Wikipedia Edu: Taking Environmental Justice Beyond the Classroom Walls

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Abstract: Universities can accelerate achievement of the Sustainable Development Goals (SDGs) by mobilizing students to fill sustainability knowledge and source gaps with the crowd-sourced Wikipedia and Environmental Justice (EJ) case studies. Our paper provides a "how to" for instructors, shares our design and implementation experiences, and identifies lessons learned and other implications.

Enrollment in the Wikipedia Education Program (Wiki Edu) provides classes with their own dedicated dashboard consisting of a flexible weekly assignment template, online training, and Wiki Edu liaisons. Online training provides students guidance on how to find, evaluate and cite the quality of sources. Librarians can often supplement online training by acquainting University resources and engage in Q & A about source literacy and "fake" news. Librarians, in turn, learn about course needs for sustainability library resources.

Environmental Justice Atlas (EJAtlas.org), is a crowd-sourced case studies database with mapped interface and keyword search function. As of this writing, there are over 3,100 case studies covering the globe. Students in our courses form teams and use EJ Atlas to find case studies they are interested in and Wikipedia articles where they can fill knowledge gaps and add sources. Conversely, students can update EJ Atlas and contribute new cases. An associated initiative, EJOLT (envjustic.org), provides a glossary of 117 academic-NGO generated EJ key concepts with quality references. Students can use these concepts in their Wikipedia contributions with citations.

We advocate a guided team Project Based Learning (PjBL) approach. We incorporate in our curriculum the Sustainability Meta-Competencies identified by Penn State's University Sustainability Institute: System & Future Thinking, Interpersonal and Ethical Literacy, and Creativity as key to building student capacity to become change agents. Students' critical evaluation of case studies (e.g. stakeholder conflicts, ecosystem resilience) help develop competencies valuable for International Society of Sustainability Professionals certification.

Positive team and student outcomes are evident in the asynchronous interactive VoiceThread project presentations, synchronous class and breakout team discussions on Blackboard Collaborate, Discussion Board, surveys and email. Students express great pride, a sense of accomplishment and efficacy through their contributions. Students express motivation to be "part of the solution" stimulated by a fear of what the future might bring if they do not act, and experience making change with Wikipedia and EJ Atlas. They ask: "What can I do?" Wikipedia Course Dashboard Metrics class of 25 students, 7 teams:

13 articles edited, 269 total edits, 12K words added, 107 references added, 450K article views (July 2020). This does not account for the two new EJ Atlas case studies (1.7K words) contributed under review. Past Wiki Education Program experience suggests that we can expect article views to go to the millions over time. This is more impactful than student work confined to the classroom.

Artifacts from final reflection essays and a survey will be discussed in the paper along with scaffolding, limitations, lessons learned, and implications. We encourage others to make use of Wikipedia and EJ case studies in the classroom and to build and improve upon our experience.

Introduction, Background and Framework.

This paper is written to serve as a guide on how to implement in classroom assignments using the crowd source platforms of Wikipedia and Environmental Justice Atlas (EJ Atlas) based on our implementation experience in an undergraduate Environmental/Ecological Economics course.

The Environmental/Ecological Economics course uses a student-centered, project-based learning (PjBL) case study approach. The instructor has been following this basic case study approach since 2016 with sets of case studies and a variety of digital technologies and platforms. The Spring 2020 class is the first time that a class participated in the Wikipedia Edu program, which we will focus and report on in this paper. Action assignments are part of every course, that involve observing or participating in outside of classroom activities or alternatives, e.g. social media or writing letters to elected officials. Wikipedia Edu is another way for a class to produce something of value outside of the classroom, and for students to have some experience of self-efficacy and collective efficacy. Another motivation is to structure source literacy and improve student writing and peer review.

The curriculum design is's goal was explicitly incorporated in the learning objectives in Fall of 2017 with the student learning Sustainability Core Meta-Competencies. The SCC's were formulated with the goal of developing student capacity to be a collaborative agent of systemic change required to be effective addressing challenges of sustainability and environmental justice. (Engle et al. 2016, 2017; Wiek et al. 2011a, b, 2015; Rieckmann 2012; Konrad et al. 2018, 2020; Bartlett et al. 2020). While most environmental studies classes implicitly involve development of some if not all ofall these competencies to some degree, to self-consciously design activities to develop each competency will result in better balance and self-awareness of the student's own learning. The Sustainability Curriculum Consortium (2020) is a leader in webinars and conferences to promote the use of the Sustainability Core Competencies for Sustainability and Environmental Studies programs, so that all of the competencies can be developed in a set of courses, as it is difficult to accomplish all of them in one class.

