources around their school. The Fellows left the first summer PD session with a few solid ideas about their learning units, and that could be refined throughout the summer until their next PD in August.



Figure 4. DITF Fellows talk to different community partners about potential learning units that can leverage their community expertise during the community partner networking session.

Helpful Insights

Sustainability Education Organizations:

- Most educators have not had formal training in sustainability education during teacher education programs. To ensure the development of effective learning units for students, teachers need to work towards achieving environmental literacy themselves.
- Utilize everyone within your community, anyone can be a community partner - even a teacher's school!
- When expecting educators to work with community partners, provide teachers the opportunity to meet potential partners to form a solid foundation for a successful partnership.

Teachers:

- If you do not have any current ideas for a learning unit, talk to as many community partners as possible. A conversation might strike inspiration from a particular problem to solve together!

- If you already have a project in mind, remember to be flexible with your plan. You want to make sure that you provide an authentic problem that a community partner is actually experiencing.
- Open communication with your community partner is vital for the success of your partnership. Be sure to communicate guidelines and expectations with your partner (i.e. do you expect a field trip or an in-class visit) from the beginning and be willing to compromise if needed.
- These types of dynamic learning experiences generally thrive when you have a strong support system within your school such as utilizing fellow educators and your principal. Developing buy in from educators within your school helps to create the space and permission for taking risks and stepping outside conventional instruction.

Meet Phil

Meet Phil Schwedler! Phil is an eighth-grade social studies teacher at Freeland Middle School in Saginaw, MI. He works with over 150 eighth-grade students a day teaching them about integrated United States history. Phil is a veteran social studies teacher with 22 years of teaching experience and has utilized project-based teaching methods in his classroom for the past five years. He took the bold step of applying to DITF with little to no experience teaching sustainability topics but has a deep interest in providing his students with a sustainability focused learning unit.



Figure 5. Phil Schwedler talks to Lisa Cleland from Saginaw Basin Land Conservancy during the community partner networking session.

When first applying to DITF Phil was not fully aware of how sustainability topics could fit into his integrated United States history classroom. Despite his hesitancy, he quickly recognized the connection between sustainability and good citizenship, a topic he makes a high priority as a social studies teacher. In his application, he stated, "being a good citizen includes assuming responsibility for the fate of future generations." This connection carries on through the development and implementation of his learning unit by emphasizing that practicing sustainability is a part of being a good citizen.

Community Partner Connections

In the professional development sessions, Phil started to see sustainability as an interdisciplinary topic and began to learn how to incorporate sustainability into social studies topics using place and project-based teaching methods. During the community partner meet-and-greet, Phil found that a partnership with the Saginaw Basin Land Conservancy (SBLC) could complement his learning unit. SBLC helped bridge connections between Phil's initial ideas about watershed scale environmental protection issues, and an authentic task that was rooted in his community. During the summer of 2019, he managed to refine his preliminary ideas into a relevant and authentic place-based learning unit that investigates the positive and negative impacts of the industrial revolution in Saginaw, MI.

Helpful Insights

Teachers:

Phil was one of a cohort of sixteen educators in which there were many different experiences incorporating sustainability learning in their curriculum. Some members of the cohort opted not to initiate partnership with community-based or civic sustainability experts, but rather to work with students, administrators, and staff in their own schools. For instance, one worked on limiting food waste in their school cafeteria. Other members of the cohort initiated partnerships with civic organizations or professionals, but faced frustrations and limitations, and ultimately had to "go it alone," finding work arounds that allowed for learning activities in their classroom without recourse to local sites and specialists. Focusing in on Phil's experience allows us to share a full experience on how place-based sustainability can be incorporated successfully into one's classroom. This type of work is very dynamic and can be adapted to fit any context whether you are a part of the fellowship or not.

Phil's Lesson

Lesson Background

It is September 2019, and Phil feels prepared to teach his eighth-grade students about the effects of the Industrial Revolution on Saginaw, MI. Freeland Middle School, sandwiched between Midland and Saginaw counties, is surrounded by a rich manufacturing history, evidenced in the abandoned buildings and vacant lots that still scatter the county. After months of lesson preparation following the summer professional development workshop, Phil has designed a learning unit with the help of DITF resources that will cover the Industrial Revolution's impact on Saginaw and its connection to current sustainability issues.

