Teaching-as-Research: A Case Study

Folahan O. Ayorinde and Ayoni F. Akinyele
Department of Chemistry
Howard University

An Initiative of the Center for the Integration of Research, Teaching, and Learning (CIRTL)
What Is Teaching-as-Research?

- Teaching and learning are intertwined and should be dynamic processes.
  - Faculty go into the classroom with a deliberate and conscious set of outcomes, create a conducive learning environment, assess students’ progress, and modify teaching and learning practice accordingly.
Why Should Faculty Engage in TAR?

- Traditional lecture/recitation method results in poor grades for too many students.
  - 32.3% Failure (D, F, W)

- Many students withdraw from program.

- Longer time-to-degree for many students.
How Can Faculty Engage in TAR?
The CIRTL NETWORK
Center for the Integration of Research, Teaching, and Learning (CIRTL)

- Howard University
- Michigan State University
- Texas A&M University
- The Pennsylvania State University
- University of Colorado at Boulder
- University of Wisconsin-Madison
- Vanderbilt University

Mission:
To enhance the Professional Development of Graduate Students and develop a national STEM faculty committed to advancing effective teaching practices for diverse student audiences.
The CIRTL Vision

- Develop a cadre of faculty and graduate students committed to implementing and advancing effective teaching practices for diverse student audiences in addition to being excellent researchers.
THE CIRTL PILLARS

- Teaching-as-Research (a dynamic process)
  - Teaching-through-Diversity
  - Teaching-through-Learning Community
  - Teaching-through-Proactive Assessments

- Learning-through-Diversity
- Learning Communities
CIRTL-at-Howard: THE GOAL

- To incorporate the 3 pillars of CIRTL across the curriculum in STEM Disciplines
  - Teaching-as-Research (a dynamic process)
  - Teaching-through-Diversity
  - Teaching-through-Learning Community
  - Teaching-through-Proactive Assessments
  - Learning-through-Diversity
  - Learning Communities
Peer-Led Team Learning (PLTL) in Chemistry for Health Sciences

- **PLTL?**
  - Teaching-as-Research
    - Active Learning
    - Formative assessments
    - Reiterations
    - Education Expert, Instructor, Student Leader
  - Learning Communities
    - Groups of 6-8 students
    - 2-Hour Weekly Session guided by P/Leader
  - Learning-through-diversity


COURSE STRUCTURE

- Fall Semester
  - Chem Hlth Sci I
    - 3 hours lecture
    - 1 hour Recitation

- Spring Semester
  - Chem Hlth Sci II
    - 3 hours lecture
    - 1 hour Recitation
For PLTL Students

- **Fall Semester**
  - Chem Hlth Sci I
    - 3 hours lecture
    - 2-hour learning community

- **Spring Semester**
  - Chem Hlth Sci II
    - 3 hours lecture
    - 2-hour learning community
Guidelines for PLTL

- The PLTL model is not for remedial instruction.

- The PLTL model is not tutoring.
  - Peer Leaders are trained to avoid teaching, tutoring or providing answer
  - Peer Leaders are facilitators who ask good questions, not answer givers who have “the right answers.”

- The PLTL model preserves the lecture and introduces a new structure:
  - Weekly 2-hour learning community session in place of recitation – guided by a S/Leader

http://www.pltl.org
Preparation of Peer Leaders

- Students who did well in the course in a recent class are trained weekly by the faculty and an educational specialist, in
  - course content
  - leadership and learning theories
- During each weekly training session, the faculty models practical ways to solve conceptual problems through asking appropriate questions.
- The Leaders replicate what the faculty does at their Learning community sessions
Preparing Peer Leaders, cont.