Sustainability Core Competencies identified by the above authors include: System Thinking; Future (Temporal) Thinking; Inter-/Intra- Personal (emotional intelligence, collaboration and communication; Gardner 1983, Goleman 1995) Literacy; Ethical (values) Literacy; Creativity (Engle et al. 2016, 2017) ns Strategic Thinking (Wiek et al. 2011a, b, 2015; Rieckmann 2012; Konrad et al. 2018, 2020).

Table 1. Sustainability key competencies, descriptions and justifications (Engle et al. 2016.)

Competency	Description	Justification
Systems Thinking	Ability to analyze complex systems across multiple domains and at different scales.	Necessary for understanding complexity of sustainability concepts; ubiquitous in sustainability competencies literature.
Temporal Thinking	Ability to draw upon and anticipate states and narratives of past and future societies and environments.	Emphasizes the ability to extract and apply lessons from the past and to envision the needs of people in the future and the effects of current actions on those needs.
Interpersonal Literacy	Ability to comprehend, motivate, enable, relate to, and communicate across diverse individuals, political systems and organizations.	The societal and policy changes necessary to deal with issues of sustainability require that individual sustainability advocates have the skills to negotiate complex personalities, networks, assumptions and political/power systems.
Ethical Literacy	Ability to identify and assess ethical issues and controversies (related to sustainability), and to discuss, respond to, and reconcile them, applying personal and societal values and goals.	Sustainability issues are inherently value-laden and must be analyzed through an understanding of ethics.
Creativity (Imagination)	Ability to envision, develop and apply innovative and strategic solutions, frameworks, etc. in order to adapt to changing and challenging situations.	Identified by research participants as necessary for addressing unforeseen outcomes and scenarios; not addressed in other categories.
Foundational Competencies	*Expected capabilities based on education and adaptation.*	*These baseline abilities are needed in order to further develop meta-competencies.*

UNESCO has created a useful teaching resource that incorporated the SCC's in their guide to develop educational learning objectives for sustainable development (Rieckmann 2017). See Table 1 below. The United Nations Sustainable Development Goals (SDGs) 2030 provide concrete policy, actions, objectives, targets and metrics to connect with their course studies and guide them to investigate and create solutions. The authors use a student-centered ethic of care approach to stimulate intrinsic student motivation to develop these capacities in sustainability and environmental justice studies (Bartlett et al 2020).

We are following the lead of the CEECEC initiative to teach ecological/environmental economics from the "Ground Up." While one can teach Environmental and/or Ecological Economics in the abstract with a traditional textbook and emphasizing methods as do most economics classes, the nature of ecological economics is an economy embedded in the natural world, the environment, not vice versa as the prevailing frame of conventional economics holds where the environment is considered an "externality" of the economy.

Environmental Justice places ethics, values and ethics to the forefront, and real case studies can include ~~all of~~all the complexity of the real world. We prepare students by teaching them about ecosystems, ecosystem services, sustainability, resilience, complexity and emergence to have a foundation in the workings of nature and the human nature interface, of social metabolism as the ecological economists call it (Ruppert & Duncan 2017; Ruppert & Bartlett 2018)..

What is Environmental Justice (EJ)? (EJAtlas 2020; Temper et al 2015)

Environmental justice was born as a slogan for the first time in the United States during the 1980s among Black and Latino communities. They mobilized against injustices perpetrated in their communities by polluting industries and waste disposal facilities. It later became an analytical frame, largely in relation to concerns about the unequal distribution of social and environmental costs between different human groups, classes, ethnicities but also in relation to gender and age. EJ draws attention to the link between pollution, race and poverty and tackle socio-spatial distribution of "bads" (emissions, toxins) and "goods" (like green spaces and better services).

It later expanded as a concept and theoretical framework, including multi-dimensional and interlinked aspects of justice related to three fundamental ~~dimension~~dimensions of EJ: distribution, ~~recognition~~recognition, and participation, as explained above. It has also globalized, tackling issues such as trade agreements, the transfers of wastes, climate change and the Rights of Nature and has served to link up groups and networks within a common similar frame and understanding.

