Collaborative Assessment: Measuring Effects of Community-Based Participatory Research on Student Learning

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Collaborative Assessment: Measuring Effects of Community-Based Participatory Research on Student Learning

Caroline Nielsen
David Dunbar
Christina Medved
Susan Gill
Community-Based Research

- Reciprocal collaboration with community partner(s)
- Student research addressing real-world problems
  → What are the benefits for students?
Community-Based Research

- Reciprocal collaboration with community partner(s)
- Student research addressing real-world problems

What are the benefits for students?

<table>
<thead>
<tr>
<th>Independently Measured</th>
<th>Student Self-Reported</th>
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Community-Based Research

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<td>Student Engagement</td>
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Community-Based Research

- Reciprocal collaboration with community partner(s)
- Student research addressing real-world problems

⇒ What are the benefits for students?

- Independently Measured Content Knowledge
- Student Self-Reported Perceived Learning Gains
- Student Engagement

- Reciprocal collaboration with community partner(s)
- Student research addressing real-world problems

⇒ What are the benefits for students?
Community-Based Research

- Reciprocal collaboration with community partner(s)
- Student research addressing real-world problems

What are the benefits for students?

- Independently Measured
  - Critical Thinking & Process Skills
  - Content Knowledge

- Student Self-Reported
  - Perceived Learning Gains
  - Student Engagement

True Value of CBR for Students
Community-Based Research

- Reciprocal collaboration with community partner(s)
- Student research addressing real-world problems

→ **What are the benefits for students?**

![Diagram](image)

- **Independently Measured**
  - Critical Thinking & Process Skills
  - Content Knowledge

- **Course Learning Outcomes**
  - True Value of CBR for Students

- **Student Self-Reported**
  - Perceived Learning Gains
  - Student Engagement
Project Background

• Partnership Model
  – Cabrini College
  – Stroud Water Research Center
  – Valley Creek Restoration Partnership

• Project Philosophy & History
  – National Science Foundation Grant
  – Watershed Ecology & Watershed Citizenship
  – Community-Based Research
Initial Assessments

• Past Assessments
  – Pre-/Post-Course Content Exam (Content Knowledge)
  – Pre-/Post-Course Survey (Self-Reported Learning)
  – Focus groups (Student Engagement)

• Current Assessments
  – 14 students
    1. Pre-/Post-Course Content Exam
    2. SALG Survey (Student Assessment of Learning Gains)
    3. CBR Student Learning Outcomes Survey (Lichtenstein et al., 2011)
Pre-/Post-Course Content Exam

- 8 multiple choice & 3 short answer questions

Result: 14% increase in scores

Limitations:
- Written by instructors (“teaching to the test”)
- No critical thinking component
- No comparison group – can’t determine CBR contribution
SALG Survey

• Rates overall course, activities, and understanding of course content
  – Likert scale of 1 (poor) to 5 (excellent)

• Result: all scores > 4 out of 5

• Limitations:
  – Focus on attitudes, not student learning
  – No comparison group
CBR Student Learning Outcomes Survey

- Assesses academic skills, educational experience, civic engagement, professional skills, and personal growth

- Result: “Moderate” to “Extensive” gains in all areas

- Limitations:
  - Relies on self-reported learning gains
  - No comparison group

![Bar chart showing learning outcomes](chart.png)
Initial Assessments

• Promising results
  – Growth in content knowledge
  – Positive engagement
  – Strong self-reported learning gains
Initial Assessments

• Promising results
  – Growth in content knowledge
  – Positive engagement
  – Strong self-reported learning gains

• Needed new assessment to complete model
  – Does a Community-Based Research approach improve critical thinking and process skills?
    → Requires independent measurement of student achievement in learning outcomes.
    → Requires a direct comparison with non-CBR learning.
Authentic Learning Outcome Assessment

• Goals
  – Independent measurement, minimize bias
  – Focus on course’s stated learning objectives
  – Comparison group

• Design & Implementation
  – Rubric
  – Questions
  – Student assignments
  – Scoring
(Very) Preliminary Results

- 8 pre- & 3 post-course assessments from CBR course
- 5 pre- & 6 post-course from comparison course
(Very) Preliminary Results, cont.

- Paired comparisons: 3 pre- and 3 post-course from each course (representing the same 6 students)

![Paired Changes in Learning Objective Scores](chart.png)

**Paired Changes in Learning Objective Scores**

(Representing 3 Students from Each Course)

- Error bars represent the standard error of the mean.
• N is too low to consider these results robust

• Nonetheless, potentially promising
  – Average total CBR score increased 3.02 points
  – Average total non-CBR score increased 0.15 points
What we’ve learned

• Promising assessment instrument
  – Course learning outcomes
  – Critical thinking & process skills
  – Scoring to minimize bias
  – Comparison group

• Needs to be an in-class assessment
  – Not at end of class
  – Institutional Review Board requirements

• Need to think carefully about questions
  – Balance critical thinking with time limitations
  – Align with rubric
Moving Toward a More Complete Assessment of Community-Based Research

- Independently Measured
  - Critical Thinking & Process Skills
  - Content Knowledge

- Student Self-Reported
  - Perceived Learning Gains
  - Student Engagement

True Value of CBR for Students
Discussion

• What learning outcomes would **YOU** like to assess?

• What have you learned in this talk that might help you develop/implement an authentic assessment instrument?

• Share your ideas with someone sitting near you.

• Report on learning outcomes & assessment ideas.
Thank you!

Please feel free to contact us with thoughts/questions.

