

A Case Study in the Stewardship of Creation: Project-Based Learning and Catholic Social Teaching in a Climate Change Curriculum

Abstract

The theme of stewardship, or caring for God's creation, features prominently throughout Catholic social teaching. This Care for Creation project was designed to make students become engaged science learners who want to dig deeper into solutions when they learn about the environmental impacts caused by human choices through a lens of Catholic faith. By employing a Project-Based Science strategy and incorporating many of the themes of Catholic social teaching, students learned about climate change in a year-long sustainability education experience, shared their knowledge with their school and parish, and sponsored projects to help the poor and vulnerable of their city and abroad. This project can be used as a model for incorporating sustainability content and Project-Based Science learning into a Catholic science curriculum.

Keywords: Catholic social teaching, Care for Creation, climate change, sustainability, stewardship, love

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Introduction

In his remarks at a World Environment Day gathering, Pope Francis emphasized the importance of social justice and the environment, saying, “I would like us all to make a serious commitment to respect and protect creation, to be attentive to every person, to counter the culture of waste and disposal, to promote a culture of solidarity and of encounter” (2013). His statement illustrates the significant overlap between the idea of sustainability and of Catholic principles. For Catholics, with a long tradition of caring for Creation, a commitment to sustainability is supported by the Vatican. For example, in a papal encyclical Pope Benedict XVI (2009) declared, “The environment is God’s gift to everyone, and in our use of it we have a responsibility towards the poor, towards future generations and towards humanity as a whole.”

In a Catholic school setting, many educators use the seven themes of Catholic Social Teaching to help students develop the tools they need to help make a positive change in their world (USCCB, 2012). Those themes are:

- Life and Dignity of the Human Person
- Call to Family, Community, and Participation
- Rights and Responsibilities
- Option for the Poor and Vulnerable
- The Dignity of Work and the Rights of Workers
- Solidarity
- Care for God’s Creation

Besides *Care for God’s Creation*, many of these themes intersect with the concept of sustainability. For example, *Rights and Responsibilities* can be summed up as a call for basic human rights and the subsequent responsibility that we each have to protect and preserve those rights for everyone. The theme *Option for the Poor and Vulnerable* is in line with the Catholic tradition, exemplified by St. Francis, of putting the needs of the poor and vulnerable first. Both of these themes resonate with the goals of sustainability, which seeks to promote development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987). With these themes in mind, the United States Council of Catholic Bishops (USCCB) says that, “This environmental challenge has fundamental moral and ethical dimensions that cannot be ignored,” and calls for educators at all grade levels and in all curriculum areas to live out their vocation by showing students they have a mission as creations of God to be good stewards of creation” (2012).

The first author, a Catholic elementary educator, sought a way to make real and meaningful connections from the science content she was teaching in the classroom – particularly the content related to climate change – to the lives of her students. By incorporating the themes of Catholic social teaching, she lent emotional and spiritual urgency to an intellectual problem. The interaction of the science curriculum and Catholic social teaching helped students take action to better the state of the Earth and its people, a process that both deepened their understanding of the problems and expanded their love and compassion for the people affected by those problems. As a consequence, her initial idea of a fifth-grade climate change project-based unit blossomed into an interdisciplinary, yearlong sustainability education experience that impacted the entire parish. We present this case study as a model for incorporating

sustainability content and Project-Based Science learning into a Catholic science curriculum.

Project Rationale

The primary author developed this project in the context of her training in implementing Project-Based Science (PBS) through a program called LEADERS. This program provided training for the participants as content and pedagogy experts, with an emphasis on teaching science with a project-based approach through a lens of renewable energy. She decided to teach climate change as part of her science instruction and wanted to take these lessons further. Teaching students about the causes and moral dimensions of climate change would provide them with real-world connections to develop a deeper understanding of the science content (National Research Council, 2012). Linking this content to her students' lives is a key feature of the PBS approach (Krajcik & Czerniak, 2014), providing a motivating force for her students to investigate climate change more deeply.

