SCIENCE TEACHER LEADERSHIP TO STRENGTHEN A LEARNING ENVIRONMENT

NATIONAL SCIENCE TEACHERS ASSOCIATION
Boston, Massachusetts
April 3, 2014

Maximizing Yield Through Integration (MYTI-I3)
Sponsored by NSF - Award No. 1038166
Introduction

- Eighteen science and math teachers developed and implemented projects in the context of Environmental Sciences
- In collaboration with University of Puerto Rico, Río Piedras Campus research faculty and graduate students from the IGERT project.
- Connecting the University to schools and communities via field sites for research, learning, and networking.
Science and Math Education in the Context of a Disposing Society

Innovation through Institutional Integration (I³)
Maximizing our products...
Vision

CSMER will provide support to conduct research in science and math education and establish outreach opportunities with partner schools.
Program Strategy

Develop M & S educational units in the context of solid waste

Mentor and assist teachers in understanding and implementing the units

Teachers participate in a scientific research project

Graduate and undergraduate students assist in the implementation of school projects

Teachers conduct action research on student learning

Professional Development for Teachers
Program Activities

1st Year (2011-12)

- Unit Design for Teachers' Professional Development
  - Integration of IGERT, Education and, Mathematics students
- Professional Development
  - Action Research

2nd Year (2012-13)

- Professional Development
  - Solid Waste Management
  - The Science Compost
  - Water Quality
- Scientific research on projects related to environmental sciences
3rd Year (2013 - 14)

- Teachers implement content units.
- Using the learning strategy Project Based Learning (PBL), teachers and students developed school projects related to environmental issues.
  - They receive mentoring and support from the faculty and IGERT & CATEC students.
Why we used the PBL learning strategy?

The most significant attributes in a PBL curriculum are:

- tackles a real-world problem that is relevant and of some interest to the student,
- has clearly defined goals,
- requires effective team interactions,
- promotes critical thinking,
- allows students choices and decisions at multiple points in the problem solving and design process, and finally,
- requires students to defend their choices

(Powers & Dewartes; 2004; Velázquez y Figarela; 2012).
<table>
<thead>
<tr>
<th>NAME</th>
<th>TITLE OF PROJECT</th>
<th>SCHOOL</th>
<th>TOWN</th>
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<tbody>
<tr>
<td>Carmen J. Velázquez Rivera</td>
<td>Applying the Problem of Solid Waste to Fast Food Restaurants in Puerto Rico</td>
<td>Sor Isolina Ferré</td>
<td>Ponce</td>
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<td>Lyamarie Pérez Muler</td>
<td></td>
<td>SU Eugenio María de Hostos</td>
<td>Cayey</td>
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<td>Josiel Rosado Tirado</td>
<td>Basura Cero</td>
<td>Juan Quirindongo Morell</td>
<td>Vega Baja</td>
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<td>Luis O. De Jesús Torres</td>
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<td>Francisco A. García Boyrié</td>
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<td>Marixa Rodríguez Vega</td>
<td>Environmental Disclosure to analyze the environmental impact (natural landscape) in our community (El Pedregal)</td>
<td>Especializada Brígida Álvarez Rodríguez</td>
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<td>Minnuette Rodríguez Harrison</td>
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<td>Julián Blanco</td>
<td>Guaynabo</td>
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<td>Carmen M. Ruiz Méndez</td>
<td>Hydrological Study in Quebrada Juan Méndez at Río Piedras</td>
<td>Central Especializada Artes Visuales</td>
<td>San Juan</td>
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<td>Jadira Aponte Ramírez</td>
<td>Potential Development of Agriculture in Urban Areas in the Municipality of Orocovis</td>
<td>Alberto Meléndez</td>
<td>Orocovis</td>
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<td>Tomás Díaz Berrios</td>
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<td>Osvaldo Parés Rivera</td>
<td>Reduction of Solid Waste</td>
<td>Eugenio María de Hostos</td>
<td>Mayaguez</td>
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<td>Sylvia Hernández Acevedo</td>
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<td>Dr. Carlos González</td>
<td>Aguadilla</td>
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<td>Loudes R. Rivera González</td>
<td>The Development of Alternatives to Reduce the Amount of Solid Waste Generated by Students from 4 Public Schools in 4 Geographic Areas of Puerto Rico</td>
<td>Juan D. Stubbe</td>
<td>Caguas</td>
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<td>Maria L. Ortiz Hernández</td>
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<td>Generoso E. Morales</td>
<td>San Lorenzo</td>
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<td>Myrna Hernández Nieves</td>
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<td>Catalina Morales de Flores</td>
<td>Moca</td>
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<td>Sandra Beltrán Morales</td>
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<td>Bayamón</td>
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<td>Amabel T. Soto Guzmán</td>
<td>Impact of Solid Waste to our Community in Terms of Volume and the Surface Area it Occupies</td>
<td>Carmen L. Feliciano Carreras</td>
<td>Rio Grande</td>
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<td>Marilyn Santiago Román</td>
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<td>Nueva Intermedia Piletas</td>
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<td>Yamily Colón Negrón</td>
<td></td>
<td>Jose Santos Alegria</td>
<td>Dorado</td>
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Study of the physical and chemical changes of matter through different alternatives of solid waste management

