STEM Literacy for ELLs through Service Learning

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STEM Literacy for ELLs through Service Learning

Sandra Rodriguez-Arroyo, University of Nebraska at Omaha
Barbara Brimmerman, Lewis and Clark Middle School
Olga Zeisler, University of Nebraska at Omaha

2013 Annual Conference of the International Association for Research on Service Learning and Community (IARSLCE)
Rationale

- Each content-area has its own set of literacy skills (Carnegie Corporation of New York’s Council on Advancing Adolescent, 2010, p. x).
- Some of these literacy skills include reading comprehension, vocabulary awareness, and other language knowledge required to communicate and learn in a particular content area.
- In Jim Cummins’s words, “the development of academic language proficiency, for both ESL and non-ESL students, requires specific instructional strategies designed to enable students to harvest the language they encounter in the content areas” (1996, p. 3).
- ELLs are less likely to be enrolled in advanced level STEM courses (Zehr, 2011a).
Model of Academic Language Proficiency
Jim Cummins’s Quadrant

Cognitively Undemanding

A.  • Art, music, PE
      • Following simple directions
      • Face-to-face conversations

C.  • Telephone conversations
      • Note on refrigerator
      • Written directions

Context Embedded

B.  • Demonstrations
      • A-V assisted lesson
      • Science experiments
      • Social studies projects

D.  • Reading a textbook
      • Explanation of new abstract concepts
      • Lecture with few illustrations
      • Math concepts & application

Cognitively Demanding
How do refugee students go from this ....
STEM Literacy for ELLs

- The National Science Foundation (NSF) and the Office of English Language Acquisition (OELA) have made a strong commitment to STEM education for English Language Learners (ELLs).
- April 2013- NSF and OELA joined forces at the National Science Teachers Association (NSTA) Annual Conference to bring together researchers and practitioners to share information on “effective instructional practices that promote science achievement of English Learners” (http://www.ncela.gwu.edu/meetings/nsta2013, pa. 1).
- Professional development opportunities have been offered and grants have been awarded to incorporate STEM opportunities for ELLs (Kobrin, 2010, Zehr, 2011b).
- Even though researchers have focused on service learning as a medium through which teacher candidates (TC) learn about ELLs (Hutchinson, 2011), the literature barely mentions service learning as a medium to incorporate STEM to develop ELLs’ language learning academic skills.
How do students go from this...
To this???
Approximately 6,400 students in the ESL program in grades Pre-K through 12

99 different languages spoken by ESL students

82% of the students speak Spanish

Other languages spoken include: Karen, Nepali, Nuer, Somali, Vietnamese, Arabic, Chinese, Hmong, Russian, French, etc.

1,253 Migrant students (2011-12)

Increasing numbers of refugee students from Thailand and Nepal

Tall grasses and Wildflowers of Nebraska:

A Service Learning Experience
## UNO Students

<table>
<thead>
<tr>
<th>Term</th>
<th>UNO</th>
<th>ELLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2013</td>
<td>19 (3 PE, 7 Middle School, 9 Art Education)</td>
<td>35 (Mostly Level 3)</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>13 (2 Art Education, 1 ESL Emphasis, 2 PE, 8 Music Education)</td>
<td>14 (Mostly Level 2)</td>
</tr>
<tr>
<td>Spring 2014</td>
<td>12 (2 Middle School, 2 Art Education, 5 ESL Emphasis, 1 PE, 2 Music Education)</td>
<td>20 (Mostly Level 3)</td>
</tr>
</tbody>
</table>
Objectives

• Rigorous topics-All topics must be tied to Nebraska/Nebraska Prairies. Discuss, think aloud, problem solve, ask student’s opinion

• Engaging activities.
  – UNO students will need to find resources at the ELL students reading level. (Must use at least three resources)
  – UNO students will help them read with comprehension. (paraphrasing, main idea-details, summarizing)
  – UNO students will help them complete an outline
  – UNO students will help them write a resource paper using the outline.
  – UNO students will help them with the bibliography. (Noodle Tools)
  – Together, as a team, will create a display board representing research.
  – UNO students will support ELL students when presenting research to public.

• Introduce/use technology available- ipads, smartboard

• Most importantly-enjoy!!! Have fun with the students.
Why?

The ELL students were curious about the name of the school-Lewis and Clark. So we read about the incredible journey of Meriwether Lewis and William Clark.
UNO Partnership-Ms. Alicia Mullarkey, UNO Biology Department
UNO Partnership-Dr. Sandra Rodriguez-Arroyo, Teacher Education.
Focus: ELL students focus on STEM
Community Partner: Allwine Prairie

Fall & Spring trip to Allwine Prairie
UNO Partnership-Ms. Alicia Mullarky, UNO Biology Department and the help of her UNO biology students.
Community Partner: Allwine Prairie

Allwine Prairie
14810 State St Bennington, NE 68007

- UNO Nature Preserves, which include Glacier Creek Preserve and T.L. Davis Preserve.
- Managed by the UNO Department of Biology
- Restore and preserve some of Eastern Nebraska's natural prairie and woodland heritage.
- Serve as educational and research sites for the University and the surrounding regional community. (New educational building-donated barn)

http://www.unomaha.edu/prairie/photogallery.php
Support from Service Learning Academy

• How does UNO’s Service Learning Academy support service learning projects?

• Lewis and Clark Prairie Service Learning Project as the opportunity to learn about U.S. culture, environment, and boost students’ confidence in making a positive contribution in the class.

• Positive attitude to learning English
Lewis and Clark ELL students with UNO teacher education candidates during the presentations.
Preliminary data analysis show that TC incorporated several strategies to develop STEM literacy skills:

- **Writing strategies**: RAFT (Role, Audience, Format, Topic)
- **Background knowledge, vocabulary development**: with visual aids, graphic organizers, and technology (iPads, SMART Boards, Laptops)
- **Research skills**: Big 6, brainstorming, online resources, library materials
- **Reading skills**: (Before, During, and After Reading activities).
- **Even though the TC are not required to use technology tools, many rely on the iPads and/or laptops to search for images and definitions for concepts that they have difficulty explaining to the ELLs.**

http://prezi.com/s5ik1ewuf5an/literacy-strategies/
http://prezi.com/io6bqvbzldi/human-influences-on-the-prairie/
Service Learning Project Outcomes

• Use of academic language (Ex. Translocation)
• Using words with comprehension
• New sense of confidence
Visit to the Prairie

- Where all comes together

Third Year 2013-2014
Future Research

• Explore the use of technology as a mediating tool for communication, vocabulary development, visual support, etc.
• Develop new survey instrument that incorporates ELLs
• Include students’ voices
• Develop a longitudinal research study
I like to play indoors better ‘cause that’s where all the electrical outlets are.

A fourth grader in San Diego.

*Last Child in the Woods—Saving Our Children From Nature-Deficit Disorder*, by Richard Louv.