In a PBS classroom, students ask questions that are interesting to them and then work to answer those questions. PBS curricula are defined by several features. First, students ask “driving questions” that motivate them. Second, students plan and carry out investigations to answer their questions. Third, students collaborate with each other and the broader world in these investigations. Fourth, students use technology throughout the investigation process. And fifth, students produce artifacts that address the question (Krajcik & Czerniak, 2014).

One of the best tools for promoting academic achievement plus civic responsibility is service learning (Davila & Mora, 2007). Service learning can be a way to bring together the themes of Catholic social teaching with the secular goals of science education, such as those set by the National Science Foundation (NSF). For example, the NSF-developed Science Engagement for New Civic Engagements and Responsibilities (SENCER) Program seeks to develop civic responsibility through science education. Program activities train science and math educators to connect their curricula to important social issues, therefore motivating students to be responsible citizens. In addition, PBS and service learning complement each other, as the problems that students may want to investigate can often be linked to pressing issues in a community. PBS and service learning therefore provided the tools that the primary author used to teach about climate change in a Catholic-oriented way.

Overview

PBS projects begin with a driving question. “How Can We Make Gesu School Greener?” was the question chosen for this project, which both invites students to learn and presents a challenge to them. This question allowed the students to raise awareness about climate change within the school and parish community as well as develop their own interest in science through the service learning projects. Once the fifth grade students began learning about climate change, they generated many questions about additional things they would like to learn, such as endangered animals (see Project Timeline, below). They then spent time in the classroom investigating those questions. Other teachers seeking to implement a project like this should similarly draw on their students' questions and interests to design activities.

The overall learning goals for this PBS unit included:

- Explain the scientific case for climate change
- Explore ways of reducing one's carbon footprint

- Describe the effects of climate change on people, animals, and the environment
- Communicate one’s knowledge of climate change with the broader community
- Advocate for the poor and vulnerable in the community and those affected by climate change globally

The project took place at Gesu School (Toledo, OH) in a fifth grade classroom. Although it is a private, Catholic school, twelve of the students that year were not Catholic, and about 50% of the student body is now sponsored through the state voucher program.

Project Timeline

When	What	Themes
October	Climate Change unit in science class -Display final projects showing what students learned in hallway so others can see them (see Figure 1)	<i>Care for Creation</i>
	School field trip to a nearby park -Students walk to the park instead of taking a bus to reduce their carbon footprint	<i>Care for Creation Rights & Responsibilities</i>
	Presentation by a local author about his book on protecting the Great Lakes from invasive species	<i>Care for Creation Rights & Responsibilities</i>
November	Research project on endangered animals -Connected to language arts by including a significant writing assignment, which was shared with the school	<i>Care for Creation Rights & Responsibilities Family & Community</i>
	Field trip to wind turbine tower factory in Monroe, MI	<i>Rights & Responsibilities Family & Community</i>
	Student-led assessment of classroom energy efficiency -Students recorded data about the efficiency of the lights, windows, heating system, computers/Smart Boards and recycling program for the rest of the year (connection to math)	<i>Care for Creation Rights & Responsibilities</i>
December	School field trip to the University of Toledo -Students walk instead of taking a bus to reduce their carbon footprint	<i>Care for Creation Rights & Responsibilities</i>
	Unit about carbon footprints -As homework, students conducted home energy audits	<i>Care for Creation Rights & Responsibilities Family & Community</i>
	Build-A-Stocking Project -Students schoolwide brought in toiletries and socks to create stockings for the homeless -Fifth graders wrote persuasive letters to their dentists to ask for toothbrushes and toothpaste donations (link to language arts)	<i>Care for Creation Family & Community Option for the Poor & Vulnerable</i>