Myrna Hernández
Catalina Morales High School
San Sebastian School District

Maximizing Yield Through Integration (MYTI-I3) – Sponsored by NSF
Award No. 1038166
RESEARCH QUESTION

Is the school project Educate, Act, and Live effective to improve the students’ understanding of the physical and chemical changes of matter?
INTRODUCTION

Some topics discussed in the chemistry course are characterized by abstractions, affecting the understanding of chemistry concepts.

Working with real world problems like solid waste management, will help students find answers to problems in their community and also improve their understanding of the physical and chemical changes of matter.
• Secondary level students have alternative conceptions on the structure of matter. If they understand the microscopic nature of matter they can comprehend how it changes physically or chemically.

• It is necessary to identify educational strategies that promote a better understanding of the nature of matter and its changes.
ALTERNATIVE CONCEPTIONS

The alternative conceptions studied are related with one of the following concepts:

- change in color
- change of state
- dissolve
- mix
- burn and heat
- change in temperature
- evidence of physical and chemical changes
- change in mass
- organization of particles
ACTIVITIES: PBL ON SOLID WASTE

• Motivational Video on Solid Waste

• Educational lectures on structure of matter and physical and chemical changes

• Internet search about different alternatives to manage solid waste and the changes of matter

• Field trips to a landfill, compost plant, and recycling company

• Create a school garden with used tires, compost, and newspaper

• Laboratory activities

• Power Point presentation
SAMPLE

✓ 26 eleventh grade students from the Catalina Morales High School from Moca, P.R.

✓ Selected students are 15-16 years old

✓ Grade point average between 3.50 and 4.0.
DATA COLLECTION

- Pre/Post test on physical and chemical changes of matter
  - 6 multiple choice exercises
  - 11 exercises to classify physical and chemical changes
  - 1 open response exercise
Test Design:

- Alternative conceptions, about the law of conservation of matter and the physical and chemical changes were identified in the literature.

- All items were aligned to the Content Standards and Grade Expectations of the Science Program, of PR Department of Education.
EDUCATIONAL INTERVENTIONS

- Students identified different sources of information
- Socialized Discussions
- Laboratory Experiences
- Field Trips
- Educational Interventions
- Educational Lectures
- Graphic Organizers
In this question the students have to explain what happen in a chemical reaction at the microscopic level.

Alternative a
Alternative conception: A change of state is a chemical change
Correct answer: the particles reorganize forming different substances
Alternative conception: chemical change because an extra particle is formed
Alternative conception: A change of state is a chemical change
Alternative e

Alternate conception: Mixing is a chemical change
I selected this answer because the molecules were separated and then mix.

Is a chemical change because the particles created a new compound.
Because particles are close to each other, but not mixed and then they appear mixed.

Because the particles were close together and then they separated and interact to form new compounds.
Test Answers

Pre test

Because the particles are in a way that cause a chemical change

Post test

This is a chemical reaction because the molecules separated and then combine transforming the matter.
18. Each one of the following question describes the combination of two or more substances. Explain if each one of the descriptions correspond to a chemical change. Justify your answers.

a. Substance A is added to substance B. The freezing point of substance B lowers 5°C.

b. Substances X and Y are mix together. A magnet is used to remove substance Y.

c. Particles of substance A are suspended in a river.

d. When substance S is added to substance R it dissolved.

e. When the solid substance L is added to the liquid P an explosion occurs. The product formed has a lower mass.
Pre test question

Pre test question

Chemical, because there was a change in the presence of another matter.