Learning Unit Goals

1. Explain the origins of the Industrial Revolution in America

2. List the benefits and problems left behind by industrialization on local communities
3. Make the connections from changing economies to demographic changes in urban centers as measured with a formative and summative assessment
4. Establish a working partnership the Saginaw Basin Land Conservancy (SBLC) to provide an authentic problem for students to dissect
5. Develop a solution/s which promotes sustainability addressing social, economic, and environmental concerns
6. Produce a recommendation to community leaders including a reflection to tie all learning goals together

Phil utilized a combination of in-class lectures and outdoor field experiences for his learning unit. The goals of the lesson were to show students the Industrial Revolution's long-standing impact on their community and how to use sustainable practices to alleviate the problem at hand. First, Phil introduced the history of the Industrial Revolution to provide the foundation for the learning unit. After a few weeks of learning about the history, students learned about the Industrial Revolutions' connection to sustainability through a presentation and field trip experience led by Phil's community partner, Ted Lind from SBLC. Having SBLC as a community partner helped Phil enhance his learning unit on the Industrial Revolution by turning it into a place-based learning experience rooted in an authentic task that was embedded in the local community.

To kick off the learning unit, Phil asked Ted to talk to his class about SBLC's current work with vacant lots, the Pollinator Project, and also provide background on the history of why SBLC started this work. Ted utilized the background of why SBLC started working on vacant lots as a call to action to propose an authentic task for Phil's students to work through. The task asked students to think about long-term solutions that could contribute to revitalizing these areas of Saginaw, MI. Phil further enhanced the student's sustained inquiry surrounding this project by taking them on a field trip to see first-hand examples of sustainable and equitable solutions from Ted's work with SBLC in revitalizing vacant lots. *Details of the field trip lesson are outlined in the following section.*

After finding inspiration from the field trip, students started to design their own sustainability solutions to the problem of vacant lots in Saginaw, MI. Their projects needed to incorporate historical highlights of the industrial revolution and a proposed sustainable solution for vacant land under the guidelines set forth by the three pillars of sustainability. Students worked in self-organized groups, a form of group engagement in which they were responsible for themselves and their groupmates during the duration of the project. Students would later present their completed projects to a group of stakeholders in a multi-media science fair-style set up.

Community Partner Integration

Ted Lind, Director of Community Conservation at the Saginaw Bay Land Conservancy, has a deep understanding of the county's history, making him the perfect community partner to compliment Phil's Industrial Revolution lesson. Ted's role as a community partner was to supplement Phil's lectures by providing community expertise in how Saginaw connects to their curriculum during classroom visits and the field trip experience. When Ted came to Freeland Middle School and led a presentation on Saginaw's vacant lot and abandoned building problem,

his presentation built upon lessons already embedded in the curriculum. Ted's presentation identifies the deep community ties that Saginaw has with the Industrial Revolution by discussing major sustainability issues surrounding vacant lots, the cause of such dilapidation, and equitable solutions that can be made. Ted's guest lecture helped to show students the connection between their current learning with the Industrial Revolution and the sustainability issues surrounding dilapidated land. With the effects of the Industrial Revolution in their neighboring town, SBLC helped to identify an impactful relationship between the student's community and the consequential topics discussed in the classroom.



Figure 6. Ted Lind provides a history of the Potter Street Train Station during the field trip experience. *Photo by Zachary Branigan, SBLC*

"Ted Lind is currently in my class going through the Pollinator Project, which on the surface sounds like a very scientific project with the environment, planting, and things like that. But it does tie into social studies greatly. You are talking about things like redlining, social justice, civic responsibility to our environment, and my curriculum of American Industrialism. For a content area that I have taught for years, now the students will get to see the impacts of Industrialism with their own eyes." - Phil Schwedler

The DITF program also supports educators in incorporating an authentic audience. The presence of an authentic audience can support student learning by further displaying the importance of the topic at hand. Phil's authentic audience was Tim Novack, the Saginaw County

Treasurer. Tim became Phil's authentic audience by making a guest appearance during the final presentations. Together, the community partner and authentic audience helped to show students the importance of their projects and further model sustainability's real-world applicability.