The global dimension is evident when it comes to trade and environmental degradation. A mine, a dam, a road in the forest are not isolated objects but connected sites along which value flows, accumulation ~~occurs~~occurs, and costs are externalized.

Environmental Justice is both a social movement and an activist/mobilized science and thus offers the potential to bring together citizens, researchers and scholars to create knowledge as part of a global and globalizing environmental justice movement. (EJAtlas 2020).

What is an ecological conflict? (EJAtlas 2020; Temper et al 2015)

Socio-environmental conflicts are defined as mobilizations by local communities, social movements, which might also include support of national or international networks against particular economic activities, infrastructure construction or waste disposal/pollution whereby environmental impacts are a key element of their grievances.

The atlas documents social conflict related to claims against perceived negative social or environmental impacts with the following criteria:

1. Economic activity or legislation with actual or potential negative environmental and social outcomes;
2. Claim and mobilization by environmental justice organization (s) that such harm occurred or is likely to occur as a result of that activity
3. Reporting of that particular conflict in one or more media stories.

These conflicts usually arise from structural inequalities of income and power. Dimensions of environmental justice include distribution over the burdens of pollution and access to environmental resources the right to participate in decision-

making and the recognition of alternate ~~world-views~~worldviews and understanding of development. The action repertoires may include formal claim-making, petitions, meetings, demonstrations, boycotts, strikes, legal actions, civil disobedience, collective violence, international campaigns and other action forms. In the act of claiming redistributions, these conflicts are often part of, or lead to larger gender, class, caste and ethnic struggles. (EJAtlas 2020).

Curriculum Design and Implementation.

~~The ProjectThe Project~~ Based Learning (PjBL) is scaffolded in two phases. In the first phase, students are provided ~~all ofall~~ the ~~information, butinformation but~~ need to learn and frame the case study in term of Ecological (Economic) Conflict, Environmental Justice and Political Ecology. They evaluate the case study in terms of the guiding principles of the International Society of Sustainability Professionals and "Professional Sustainability Competencies. The instructor floats from group to group to guide teams and help them when they get stuck. Students learn the Ecological Economic Sustainability Conceptual knowledge as it is useful in an applied setting. In the second phase students are more on their own and engage in research, learn source literacy, and develop abilities to work outside a class setting. The instructor is available to guide and help each team. This way, each project can get much more instructor attention, then each student working on their own. What is new in the Spring 2020 class is participation in ~~the Wikipediathe Wikipedia~~ Edu program.

Phase 1. Team Environmental Justice Case Study analysis and presentation. Students form teams and select Environmental Justice case studies of their own interest. We start with well-studied set of case studies from the European Commission funded Civil Society Engagement with ECological EConomics (CEECEC) consortium that matched NGOs with researchers and published for educational purposes "Ecological Economics from the Ground Up" (Healy et al 2013) with what is now an online glossary of ecological economics concepts and tools with supporting citations. Students learn sustainability, ecological economics conceptual knowledge through real life examples. Students learn professional sustainability competencies by identifying stakeholders and their interests, conflicts, environmental justice issues, and project evaluation, guided by a political ecology approach. They update the CEECEC case study they chose in the CEECEC set and map them with the Sustainable Development Goals. Students create team Wikis on Blackboard Wiki or ePortfolio that have the following sections:
1. Summary/abstract;
2. Eco-System Services & Other Issues (harm or benefit to ecosystems)
3. Stakeholders: (Competing Interests, Conflicts, Ecosystem Threats/Damage, Distributive and Environmental Justice);
4. Keywords & Concepts for Sustainability Used in the Case Study (Online glossary, EJOLT 2020)
5. UN SDGs 2030 (relevant to case study and how them might apply);
6. Sustainability Insights Opportunities & Lessons Learned.
7. Updates to published case study with references.