Post test question

Chemical, because there was an explosion and the mass decrease because gases are produced.
Chemical change because an explosion was produced

Is a chemical change because an explosion was produced and the product change completely.
Pre test vs. Post Test

# of items

# of correct answers

Pre: 11.6538
Post: 14.0769
Pre test vs. Post test
Open response exercise

<table>
<thead>
<tr>
<th># of items</th>
<th># of correct answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>1.26923</td>
</tr>
<tr>
<td>Post</td>
<td>3.7692308</td>
</tr>
</tbody>
</table>

# of correct answers
RESULTS AND DISCUSSION

- The results indicate that most of the students increased their scores in the multiple choice questions in the post test.

- All the scores were between 70% to 100%.

- The answers to the open-ended questions in the post test demonstrated that students modified their alternative conceptions related with the concepts of physical and chemical change of matter.
CONCLUSION

• Using the PBL strategy in the context of solid waste could help students improve their understanding on changes of matter.

• The PBL strategy demonstrated to be a motivational tool to improve the students’ understanding of core chemistry concepts.

• There were some alternative conceptions that require more time to be modified.
Using the School Project “Educate, Act, and Live” to improve students’ understanding of the carbon and nitrogen cycles.

María L. Ortiz Hernández
Generoso E. Morales School
School District: San Lorenzo

Maximizing Yield Through Integration (MYTI-I3)
Sponsored by NSF - Award No. 1038166
RESEARCH QUESTION

Does the School Project “Educate, Act, and Live” improve students’ understanding of the carbon and nitrogen cycles?
INTRODUCTION

For years, the levels of academic achievement in science concepts, of my middle school students, has been declining.

These results can be evidenced in their Academic Achievement Tests and Alternate Assessment scores offered by the Puerto Rico Department of Education.

(Results of PPAA -2010-2011 and 2011-2012)
Consequently, my efforts were directed to identify educational strategies that promote the involvement of my students in their learning process. The lessons learned through these experiences could improve their academic achievement and at the same time be applied to their daily lives.
I tried to correct some misconceptions that students had about the Carbon and Nitrogen Cycles. An accurate understanding of biogeochemical cycles can transform deeply held beliefs. Successfully teaching this topic can have the collateral benefit of inspiring lasting interest in science (O’Connell, 2010).

“Matter dies and nothing else happens”

Students are not able to identify or understand the process in which matter is transformed.
Two groups of seventh grade students were selected.

- The control group consisted of 23 students from the mainstream.
- The experimental group consisted of 23 students: 20 students from the mainstream and 3 students with special needs (two with specific learning disabilities and one with autism) integrated into the mainstream.
PBL strategy to work the school project: *Educate, Act, and Live!*

School Project Problem: The generation, handling, and improper disposal of solid waste

Curricular theme: the Carbon and Nitrogen Cycles
EDUCATIONAL INTERVENTIONS

- Pre-test about the Carbon and Nitrogen Cycles
- Motivating activities: videos and homework
- Collaborative work: The class was divided into five groups and each group sought information on one of the alternatives presented: reduce, reuse, recycling, energy recovery, and landfill.
- Power Point presentation
- Oral report
- Oral discussion
EDUCATIONAL INTERVENTIONS (Cont.)

- Composting (natural recycling) and vertical farm of crops (emphasis on reuse). The preparation of compost and vertical farm were used to explain the Carbon and Nitrogen Cycles.

- The teacher clarified questions that the students made after the process of:
  - reading
  - using videos
  - power point presentations
  - oral discussion

- Post-test
DATA COLLECTION

- Pre/Post test
  - Eleven multiple-choice items

- Drawing of the Carbon and Nitrogen Cycles.
  - The diagrams were evaluated using rubrics.
Brainstorming technique:

To determine if the student needed to clarify misconceptions of the concepts of composting, carbon, and nitrogen cycles.