Helpful Insights

- Make sure your community partner and authentic audience are rooted in the community you're learning about. People who work and live in the communities we hope to engage with have a deeper understanding of the issues at hand.
- Once you've found a community partner you could bring them into the classroom for a lecture, take students on a trip with them as a guide, have the partner participate in a video conference call with students, etc. The possibilities are endless!
- If able, try to partner up with stakeholders who have direct experience in what you hope to teach. For example, if you want to teach about waste management, a key community partner could be someone who works at a waste-to-energy facility and the authentic audience could be a local citizen who started a community organization to advocate for better waste management.
- If you're unable to take students into the field for a place-based education lesson, then bring the place to the students! For example, a PowerPoint with photographs, videos of the community, or even bring in a guest lecturer if you're able! You could also consider developing a learning unit with an authentic problem found within your school, such as food waste in the cafeteria.

Field Trip Experience

Experiencing Saginaw

In the halls of Freeland Middle School on a cloudy October day, large groups of eighth-graders hurry outside of the building with excitement for their field experience that Phil and SBLC organized for their sustainability learning unit. With the help of his teaching team and principal, Phil managed to give almost every eighth-grader at Freeland Middle School, over 150 students, the opportunity to participate in his project's field experience. This field experience had a full and immersive itinerary to provide students with knowledge on and an understanding of urban blight in their neighboring town, Saginaw, MI.

Students visited five different locations and participated in a cleanup at their last site visit. The purpose of these site visits was to show actual examples of positive transformation by introducing landmarks throughout Saginaw that have experienced destitution and then revival. These examples embody the types of solutions that Phil hopes his students will develop for their final project. The itinerary for their field experience included these stops:

- General Motors Former Malleable Iron Site
- Saginaw Children's Zoo Trail
- Potter Street Train Station
- Janet H. Nash Riverfront Preserve
- Davenport Street Clean-up



Figure 7. Director of Saginaw County Parks and Recreation, Brian Keenan-Lechel, discusses the revitalization of the former General Motors Malleable Iron Site into a recreation area. *Photo by Zachary Branigan, SBLC*

Taking Root in Saginaw

At each stop, Ted Lind gave a quick introduction about the site along with an overview of its unique history. Their first stop even had a special guest, Brian Keenan-Lechel, Director of the Saginaw County Parks and Recreation. Brian was asked by SBLC to help introduce the purpose of the field trip by discussing one of Saginaw County's most significant revitalization efforts that is currently in the works. The 322 acres of the former General Motors Malleable Iron Site will be transformed into a recreation area for hikers and bicyclists with both riverfront and observational trails. Deliberately, this site was the first stop to introduce the narrative of how Saginaw is rebounding from the effects of the industrial revolution.

"Saginaw is less than 15 miles away, but it is a world away for our students. When they were able to see with their own eyes, walk outside, and see these projects and see these areas I just think it was so powerful and then to be able to physically take part in a cleanup- I just don't think you can get any better than that was ultimate learning. And it was just really cool...Having my principal there, and the other teachers there, it became cross-curricular everybody was involved, and I just thought that was the best part."

- Phil Schwedler

Each unique location continued to build on the narrative of how the industrial revolution has affected Saginaw and how the city is responding to the negative consequences. The site visits corresponded with topics that students examined on the first day of the project when Ted Lind discussed redlining and urban blight within Saginaw. Specifically, SBLC built a trail to the Saginaw Children's Zoo to provide equitable access to the zoo by connecting it to a lower-income neighborhood. This site visit was an example of how these sustainable solutions are not only meant for helping the environment, but also for instilling equity within their community. These visits provided tangible examples about the decline of the manufacturing industry in Saginaw and how real practitioners are providing sustainable and equitable solutions. The main takeaway from this field trip was to show students the realities that Saginaw faces, with the intention of inspiring students to develop these types of solutions for their own projects.

"Changing the culture of how people view vacant land is not something that happens over a short period of time. It took a long time to create the problems that we are seeing in Saginaw now, and it is going to take a long time to undo those problems and change some minds. Being able to reach a younger audience like this to introduce some of these [topics] has good value." - Ted Lind

Helpful Insights

Educators:

- When developing a field trip experience, you want to make sure your field trip enhances the project-based learning aspect of your unit. Having a field trip that is a tangential experience your authentic problem is not as effective.
- Consider the following questions while developing your field trip experience:
 - What is your community partner's role? What do you expect of them?
 - What is you and your classroom's role in the field trip? What does the community partner expect of you?
 - How does this experience connect to the learning objectives of your unit plan?
 - How will this experience enhance project-based learning and place-based education learning opportunities?