January	Students write notices for the church bulletin about the Church's stance (and Gesu School students' thoughts) on climate change	<i>Care for Creation Family & Community</i>
February	Fifth-grade students teamed up with lower grade students to share their knowledge of climate change during science class	<i>Care for Creation Family & Community</i>
March	The school participated in the Catholic Relief Service's Rice Bowl collection -The project aims to fight global hunger -Fifth graders created video clips describing how climate change has affected farmers in drought-riddled countries for the school's morning announcements (connection to social studies)	<i>Family & Community Option for the Poor & Vulnerable Solidarity</i>
April	Students raised money for The Water Project (thewaterproject.org) -Some students pledged to drink only tap water, donating the money that would have been spent on bottled water	<i>Family & Community Option for the Poor & Vulnerable Solidarity</i>
	Students created "toilet papers" for the school bathrooms -These informational sheets presented the students' research on the importance of water to people	<i>Care for Creation Family & Community Solidarity</i>
	Students planted seeds to grow starter plants for the parish's food pantry garden	<i>Care for Creation Family & Community Option for the Poor & Vulnerable Solidarity</i>
May	Students were highly motivated to raise more money for The Water Project and initiated several projects (bake sale, car wash, etc.) to do so -Students were especially moved by learning about the children in other countries who did not have access to clean water	<i>Care for Creation Family & Community Option for the Poor & Vulnerable Solidarity Life and Dignity of the Human Person</i>
	Students helped to weed, mulch, and plant in the school's garden space	<i>Care for Creation</i>
June	Class field trip to state park -Students went on a tour with a naturalist and learned about how people had altered the Black Swamp region	<i>Care for Creation</i>

Figure 1. “The Saints cared for creation and the poor – Gesu can too!” Students made a bulletin board to share their knowledge about reducing their carbon footprints with their parents and the school. Each student wrote about human impacts on the environment and steps that they could take to reduce their carbon footprints.