Individual reflection:

To collect qualitative data on students perception regarding their learning process on curricular issues discussed during the project.
Results

Pre and Post-test Results of the Control Group Vs Experimental Group

Scores Average

Pre- test Control Group: 3.7
Pre- test Experimental Group: 3.3
Post-test Control Group: 7.74
Post-test Experimental Group: 9.01
Statistical Analysis T-test

• To establish the differences between the means of the control group and the experimental group.
• The test yielded a value of 3.62 (p = 0.001).
• This value means that there was a greater increase in the academic achievement of the experimental group over the control group.
Results

Carbon Cycle Diagrams of the Control Group vs Experimental Group

Scores Average

<table>
<thead>
<tr>
<th></th>
<th>Control Group</th>
<th>Experimental Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group Before</td>
<td>0.17391</td>
<td>0.17391</td>
</tr>
<tr>
<td>Experimental Group Before</td>
<td>21.3913</td>
<td>26.087</td>
</tr>
<tr>
<td>Control Group After</td>
<td>21.3913</td>
<td></td>
</tr>
<tr>
<td>Experimental Group After</td>
<td>26.087</td>
<td></td>
</tr>
</tbody>
</table>
The student demonstrated a lack of knowledge on the subject by indicating that plants:
- Give us oxygen and we exhale CO$_2$.
- Acquire carbon from the soil rather than from the air during photosynthesis.

The student demonstrated a lack of knowledge on the subject by:
- Representing alternative conceptions about the subject
- Indicating that organic matter dies and nothing else happens
- Demonstrating that they didn’t understand the process in which matter is transformed.
Carbon Cycle Diagrams

Control Group  After the discussion

Experimental Group  At the end of the School Project

Students did not:
• Identified some carbon sources
• Included photosynthesis as part of the process
• Included the process of cellular respiration as a route that returns carbon dioxide to the atmosphere.

Students:
• Identified sources of carbon dioxide and the process of photosynthesis
• Included the process of cellular respiration as a route that returns carbon dioxide to the atmosphere.
• Represented how dead matter is transformed and the role of microorganisms in the process.
• Identify the role of organisms in the cycle as primary consumer, etc.
Results

Nitrogen Cycle Diagrams of the Control Group vs Experimental Group

Scores Average

<table>
<thead>
<tr>
<th></th>
<th>Control Group Before</th>
<th>Experimental Group Before</th>
<th>Control Group After</th>
<th>Experimental Group After</th>
</tr>
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<tbody>
<tr>
<td>NC Diagram</td>
<td>0</td>
<td>0</td>
<td>21.09091</td>
<td>22.45455</td>
</tr>
</tbody>
</table>

Before and After comparisons for the Control and Experimental groups.
Both groups demonstrated a lack of knowledge on the subject.
The students:
• Presented an incomplete diagram of the process.
• Represented the role played by bacteria in the different process of the cycle, except in the denitrification process.

The student:
• Identified all transformations in nitrogen cycle.
• Represented that dead matter is transformed and the role of microorganisms in the process.
• This diagram did not present any misconceptions about matter decomposition by soil organisms.
RESULTS AND DISCUSSION

• Tracing matter is one of the fundamental principles in Biology and can be used as a tool for reasoning about biological processes (Asshoff, R., Riedl, S. & Leuzinger, S. 2010).

• Also can help students understand the complexity and variety of natural processes.
Students have difficulty understanding the importance of microscopic organisms in the Carbon Cycle.

It is challenging for students to comprehend how plants, through photosynthesis, turn an invisible gas into organic molecules in biomass that they can see, touch, and taste.

It is equally challenging for them to comprehend how invisible microbes that live in environments such as soil can decompose those organic substrates back into invisible carbon dioxide, thus completing the Carbon Cycle.
CONCLUSION

• The final results showed that both groups improved their understanding on the science concepts, but the experimental group had a better academic improvement.

• We can conclude that the School Project was effective when discussing the topics the Carbon and Nitrogen Cycles.