- The Learning Specialist
  - Levels of critical thinking
  - Different learning styles
  - Time management
  - Group management
  - Conflict resolution
  - Ways of presenting information
Formative Assessment

- In the weekly Faculty-led Peer Leader Training sessions
  - Peer leaders present feedback from learning community sessions
  - Faculty presents feedback from the students
  - Each feedback was discussed and decisions were made on appropriate actions to be taken.
Spring 2005 PLTL and Non-PLTL Student Performance

<table>
<thead>
<tr>
<th>Grades</th>
<th>PLTL (n = 46)</th>
<th>Non-PLTL (n = 33)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+B+C</td>
<td>90%</td>
<td>60%</td>
</tr>
<tr>
<td>A</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>B</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>C</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>D</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td>F</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td>I/F</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>W</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Fall 2005 PLTL and Non-PLTL Student Performance

Distribution (Percent)

PLTL (n = 37)  Non-PLTL  (n = 71)

Grades

A+B+C  A  B  C  D  F  I/F  W

Distribution (Percent)
Comparison of Percentage of Students Earning D, F, W Grades

PLTL (n = 37)  Non-PLTL (n = 71)  n = 475

Distribution (Percent)

Fall '05
Spring 2006 PLTL and Non-PLTL Student Performance

<table>
<thead>
<tr>
<th>Grades</th>
<th>PLTL (n = 35)</th>
<th>Non-PLTL (n = 70)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+B+C</td>
<td>85</td>
<td>35</td>
</tr>
<tr>
<td>A</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>C</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>F</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>I/F</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>W</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>
Comparison of Percentage of Students Earning D, F, W Grades

PLTL (n = 35) | Non-PLTL (n = 70) | n = 475

Spring '06
Learning Gains:
The average rating (on a 5 point scale) for SALG Survey questions was 3.80 (standard deviation 1.01). 38.2% (n=45) of the students surveyed stated that the PLTL workshops helped a great deal in the gains they made in:

- understanding the main concepts.
- understanding the relationships between concepts.
- feeling comfortable with complex ideas.
- their ability to:
  - solve problems.
  - think through a problem or argument.
  - work effectively with others.
Other Outcomes

- For PLTL students, Failure Rate was about 12% compared to about 32% for Non-PLTL students.

- 100% (n = 9) of the peer leaders surveyed stated that the experience of serving as Peer leaders positively affected their subject learning.
  - “It built my ability to think critically and solve chemistry related course work.”

- 78% (n = 9) of the Peer Leaders surveyed stated that the experience of being Peer leaders positively affected their ability to communicate ideas to others.
Support for TAR?: Proposed Graduate Teaching Fellow (GTF) Course

- 3 credit-hour Graduate School course
- Targeting Teaching Assistants
- Students in each discipline will enroll under a faculty in that discipline
- Will create a learning community for students and faculty
- Upon completion, student will be given supplemental stipend to assume greater role in teaching service courses
Adaptation of PLTL into Student-Led TL (SLTL)

- Use Graduate Students instead of Peer Leaders
- Use GTF course instead of Education Specialist
- Potential Courses to use
  - General Chemistry, Organic Chemistry
  - Introductory Biology
  - Calculus, Introductory Physics, etc.
- Everything else stays the same
Pilot SLTL Project – Fall ’07 G-Chem
Responsibilities of Graduate Assistants

- Designate 2 recitation sections for SLTL
- GA’s to attend course lectures
- Create learning communities of 8-10 students/group
- Weekly 2-hour session with each group led by graduate assistant (GA) using PLTL model
- GA’s meet with Instructor to obtain conceptual questions, and give feedback
- CIRTL leader, GA’s, education specialist to meet 1 hour per week
- GA’s to collect data on student performance
- Data Analysis

Similar model for Introductory Biology/Physics, and Calculus
Thank You

Your Views, Comments, and Suggestions are WELCOME
Resources

- www.pltl.org
- http://www.cirtl.net/STEMES/
- http://www.cirtl.net/
Acknowledgments

Financial Support
- The Peer-Led Team Learning Project
- Dr. Dorothy Powell
  - Division of Nursing
- Dr. Peggy Valentine
  - Division of Allied Health Sciences
- Howard University Fund for Academic Excellence Program 11th and 12th Cycles
- Dr. Jesse M. Nicholson
  - Department of Chemistry
- Dean James A. Donaldson
  - College of Arts & Sciences
- Dean Orlando L. Taylor
  - Graduate School
- The CIRTL Network
  - National Science Foundation
- Center for Academic Reinforcement
  - Roland Byrd
  - Sharon Fletcher
- CETLA
  - Dr. Teresa Redd
- Professor Pratibha Varma-Nelson
- CIRTL-at-Howard
  - Dr. William Eckberg
  - Dr. Ayoni Akinyele
  - Ingar Johnson
  - Schabash