Students comment on each other's team Wiki and evaluate them in the midterm essay exam (reflection and peer learning). The midterm essay assignments assure students learn from the other case studies and student work, and gain experience in peer review, and meta-cognition, awareness of their own work and learning. It has been found that a drawback of challenging active Project Based Learning (PjBL) is that students are

unaware of their deeper learning and retention when the instructor doesn't create assignments for self and peer evaluation and provide adequate feedback (Deslauriers et al, 2019).
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Phase 2. EJ Atlas Case Study. The second phase of the course involves teams selecting a case study from the crowd-sourced Environmental Justice Atlas data base. EJ Atlas is a next generation project outcome of the CEECEC. These crows-sourced case studies vary in completeness of content, sources, and analysis in contrast to the through CEECEC Ecological Economics from the Ground Up case studies which includes curated ecological economics online concepts and tools (EJOLT 2020) appropriate for each case. Student teams conduct research on the EJ Atlas case studies to add quality sources, fill gaps, and use the case study to teach each other (peer learning) about Ecological Economics.

Phase 2 Wikipedia Edu Program Enhancement. New for the Spring 2020 semester for this course was participation in the Wikipedia Edu program: online training, course platform, and dashboard. Students find incomplete Wikipedia articles that match their EJ Atlas case study. Students use the framework and conceptual knowledge learned in Phase 1 to guide them on text to contribute and sources. Student edits and source contributions are kept track of by the Environmental Economics Spring course dashboard (2020). Student teams share work in progress with other teams and share tips with the Wikipedia technology and a weekly class meeting. Student team Wikipedia pages are in the reference section of this paper. Wikipedia dashboard provides online step-by-step training tutorial modules which saves class time. Some of the important modules are:
- [Wikipedia policies](#)
- [Evaluating articles and sources](#)
- [Finding your article](#)
- [Editing health and psychology topics](#)
- [Contributing images and media files](#)
- [Translating articles](#)
- [Keeping track of your work on the Dashboard](#)
- [Adding citations](#)
- [Plagiarism and copyright violation](#)

Wikipedia has an article finder that has a search function that also rates how complete an article is considered, and which articles need the most work and most appropriate for less experienced editors (training module "Finding your article"). When the course is approved in advance and subscribed to the Wikipedia Edu Program, the course dashboard keeps track of what modules students have completed. An editable timeline template on the dashboard schedules assignments.

Wikipedia discourages newbies to work on an article that is considered complete, because it will be harder to make contributions that will not be deleted by other more seasoned editors. Wikipedia also discourages newbies from starting a new article from scratch until they experience editing. Consequently, student teams may go through a number ofseveral EJ Atlas case studies before they find one that matches a Wikipedia article in need of work.

Phase 2 Assignment Deviation: Creation of New Article. One student team became very interested in an EJ Atlas case study that involved an ethical environmental justice conflict between a clean renewable energy wind farm and the harm the project was expected to entail damage to the marine ecosystem and indigenous people that depended

on it. ~~However~~However, there was no Wikipedia article in English, but there was an article in Portuguese. The team received permission to take on the daunting task of creating a new article, which did win hard earned approval: "Wind Farms in the Sustainable Reserve of Ponta do Tubarão." The article is a good example of the aim of the course, explicitly including the SDGs, important key concepts, identification of stakeholders and political ecological conflicts.

Students create and engage in. In some cases, they may draw upon Wikipedia entries in other languages.

Phase 2 Assignment Deviation: New EJ Atlas Case Study. Another team also requested an exception to an assignment. They felt strongly about two environmental justice case studies that were covered by Wikipedia but were not listed in the EJ Atlas database. The EJ Atlas case study submission form has the following sections:
- Description;
- Basic Data;
- Source of Conflict (1st and 2nd Level Types of Conflict);
- Project Details and Actors;
- Conflicts and Mobilization;
- Impacts;
- Outcome;
- Sources & Materials;
  Meta Information

The team created two new EJ Atlas case studies -- Aliso Canyon Methane Leak & Kingston Fossil Plant coal fly ash slurry spill -- but were unable to get approval before the semester ended. EJ Atlas does not have thousands of volunteers as does Wikipedia, so may not be as suited for a semester class unless arrangements are made with the EJ Atlas organization in advance.

Pandemic disruption NYC Spring 2020. The course was unexpectedly moved from in person classroom to fully online March 9th, 2020 on the initiative of the University in view of the COVID-19 epidemic in New York City. Later, New York State mandated that higher education no longer meet face to face. The pandemic disrupted the group work with some students thrown into different time zones or with poor internet service. Individual students face other disruptions with family, health, and employment. Some Wikipedia Edu participating courses dropped out. We were able to continue with synchronous Blackboard Collaborate and use VoiceThread for student teamwork and presentations. We used Discussion Board for asynchronous discussion of class reading of weekly topics in ecological/environmental economics.