• Learning strategies, like PBL, allow students to build their knowledge and change their misconceptions. They internalize the curricular concepts correctly and understand how scientific knowledge transforms the way they see the world.
Sandra Beltrán

Francisco Gaztambide School
School District: Bayamón
Solid Waste Management
Alternatives: The Hidden Energy

Action Research Problem
Is the school project “Educate, Act, and Live” effective to improve the academic achievement of students in the concepts alternatives of solid waste management and alternative energy from solid waste biomass?
Introduction

- In Puerto Rico and others countries, the excessive production of solid waste is a pressing issue. However, most of the citizens are not aware of this problem and only a few do effective practices of solid waste management.
Justification

- Students presented the following difficulties:
  - Distinguishing between reuse, recycle, and reduce
  - Recognized the process of recycling as the only solution to address the problem of solid waste management
  - Believed that the only way to dispose organic matter is in a landfill
  - Didn’t recognize waste as an alternate source of energy.
Description

- Through the school project Educate, Act, and Live the students
  - Explained the differences between all solid waste management alternatives
Description

- Through the school project Educate, Act, and Live the students
  - Built homemade models showing how to obtain energy from solid waste characterized as organic matter
School Project:
Human impacts on the urban area
“El Pedregal”
(rocky ground)

Minnuette Rodríguez Harrison
Master Science Teacher  UPR-RP
Benjamin Branoff & Christopher Nytch
NSF - IGERT Fellows

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Research Question

Do twelfth grade students’ learning about urban ecology improve by their participation in “El Pedregal” Project?
Keywords

- Ecology
- Human influences and impacts
- Urban ecology
- Conservation
Justification

- Students’ need to understand how their actions impact local urban ecosystems, how they can improve and change their city’s ecosystem for the better, and how healthy urban ecosystems benefit their own lives (Barnetta, Vaughn, Strauss & Cotter, 2011)

- The four ways of knowing are understanding, doing, talking, and acting on science (Price, Pimentel, McNeill, Barnett & Strauss, 2011)
Sample

- The research was conducted with a group of students from the Specialized School of Ballet Julián E. Blanco / San Juan School District
  - Environmental course
  - 10 twelfth grade students (17-18 years old)
School Project “El Pedregal”

What is “El Pedregal?”

Stage #1 School Project Expectations

Stage #2 New beginning

Stage #3 Students in action

Stage #4 Final presentation
What is “El Pedregal?”

• Is a urban area near our school

• Every afternoon my students walk by this area to take their ballet class

• “El Pedregal” will be used as a learning in-situ laboratory for our school.

• San Juan does not have many green areas and “El Pedregal” will be a good option

• Actually, there is coalition to protect “El Pedregal”
• First, students ideas included to plant the host plant of the monarch butterfly (we have a butterfly nursery in our school) on the urban area “El Pedregal”

• They wanted to collect long-term (LTER) data on larval monarch populations and milkweed habitat.
• The owners of “El Pedregal” had different ideas to develop in this area.
• We had to change our Project.
• Now, my students have a different perspective.

Before and after.
Students Reactions

• Using the one-five minute paper, students wrote their reactions about the changes on “El Pedregal”

“When I saw the pictures (before-after) I felt very disappointed, because we already had many plans and expectations with the School Project “El Pedregal” and the work we began to do was no longer there. (Student #1)"
• The students wanted to see the changes in the area as a consequence of anthropogenic actions.

• This will allow them to identify if this land is viable to cultivate the monarch butterfly host plant.

• Google Earth Maps was one of the tools used.

• Interviews with experts that have worked in this area.
• Students will design a urban physical model to demonstrate how they will like their city to look like in 10 or 20 years.
Strategies

1. Cooperative groups
2. Using Google Earth and Google Maps
3. Continuous assessment
   • lessons (10)
   • one-five minute paper
   • field trips
   • pre and post test
   • urban physical model
First lessons

Unit: Ecology (review)
- Principles of Ecology

Biological Community
Ecological Succession
Population-limiting factors

Biogeochemical cycles (compost)
Urban Ecology Lessons

- Ecological Footprint
- What is urban ecology?
  - Characteristics of Urban Sprawl
  - Urban areas and urban problems
- Human Impacts
  - How patches change in space and time
Urban Ecology Lessons (cont.)

• Acting on science
  • Litter Less Campaign (Eco School Program)
  • Urban physical model
    • how they will like their city to look like in 10 or 20 years.
Data Collection

- Pre/post test
  - Ten multiple choice questions on environmental science and urban ecology (including the use of maps)
- Rubrics (working on...)
  - Maps and urban physical model
## Results

<table>
<thead>
<tr>
<th>Students</th>
<th>Total Correct Answers (of 10 questions)</th>
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<tbody>
<tr>
<td></td>
<td>Pre-Test</td>
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<tr>
<td>1</td>
<td>6</td>
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<td>2</td>
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<td>8</td>
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</tr>
<tr>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>6.1</strong></td>
</tr>
</tbody>
</table>

**Table 1.** Summary of nine individual student correct responses and group average for pre- and post-test.
Pre- and post-test average results for nine students

Figure 1. Summary averages and standard error bars of number of correct answers for pre- and post-test results for nine students.
1. The results were not proven statistically due to the small sample size, but it shows a trend that may be indicative of the potential effect of the lesson instruction and the use of the PBL strategy.