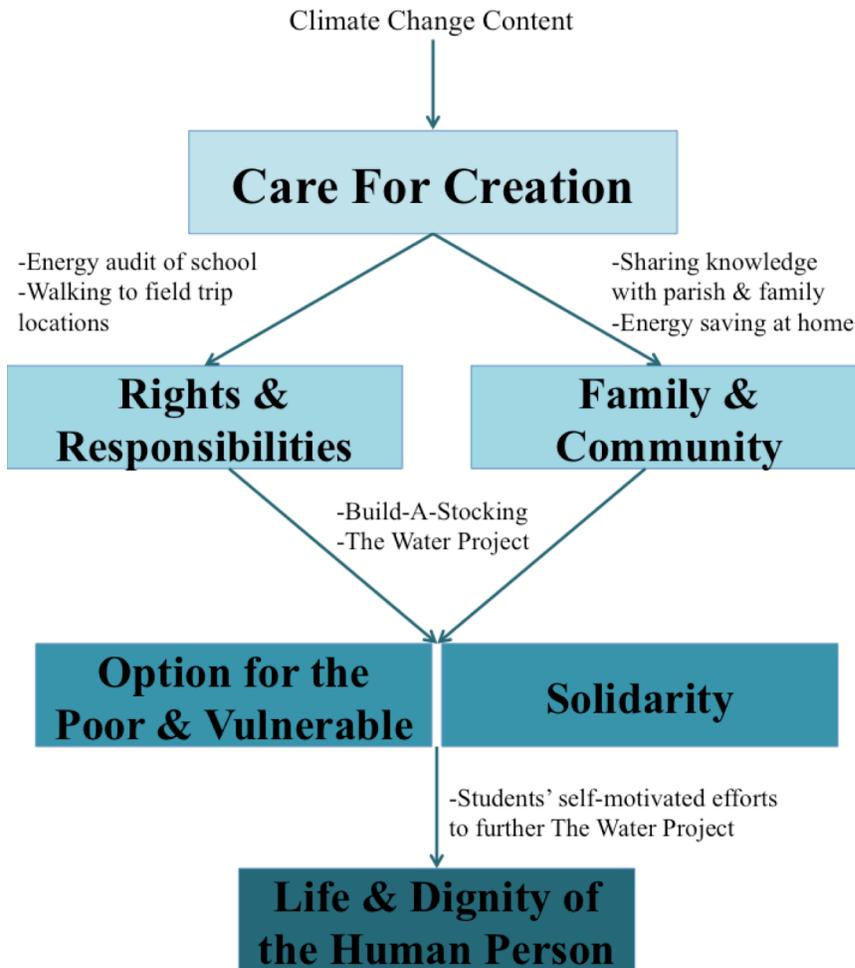
Results

During the project, incorporation of the themes of Catholic social teaching followed a natural progression (Figure 2). The initial science content led to activities that stressed *Care for Creation*. Activities that followed, such as students sharing their knowledge about climate change with the families and walking instead of taking a bus to their field trip, brought in the next level themes of *Rights & Responsibilities* and *Family, Community & Participation*. This progression was not linear, but rather the themes reinforced each other.

Throughout this project, students regularly revisited the question, “How do we make our school greener?” As the project timeline shows, the project-based learning aspect of the science content meant that students often made connections to language arts, social studies, and math during science class. These connections demonstrated the importance of accurate measurement and data collection in math; the need for good grammar and convincing arguments in persuasive writing; and the need for map skills when learning about the needs of others abroad. Most importantly, the daily connections from all content areas to themes of Catholic social teaching made real for them the connection between a pressing issue and their faith: they should seek to act as stewards of creation in all that they do and at all ages of life.

The project also inspired others in the school and parish. For example, several other teachers at the school felt inspired to learn more about PBS as a result of this project, and they also wanted to continue working on the concepts in the year to come. As a result, the school formed a committee of teachers who are to help develop the connections across content areas in a deeper way.

Figure 2. Incorporating six of the seven themes of Catholic social teaching into a climate change project.



Do project-based science and service learning help to create responsible citizens who are more scientifically literate? This classroom experience proved to be similar to Krebbs and Brew who found when science content was linked to religion, it opened up the opportunity to develop caring and compassionate students (Krebbs, 2011) who live out the principles of Catholic social teaching (Brew, 2008). When the students learned about children on the other side of the world not having safe drinkable water, they wanted to learn more about why and what effect lack of water had on the lives of those people. When they learned about animals, which have become threatened or endangered they wanted to know why and how they could raise awareness about ways to slow down or reverse the process to help save them. Their desire to learn more meant they were able to stay on task for longer periods of time and exert more effort into their schoolwork. One indicator of the project's success is student desire to begin an after school Green Club to continue what they are learning and so they take a leadership role in ways the school can reduce its carbon footprint even more. The primary author planned to invite those Green Club students to work cooperatively with teachers as a "Green Team" to continue the curriculum and outreach goals of the project the following school year, though she was offered a new position before she could

implement this. Overall, this project was a successful example of the integration of Catholic social teaching into a project-based learning on sustainability curriculum, with the end result of students who have truly developed a sense of love and responsibility for the world around us.

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References

Benedict XVI. Encyclical on Integral Human Development in Charity and Truth. *Caritas in veritate*. 29 June 2009.

Brew, M. (2008). Teaching English through the principles of Catholic social justice. *Today's Catholic Teacher*, 14-21.

Davila, A. & Mora, M. (2007). Civic Engagement and High School Academic Progress: An Analysis Using NELS Data. Working Paper, Center for Information & Research on Civic Learning and Engagement.

Francis. (June 2013). *Catechesis* at World Environment Day gathering, Vatican City.

Krajcik, J., & Czerniak, C. (2014). *Teaching science in elementary and middle school: A project based approach*.

Krebbs, M. J. (2011). Catholic identity across the curriculum. *Today's Catholic Teacher*.

National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*.

SENCER. (2012). *About us*. Retrieved May 1, 2012, from SENCER: Science Engagement for New Civic Engagements and Responsibilities: <http://www.sencer.net/About/aboutus.cfm>

United States Conference of Catholic Bishops. (2012). Seven themes of catholic social teaching. Retrieved April 10, 2012, from <http://usccb.org/>.

World Commission on Environment and Development. (1987). *Our Common Future/Brundtland Report*.