Student Reflections

Student Project Expectations

After the field trip, Phil asked his students to form their own groups for their projects. Within their groups, students designated roles to one another and developed norms for all group members to follow while working on their collective project. For example, all groups had a self-designated "timekeeper", "organizer", and "group manager" to keep everyone on track. Over the course of a few weeks, students worked together to complete their project objectives outlined by Phil:

- Research the issue of abandoned properties due to the exodus of industry.
- Identify problems left behind in onetime industrial communities and create a multimedia presentation, including the following:
 - A history of Industrial America throughout the 19th and 20th century

- Population trends in industrial America throughout the same time period
- Include a comparison of those population trends to today
- An outline of the problems caused by abandoned properties and the practice of redlining, including information that was discovered during the site visit to Saginaw
- Solutions: create a viable plan for vacant lots in Saginaw that will satisfy the three pillars of sustainability - economic (profit), social (people), and environmental (planet). That plan can include a list of permanent solutions to create "assets" in the community
- Prepare the presentation to share with a group of local leaders from the community
- Answer the driving question: In what ways is sustainability a civic responsibility? Utilize details and examples

Student Presentations

After weeks of hard work, on November 22, 2019, students were ready to present their projects. Projects were presented to Ted Lind and Tim Novak, who both served as authentic audience members. An authentic audience usually consists of key stakeholders, practitioners, or citizens who have experience with the content at hand. An authentic audience is unique in that they provide key perspectives to the learning experience which is considered to be critical to pedagogical practice (Schlottmann, 2005). Having an authentic audience was a crucial piece in providing students with deeper connections to their work and modeling how they could use what they learned to answer real-world problems. Phil had Ted Lind participate as an authentic audience member along with Saginaw County Treasurer, Tim Novak. Phil chose these authentic audience members with the intent to provide students with an opportunity to interact with practitioners that attempt to solve these problems through their work. Having an authentic audience adds another layer of depth to place-based and project-based learning that can truly enhance the whole educational experience.

Student creativity was prominent throughout the projects from their presentation style to their solutions for vacant lots in Saginaw. Some groups used regular poster boards to display their work while others made websites, slideshows, and videos about their projects. Similarly, other groups utilized the multimedia aspect of the project to engage audience members by having them participate in a quiz about their project through *Kahoot!*, a popular educational tool. The students' creativity in presentation style was accompanied by unique and innovative solutions to the vacant lot found in Saginaw.

Student solutions ranged from athletic centers and community housing to parks and outdoor recreation areas. Students justified their chosen solutions by intertwining the three pillars of sustainability into their presentations. Most students hit on aspects of community and economic growth, with a few projects really embodying sustainable solutions. During the presentations, it was apparent that elements of the field trip resonated with the students through their use of examples and solutions learned from that experience. For example, one group designed a wildflower garden as a solution for the vacant land they helped clean-up on the field trip.

When asked what they most enjoyed about the project, students provided a wide range of responses. Some touched on how they had never been to those parts of Saginaw and never realized these problems existed in their neighboring city. Similarly, others highlight how they enjoyed going on the field trip to see different parts of Saginaw. Lastly, students expressed appreciation for working in teams and being able to generate creative solutions without restriction. Throughout the project, Phil's students were able to form connections on how their projects could provide authentic solutions to real-world problems rooted in their community.



Figure 8. During the last stop of the field trip, students participated in cleaning up a vacant lot cleaning up large amounts of litter and items that were illegally dumped at the Davenport site. *Photo by Zachary Branigan, SBLC*

Helpful Insights

Educators:

- Having an authentic audience goes beyond the typical peer audience that students experience when presenting in a classroom. Utilizing an authentic audience fosters a sense of importance and relevance of student work.
- When choosing an authentic audience, it could be helpful to utilize someone from your community partner organization since they already have an understanding of the project parameters.
- Also, make sure you choose individuals who have a stake in the project when choosing authentic audience members. You want to keep their participation relevant to the project, so it helps to mimic real-world situations.
- When assessing student performance, it could be helpful to use formative assessment methods throughout the project especially when students are working in large groups.

Large place-based and project-based assignments about complex problems can be overwhelming. Having checkpoints throughout the project could provide the necessary scaffolds to help provide support for the students and keep their project on track.