2. It is also possible that there actually was a significant increase in the level of understanding among all the students, but that the design of the test was not capable of demonstrating this change.

3. For future analysis I will consider redesigning the test items and include more rigorous methods.
Conclusions

- The research showed that students improved their learning about urban ecology by their participation in “El Pedregal” Project.

- The students began to understand how their actions impact local urban ecosystems.

- This study complements the process of environmental literacy for our students.
LIFE PROJECT
FOR PLANETARY EVOLUTION AND SUSTAINABILITY

Natural Recycle Nutrients
(Carbon and Nitrogen)

Jadira Aponte
Alberto Meléndez Torres  High School
School District: Orocovis, PR

Ose Pauleus & Marianne Cartagena
NSF-IGERT Fellows

Maximizing Yield Through Integration (MYTI-13) – Sponsored by NSF
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Life Project is based on the educational strategy Problem Based Learning (PBL) to improve the student’s academic achievement through an ecological laboratory.

- The role of the student in Life Project is to be an active researcher that identifies solutions to environmental problems and improve our quality of life.
- This lab had different settings: Compost, Garden, and Hydroponic, among others.

Objective

- Promote an urban and sustainable agriculture to minimize the shortage of food and organic waste from landfills.
The impact of the *Life Project* in the academic achievement of high school students on the concept of Natural (Organic) Recycling in Urban Agriculture?

Hypothesis

- Students improve their academic achievement, due to the impact of the activities related to the *Life Project*. 
Method

- We used a quasi-experimental research design (in the context) of Organic Recycling (Carbon and Nitrogen Cycles).

- Control group = students who learn the concepts using traditional teaching.

- Experimental group = students who learn the concepts participating in the *Life Project* activities.
Method (cont.)

Samples

- Two groups of twelve grade students:
  - 24 participants in each group
  - Both groups have the same amount of special education students
Data Collection

- Pre-test and post-test.
- Different assessment activities to discuss the following concepts:
  - Compost
  - Food chain
  - Biogeochemical Cycles (Carbon and Nitrogen)
Method (cont.)

• Statistic test
• Covariance analysis was performed by using the general linear regression model
  • The dependent variable are the results of the post-test.
  • The covariate are the results of the pre-test.
Results

- Shows an increase in the results obtained by students in the experimental group in the post test.
- There is a significant difference between the two groups (F=31.90, p=0.000)
• The results demonstrate that use of the activities in *Life Project based on the PBL strategy* are effective to increase the academic achievement of the students.

• We can improve the sustainable urban agriculture to decrease the food shortage and the amount of organic waste in landfills through environmental education using the PBL strategy.
Transforming garbage to eat better

Maximizing Yield Through Integration (MYTI-I3) – Sponsored by NSF
Award No. 1038166

Marixa Rodríguez
Science and Math Specialized School Brígida Álvarez Rodríguez
School District: Vega Alta, Puerto Rico
AFTER MANY POLITICAL DEBATES IF ALL PORTS IN PUERTO RICO ARE CLOSED NOTHING CAN BE IMPORTED AND EXPORTED. WHAT WE CAN DO?
RESEARCH QUESTION

Does seventh grade students understanding of the concept “changes in matter” improve by participating the school project: Transforming garbage to eat better?

1. Identifying the situation
2. Implementation of the school project
3. Students improve their understanding of science concepts
METHODOLOGY

- A pre-experimental investigation
- Sample
  24 students of seventh grade.
METHODOLOGY

• The students are working in their plan to identify solutions to the situation presented.
• This plan includes:
  – Production of compost
  – Design a school garden
• They will make flyers and videos to share what they have learned with their peers and community.
DATA COLLECTION

- Pre/post test
- Assessment
Conclusions

• At this moment the investigation is not concluded.
Questions?