Caroline Nielsen – cbn24@cabrini.edu
David Dunbar – ddunbar@cabrini.edu
Christina Medved – cmedved@stroudcenter.org
Susan Gill – sgie@stroudcenter.org
Extra Slides
<table>
<thead>
<tr>
<th>1) Students will understand the interdisciplinary nature of science.</th>
<th>4 points</th>
<th>3 points</th>
<th>2 points</th>
<th>1 point</th>
<th>0 points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student identifies disciplines both within and outside of the natural sciences and clearly explain how those disciplines work together to identify/resolve relevant issue(s).</td>
<td>Experiment tests a legitimate hypothesis, and includes the following, as appropriate: 1) control and treatment groups; 2) quantitative measurements; 3) replication.</td>
<td>Experiment tests a legitimate hypothesis, and includes two of the three required elements.</td>
<td>Experiment tests a legitimate hypothesis, and includes one of the three required elements.</td>
<td>Experiment either fails to test a legitimate hypothesis, or fails to include any of the three required elements.</td>
<td>Experiment fails to test a legitimate hypothesis, and fails to include any of the three required elements (or no experiment is described).</td>
</tr>
</tbody>
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<tr>
<th>2) Students will apply the scientific method through laboratory and/or field experimentation and data analysis.</th>
<th>4 points</th>
<th>3 points</th>
<th>2 points</th>
<th>1 point</th>
<th>0 points</th>
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<tr>
<td>Student describes at least one method of aggregating data (mean, median, etc.), and analyzing the statistical significance of the results.</td>
<td>Student clearly describes two or more relevant social/ethical issues, and indicates that they must be considered along with any scientific findings.</td>
<td>Student clearly describes at least one relevant social/ethical issue, and indicates that it must be considered along with any scientific findings.</td>
<td>Student clearly describes at least one relevant social/ethical issue.</td>
<td>Student mentions any social/ethical issue.</td>
<td>Student fails to mention any social/ethical issues.</td>
</tr>
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<tr>
<th>3) Students will apply quantitative skills through laboratory and/or field experimentation and data analysis.</th>
<th>4 points</th>
<th>3 points</th>
<th>2 points</th>
<th>1 point</th>
<th>0 points</th>
</tr>
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<tr>
<td>Student clearly describes legitimate modes of scientific and public communication, and demonstrates understanding of the differences.</td>
<td>Student clearly describes legitimate modes of both scientific and public communication.</td>
<td>Student clearly describes legitimate mode(s) of either scientific or public communication.</td>
<td>Student mentions communicating with scientists and/or the public, but does not describe legitimate modes of communication.</td>
<td>Student fails to mention communicating with scientists or the public.</td>
<td>Student fails to mention communicating with scientists or the public.</td>
</tr>
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<tr>
<th>4) Students will become aware of social and ethical issues surrounding scientific discovery and technology.</th>
<th>4 points</th>
<th>3 points</th>
<th>2 points</th>
<th>1 point</th>
<th>0 points</th>
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<tbody>
<tr>
<td>Student names at least one discipline and mentions contributions each could make.</td>
<td>Student names at least one discipline with which to collaborate.</td>
<td>Student names at least one discipline with which to collaborate.</td>
<td>Student names at least one discipline with which to collaborate.</td>
<td>Student fails to name any other disciplines with which to collaborate.</td>
<td>Student fails to name any other disciplines with which to collaborate.</td>
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<tr>
<th>5) Students will enhance their ability to communicate scientific ideas.</th>
<th>4 points</th>
<th>3 points</th>
<th>2 points</th>
<th>1 point</th>
<th>0 points</th>
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Question 1: There are plans to build a highway through your neighborhood and the designers have proposed two alternatives. The first alternative has the highway being built along the stream and, although it is not in the flooding area, which is legally protected, it does require taking woodlands upstream. Taking this land would eliminate critical area for brook trout, which are just beginning to return themselves in the stream. The second alternative would route the highway through a low-income neighborhood that has just begun to recover after years of economic and social problems. Residents of this area are concerned that the route will take a church and community center that is the heart of the community and cut the neighborhood in two. Transportation planners tell you that the road is critical for the economic vitality of the region; while environmentalists say that the protecting the water and the wildlife are critical to regional water quality. Political leaders are concerned about the citizens of their districts and remind you that people are more important than fish. Your task is to develop a method to evaluate both the environmental and socioeconomic impact of the alternatives. Please outline the process that you would undertake to find a solution to this problem and explain:

• how you would gather your data.
• how you would analyze your data.
• what other expert(s) you would consult.
• what information informed your recommendation and why
• how you would communicate your results to:
  1. other scientists
  2. members of the community
• what actions you would recommend to manage the environmental and social impacts of the action that you propose
Question 2: There is a proposal to expand a local mall in your neighborhood to become a regional attraction. This mall is expected to attract shoppers from miles around. The shopping center is located in an area that has underground caves and where the water that flows through the underground network of caves will be susceptible to contamination both during construction and afterwards from the increased traffic in the area (e.g., road salt, gas or oil spills, etc.). The groundwater that comes from this area feeds into your local stream, thereby raising the potential for water contamination. On the other hand, the residents of the area are very excited about having such new jobs and money into the area, which could minimize the need for high property taxes. Most public sentiment supports the development. However, a small, but vocal, minority is trying to alert residents to a potential environmental catastrophe. Your task is to develop a method to evaluate both the environmental and socioeconomic impact of this issue. Please outline the process that you would undertake to find a solution to this problem and explain:

• how you would gather your data.
• how you would analyze your data.
• what other expert(s) you would consult.
• what information informed your recommendation and why
• how you would communicate your results to:
  1. other scientists
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• what actions you would recommend to manage the environmental and social impacts of the action that you propose