Reflections

Phil's Reflections

During his exit interview with CEDER, Phil reflected on the fellowship experience. Overall, he thought that the DITF program has been a great experience, for it introduced him to concepts of sustainability and provided him with useful resources for his classroom. The evening network events, PowerPoint presentations, resources available throughout the experience, and overall support from CEDER staff are aspects of the fellowship Phil notes as memorable. In the future, Phil thinks it would be helpful if DITF were to provide more resources for teachers who need to cater to different learning styles. This idea stemmed from his desire to make his place-based learning unit as inclusive as possible for all of his students. Additionally, Phil noted it would be nice to have a larger selection of community partners to work with for developing an authentic learning unit. While collaborating with SBLC was a great partnership, it would be even more helpful in the future to know of other potential community partners that would be interested in collaborating with schools. As Phil's experience comes to a close, he expresses gratitude to the DITF team for supporting his journey throughout the fellowship.

One of the long-lasting impacts of the DITF experience is that it has also inspired Phil to become more eco-friendly! On camping trips, he and his family now pack reusable water bottles instead of plastic ones. Phil says, "I think they learned more or had a better grasp of sustainability than I did back when I was participating in the fellowship, and I know more now too." Even his students began thinking more critically about environmental issues and adopted some eco-friendly habits like recycling! The time Phil and his students spent investigating an important social and environmental problem influenced his students to become more conscious about sustainability efforts. It is incredible that one place-based sustainability learning unit was able to positively impact not only Phil but his students and family as well.

Improving the Fellowship Experience

Overall, CEDER hopes to use this cohort's experiences to enhance the DITF program for future Fellows. Since a decent number of educators did not have experience with place-based education and/or sustainability, one central idea is to extend the professional development workshop from three to four days. Having an extra day would allow for DITF to include more in-depth learning sessions on sustainability, as well as allow teachers more time to network with one another. Similarly, CEDER plans to increase the depth and breadth of sustainability topics during workshop sessions to further help set teachers up for success. The extension of sustainability topics will provide educators with more opportunities to understand how to investigate complex sustainability problems within real-world scenarios. Lastly, CEDER wants to provide more methods for engaging with community partners. As of now, this could look like a more extensive database of partnerships, with the potential of having a master document which includes comments about community partners from previous Fellows. These improvements with community partner connections will be utilized to better support the in-person interactions that CEDER provides with the Fellows. These changes are needed to make the DITF program an even more in-depth learning experience while also providing educators the necessary support to

develop and implement this work within their classroom. Thus, ensuring that educators have been set up with a quality understanding of sustainability that can be passed on to their students.

Helpful Insights

Sustainability Education Organizations and Educators:

It's now May 2020, and we are still in the midst of the global pandemic. While CEDER is striving to conduct another in-person professional development workshop over the summer, it may no longer be able to happen, or may be conducted via online. CEDER is still recruiting the 2020 Dow Innovation Teacher Fellowship cohort, but there are some changes that are happening. The professional development workshop has been rescheduled, with a new timeline outlined below. Decisions regarding the in-person or virtual nature of the sessions will be determined between now and June. Potential dates are outlined below:

- The Fellowship application deadline has been extended to June 21st
- Selected Fellows will be notified the first week of July 2020
- Virtual or in-person professional development sessions will take place on August 12-13, 2020.
- Two days of in-person professional development will be scheduled in the fall, based on fellow availability

The hope is that these shifts will allow teachers more time to plan for the professional development workshop. For more information, or for information beyond the year 2020, please consult the [DITF website](#).

Conclusions

While the DITF program intends to help educators develop learning opportunities for students engaging with place-based sustainability topics, educators outside of the scope of this fellowship should also feel empowered to participate in this work. Connecting with nature and learning about sustainability is an experience every teacher can have; even if attending a workshop or professional development session on place-based sustainability education is not readily available. Place-based education is impactful, for it roots students in their community by forming relevant, direct, and authentic connections with the curriculum at hand (Santone, 2019). Students will begin to recognize patterns of inequity and know how to take action against these deeply rooted issues by identifying, investigating, and reflecting on authentic problems rooted in their community. When students participate in authentic project-based learning, they begin to recognize the potential and relevance of their work and therefore become more inspired to be active participants within their communities.

Integrating sustainability education into classrooms is crucial for adapting to and mitigating the effects of the planetary disaster that we currently face. In formalized academic settings, place-based sustainability education can be impactful in influencing students to become better stewards of the environment by becoming informed, participating in critical thinking on real-world problems, and developing creative solutions to issues in their community. Learning opportunities rooted in sustainable concepts are embedded well throughout our daily lives and communities. These opportunities provide ample possibilities for developing place-base

sustainability projects across all K-12 core subjects. Place-based sustainability education can be a powerful tool in influencing one's desire to make a positive change for the planet.