Course Outcomes.

Environmental Economics (Spring 2020) course dashboard outcomes:
13	Articles Edited,
1	Article Created
269	Total Edits
25	Student Editors
12K	Words Added
107	References Added

453K   Article Views (August 1, 2020, views since editing and/or source contribution, calculated by the course dashboard).

The Environmental Justice Wikipedia articles are listed below (also cited and linked in the Reference ~~section of~~section of this paper).

- [2009 Cataño oil refinery](#)
- [Fukushima Daiichi nuclear disaster](#)
- [Hurricane Sandy](#)
- [Jubilee Oil Field](#)
- [Laurence D. Fink](#)
- [Pebble Mine](#)
- [Russian floating nuclear power station](#)
- [Wind Farms in the Sustainable Reserve of Ponta do Tubarão](#) (New Article)

One of the article edits, Laurence D. Fink, was an extra credit project on the initiative of the student. One of the other articles, the 2009 Cataño oil refinery is an additional project a student took on for an additional one credit for the course so he could graduate in the Spring 2020. Five articles were edited were done for practice by students on their own.

Student contributions identified and profiled stakeholders (e.g. indigenous people impacted by the Pebble Mine, Alaska), ecological conflicts, environmental racism and justice, and activist organizing and mobilization, and other neglected areas of impacts. Students learned from each other's works, commenting and responding on VoiceThread, and in their final essays.

Students reflected on what they learned from their EJ case study and the value of Wikipedia in their final essays and in a survey. The responses varied considerably and was affected by the disruption of the pandemic. Students became frustrated with the Wikipedia and dashboard technology, for instance the sandbox used to draft team edits before making them. Some teams preferred Google Docs for teamwork, and then making direct edits to Wikipedia. Some students were frustrated with how much work it took to find a quality source to cite and sentences to add. They discovered the curse of the academic that can spend hours searching for and reading ten articles to write two sentences and add one citation. However, their learning showed. The quality and relevance of the sources were much better than many conventional student research papers. Students learned how to separate their opinions from factual and analytical writing in Wikipedia, and the quality of classroom discussion improved. Students had the outlet of the

However, many of the students exhibited great pride and rewarding teamwork when they made their VoiceThread presentations and we had live synchronous discussion of their accomplishments. Students demonstrated personal growth in source literacy and digital literacy and some many strong working bonds with teammates. One student I had from a previous class who expressed her interest working on her own, said she that was surprised how she began to enjoy the team process and realize they could do so much more as a team then on their own.

While most students gained considerable respect for the editing and peer review of Wikipedia and the quality of the articles, a few were remarking even at the end of the semester how they couldn't understand why we spent so much time with Wikipedia

editing and sourcing, when most of their professors have such a low opinion of Wikipedia.

Student writing improved considerably as they learned together how to write for the public and had teammates to help them. Economic students are not known to be good writers, so many of us have increased the writing in our classes. A recent study has shown that economic students with Wikipedia editing had better writing performance than those in equivalent classes without Wikipedia editing Freiri & Li 2016). Tiego & Li (2014(2014) found that writing quality improved, more balanced discussions of relevant issues occurred, and there was a greater number of primary sources.

Carver et al (2012), Brox (2016), Christianson (2015) research has found that Wikipedia editing and sourcing not surprisingly increased student digital literacy.

McDowell and Stewart (2017) report that the research of Cummings (2009), Roth et al (2013) and Vetter (2014) indicate that student experience with public writing with Wikipedia often resulted in increased student motivation and engagement as compared to traditional research paper. McDowell and Stewart (2017) "[f]ocus group responses also suggest that students directly engaged concepts outlined in the ACRL framework for information literacy, particularly when engaging understandings of systemic biases, construction of information, and value of information."

We did not engage in a research study of our implementation with any pre- post- evaluations or control groups but are impressed with the student contributions to Wikipedia and EJ Atlas and the high quality of writing in the final essay exams. Classes always vary in quality of outcomes semester to semester and section to section, but this class did perform much higher than usual in the final essay exams, which does infer there are benefits to include Wikipedia writing, editing and sourcing in the curriculum.

[Images.] Images: Presentation slides showcase student work (VoiceThread presentations, quotes, Wikipedia Edits, EJ Atlas contributions). Selected images will be added when paper is updated following conference and feedback to be published in proceedings.

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