Theory to Practice Workshop
Promoting Persistence and Success: Adapting Promising Practices and Promoting Institutional Change

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“Crossing Boundaries: Transforming STEM Education”
AAC&U Network for Academic Renewal STEM Conference
13 November 2015
Seattle, WA

Please visit http://tinyurl.com/AACUCS17 for workshop handouts.
Poll Question: What’s Your Institution Type?

- Associate's/Public College or University
- Baccalaureate College or University
- Master's College or University
- Research University/VH & H
- Other

Responses vs Percent
Poll Question: What’s your role on campus?

- Science Faculty (Responses: 23, Percent: 46%)
- Engineering Faculty (Responses: 2, Percent: 4%)
- Math Faculty (Responses: 5, Percent: 10%)
- Other Faculty (Responses: 1, Percent: 2%)
- Administrator (Responses: 7, Percent: 14%)
- Both Faculty & Administrator (Responses: 17, Percent: 34%)
Poll Question: What are the roadblocks or barriers to student success in year 1?

- poor math skills, unable to access their math skills in a real setting
- Courses impacted bc not enough faculty.
- Lack of interdisciplined work and co-teaching opportunities
- Non-engaging 1st year courses
- Lack of understanding as what constitutes ownership for their learning
- No incentivization of faculty for student success
- Lecture format
- Not enough classroom sections
- Too many prerequisites
- Not enough personal to help those undecided
- Intro courses intended by faculty as weed out courses
- Student skills currently expected in HS do not match skills we expect them to have
- Large lecture sizes
- No FYE program currently
- Mentoring
- Disconnect between faculty and admin
- Advising from multiple arenas
- Faculty are not trained in student support beyond academic
- Large enrollment gateway courses
- GE is too many credits
- Curriculum inflexibility
- Remedial math
- Overwhelmed and do not know where to go for help
- Lack of educational ownerships
- Lack of communication between faculty
- Under-prepared for college level STEM
- Work
- Not ready for science to be hard
- Changing academic expectations
- Lack of preparation.
- Math prep. Low motivation
- Lack of academic skills
- Lack of Math skills
- Not sure - we don't have a good understanding
- Time management
- Time management
- Managing time and workload in the transition from high school to college.
- Lack of metacognitive skill
- Overwhelmed and do not know where to go for help
- Basic math skills
- Not getting connected to resources and people
- Low Emotional intelligence
- All of the above
- Distracted by other activities
- Not clear about their academic direction
- Lack of help seeking behaviors
- Change their frame on how to be a university student (instead of a high school student).
- Fear of failure
- Lack of preparation.
- Lack of community
- Math and college readiness. Life happening
- Discouraged students who can be successful but need some time to get adjusted
- Integration
- Challenges with increased faculty expectations
- I am from ABET, which accredits programs at universities and colleges. So N/A
- Underprepared--emotional, academics, social
- Life happens
- Not ready for science to be hard
- Inadequate preparation
- Lack of preparation
- Time management
- Time management
- Lack of preparation
- Math skills, navigating college
- Developing effective study habits.
- Math and Chem success
- Lack of awareness of metacognitive skills
- Overwhelmed with experience
- Barrier course attrition
- Under prepared
- Intro courses serving as weed out courses
- Institutional and discipline culture
- Poor preparation
- Poor math and QR skills
- Math preparation
- Time management
- Number of courses to obtain degree
- Lack of preparation
- Lack of preparation
- Not being connected to a cohort group.
- Not knowing how to ask for help.
- They come in unprepared from high school!
# AAC&U Framework Goals

## Commitment to Equity

- Knowing who your students are and will be
- Committing to transformative dialogues about climate for underserved students
- Investing in culturally competent practices that lead to the success of all students
- Setting and monitoring progress toward equity-minded goals

## Commitment to Inclusive Excellence

- Developing and pursuing high-quality learning goals
- Ensuring equitable participation in Signature Work as a required element at the baccalaureate level
- Providing resources and monitoring quality of support for student success
- Ensuring equitable student access and participation in High Impact Practices (HIPs)
- Ensuring integration of goals and practice across major, general education, co-curricular, and community-based programs
- Making student achievement visible and valued