Soon, people around the world will see the severity of the planetary catastrophe we are experiencing. As this awareness increases, educational efforts must support learning about and coping with these topics. Teaching sustainability empowers students to recognize environmental injustices, cope with impacts, and organize towards finding solutions for these environmental inequities. Providing more equitable experiences of sustainability education is incredibly important for making these experiences accessible for all students. Now is the time for us all to come together and support the journey towards learning more about the environment, so we can all become better protectors of the earth.

Helpful Insights

Sustainability Education Organizations and Educators:

For questions regarding the work or the research process that continues to inform the DITF program through UMSEAS and CEDER collaboration and For more information about the wide variety of experiences, and the ways many educators made positive change in their school's offerings, contact Rebecca Hardin at rdhardin@umich.edu.

References Cited

- Fien, J., Scott, W. A. H., & Tilbury, D. (2001). Education and conservation: Lessons from an evaluation. *Environmental Education Research*, 7(4), 379–395.
- Haynes, S., Alter, C. & Worland, J. (2020). *Greta Thunberg Is TIME'S 2019 Person Of The Year*. *TIME*. Retrieved from <https://time.com/person-of-the-year-2019-greta-thunberg/>
- Monroe, M. C., Andrews, E., Biedenweg, K. (2007). A framework for environmental education strategies. *Applied Environmental Education Communication*. 6, 205-216.
- Prüss-Üstün., Corvalán. C. (2006). Preventing Disease through Healthy Environments, 2-104.
- Santone, S. (2019). Reclaiming Education as a Public Good: Place-Based Teacher Education, 95(5).
- Schlottmann, C. (2005). Introduction: Place-based and environmental education. *Ethics, Place and Environment*, 8(3), 257-259.
- Wals, A. E. J., Brody, M., Dillon, J., Stevenson, R. B. (2014). Convergence Between Science and Environmental Education, 344(6184), 66-69.

Supporting References

- Bowers, C. A. (2009). *Educating for ecological intelligence?: Practices and challenges*. Retrieved from <http://scholarsbank.uo-regon.edu/jspui/bitstream/1794/9268/1/Book%20on%20E-Intell.pdf>
- Brookhart, S. M., & Nitko, A. J. (2019). *Educational assessment of students* (8th ed.). New York, NY: Pearson.
- Cochran-Smith, M. (2003). The multiple meanings of multicultural teacher education programs. *Teacher Education Quarterly*, 30(2), 7-26.
- Cubukcu, Z. (2012). Teachers' evaluation of student-centered learning environments. 133(1), 49-66.
- Greenwood, D. A. (2010). A critical analysis of sustainability education: Barriers and small openings in teacher education. *Teacher Education Quarterly*, 37(4), 139-155.
- Grossman, P., Schoenfeld, A., & Lee, C. (2005). Teaching subject matter. In J. Bransford & L. Darling-Hammond (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do*, (201-231).
- Gruenewald, D. A. (2003). Foundations of place: A multidisciplinary framework for place-

- conscious education. *American Educational Research Journal*, 40(3), 619-654.
- Hammerness, K., Darling-Hammond, L., Grossman, P., Rust, F., & Shulman, L. (2005). The design of teacher education programs. In J. Bransford & L. Darling-Hammond (Eds.), *Preparing teachers for a changing world: What teachers should learn and be able to do*, (390-441).
- Kihc, A. (2010). Learner-centered micro teaching in teacher education. *International Journal of Instruction*, 3(1), 77-100.
- Meadows., D. H., Meadows, D. L., Randers, J., & Behrens, W.W., III. (1972). *The limits to growth*. New York, NY: Universe Books.
- Mckeown, R. (2012). Teacher education 1992 and 2012: Reflecting on 20 Years. *Journal of Education for Sustainable Development*, 6 (1), 37-41.
- Monroe, M. C., Andrews, E., Biedenweg, K. (2007). A framework for environmental education strategies. *Applied Environmental Education Communication*, 6, 205-216.
- Nolet, V. (2009). Preparing sustainability-literate teachers. *Teachers College Record*, 111(2), 409-442.
- Orr, D. W. (2004). *Earth in mind: On education, environment, and the human prospect*. Washington, DC: Island Press.
- Perry, R. K. (2013). A Case for Sustainability Pedagogical Content Knowledge in Multicultural Teacher Education. *Journal of Multicultural Education*, 21(1), 46-51.
- Scott, W., & Gough, S. (2003). Rethinking relationships between education and capacity—building: Remodelling the learning process. *Applied Environmental Education and Communication*, 2(4), 213–219.
- Schlottmann, C. (2005). Introduction: Place-based and environmental education. *Ethics, Place and Environment*, 8(3), 257-259.
- Shrivastava, P., Kennelly, J. J. (2013). Sustainability and place-based enterprise. *Organization and Environment*, 26(1), 83-101.
- Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14. Retrieved from <http://www.jstor.org/stable/1175860>
- Sobel, D. (2004). *Place-based Education: Connecting Classrooms and Community*, Orion Society Press, 1-4.

Appendix A: Methods

DITF 2019 Semi-Structured Teacher Fellow Interview Protocol

Interview time: 15-30 minutes

Below is a draft of our Teacher Fellow Interview Protocol that includes the type and range of questions we expect to ask.

1. Basic Information
 - a. Name
 - b. Grade level and subject they plan to implement their DITF lesson plan in
2. What stage are you at in developing your sustainability unit? (i.e. still developing the unit plan, will be implemented within the classroom soon, currently implementing, or already implemented the unit plan within the classroom.)
3. Overall, how has your experience been with the DITF program?
4. What have you learned from the DITF experience so far?
5. What challenges have you faced with...
 - a. creating your unit?
 - b. Working with your community partner?
 - c. Finding the necessary resources to implement the unit?
 - d. Coordinating with your administration and other teachers who are not fellows?
6. Do you feel supported by the DITF program staff? Why or why not?
7. Community partner? Why or why not?
8. School? Why or why not?
9. Do you feel like the DITF program has provided enough support and resources for you to successfully implement your lesson within the classroom?
10. How much time did you spend on planning and organizing your lesson plan?
11. Is there any part of the DITF program that you would like to change?

Semi-Structured Analogous Program Interview Protocol

Interview time: 20-30 minutes

1. Basic Information
 - a. Organization name, how long has your organization existed?
 - b. What is the mission of your organization?
2. What prompted the development of your program? (i.e. passionate individual, donor, grant)
3. How is/are your program/programs funded?
4. What impact does your program hope to have on your intended audience (i.e. k-12 teachers)?
5. What resources were vital to support the development of your program?
6. What experiences were most impactful in the development of your program?
7. What challenges have you faced with developing and implementing the program?
 - a. What challenges have you faced in supporting teachers around sustainability education?
 - b. What challenges have you faced in supporting teachers around place-based education?
 - c. What challenges have you faced in supporting teachers around project-based education?
8. Did you use external support to help develop this program? (outside of funding supporting, i.e. strategic partners)
 - a. If so, who and how did they support you?
9. Are there any components that you wish you could change/improve about the program you have developed? If so, why?
10. Have you had a shift in mission or goals since its first year? If so, what influenced this change and why?
11. What components of your program do you think are the most successful?
 - a. Why do you believe those components are successful?
 - b. How did your organization manage to make these aspects successful?
12. What advice would you give to another organization that is trying to develop a program that focuses on similar topics?

DITF 2019 Classroom Observations Protocol

Below is a draft of our classroom observation protocol that includes questions to guide observers as they observe the implementation of sustainability-focused units that fellows developed through the Dow Innovation Teacher Fellowship.

Location:

Time:

Class Subject and Grade:

Unit Topic:

Lesson Objective:

Number of students:

Adults present:

Guiding Questions

1. What is the main theme of the lesson plan? What point is the teacher trying to make?
2. How involved is the community partner? What characterizes this partnership? What role does the community partner play?
3. What types of activities does the lesson include? Do they align with place-based principles? Project-based principles? Try to be detailed.
4. How engaged are the students?
5. Does the teacher seem comfortable and confident with the content and material? If so, how and describe their actions.
6. What teaching strategies are being utilized within the lesson? Do they align with place-based principles? Project-based principles?
7. As implemented, is the sustainability problem authentic for students? How are students engaged in the problem?
8. How is content knowledge incorporated into this lesson? How is sustainability present in this lesson?