Workshop Objectives

• Become familiar with theoretical frameworks that may inform institutional practices that promote student persistence and success

• Practice evaluating institutional persistence status

• Practice conducting a landscape assessment of persistence practices on your campus
Developmental Framework for Persistence

Student Demographics – defining characteristics

- Socioeconomic status
- Gender
- Age/generational status
- Ethnicity
- Race
- Familial collegiate history
- Educational pathway
- Familial context
- Immigration status
- Citizenship
- Disability status
- Military duty status
- Full-time vs. part-time enrollment
- Continuous vs. punctuated progress toward baccalaureate degree (STEM or non-STEM)
  – (stopout, deployment)
- Enrollment at single vs. multiple institutions
  – (transfer, swirling)
Figure 1. Comprehensive Model for Persistence Research [From Reason, R. D. (2009). An examination of persistence research through the lens of a comprehensive conceptual framework. Journal of College Student Development 50(6), 659-682.]
<table>
<thead>
<tr>
<th>Persistence Framework Component</th>
<th>Program Activities</th>
<th>Immediate Impact</th>
<th>Long-term Goal</th>
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| Learning                        | STEM bridge program tutoring  
Intro science skills sections with bridge program | Students all become prepared for classes to the same basic level  
ALL students better understand class material  
Increase performance on assignments | URMs have an equal understanding of class content as reflected in grades |
| Motivation                      |                     |                  |                |
| Confidence                      |                     |                  |                |
| Social Factors                  |                     |                  |                |

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</tr>
<tr>
<td><strong>Motivation</strong></td>
<td>Career exposure/shadowing program</td>
<td>Students observe the different applications of a STEM degree</td>
<td>Increased student interest &amp; participation in STEM classes</td>
</tr>
<tr>
<td></td>
<td>STEM mentoring program</td>
<td>Students learn about mentors’ experiences</td>
<td>Students explore STEM careers independently</td>
</tr>
<tr>
<td><strong>Confidence</strong></td>
<td>Course based undergraduate research experience (CURE)</td>
<td>Students conduct real scientific research</td>
<td>Students contribute to scientific knowledge</td>
</tr>
<tr>
<td></td>
<td>Students contribute to field through local poster fair(s)</td>
<td>Students recognize that they are doing “real” science</td>
<td>Students see themselves as capable students and scientists</td>
</tr>
<tr>
<td><strong>Social Factors</strong></td>
<td>STEM mentoring program</td>
<td>Students participate in STEM community events</td>
<td>Students recognize that they are part of the STEM community</td>
</tr>
<tr>
<td></td>
<td>Undergraduate STEM events</td>
<td>Students meet others with similar interests</td>
<td>Students believe they can succeed in STEM</td>
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<tr>
<td><strong>Development of inclusive STEM community</strong></td>
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How to Understand Effect of Program(s)
Clarity About Which Programs Support Which Outcomes?
Broader Understanding of What Colleagues Are Doing
Cost Effectiveness of Established Programs
An Example: HHMI SEA-PHAGES

Persistence Framework

Confidence -> Motivation

Sense of Belonging
Self-efficacy
Project Ownership

Learn science

Science Network

Early research
Identify as a scientist

Active learning
Science Identity

Learning Communities

Sense of Belonging
Self-efficacy
Project Ownership
Edward S. Shihadeh
Chair, Department of Sociology, LSU
Director, Crime and Policy Evaluation Research Group

Anthony Reed
LSU Department of sociology
Crime and Policy Evaluation Research Group

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VICE CHANCELLOR, KURT J. KEPLER, PhD
## Where LSU Stood 2013

<table>
<thead>
<tr>
<th>University</th>
<th>2013 Retention Rate</th>
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</thead>
<tbody>
<tr>
<td>University of Maryland</td>
<td>94.7%</td>
</tr>
<tr>
<td>University of Georgia</td>
<td>93.7%</td>
</tr>
<tr>
<td>University of Illinois</td>
<td>93.1%</td>
</tr>
<tr>
<td>North Carolina State University</td>
<td>92.6%</td>
</tr>
<tr>
<td>Virginia Polytech. &amp; State U.</td>
<td>91.4%</td>
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<td>Texas A&amp;M</td>
<td>91.4%</td>
</tr>
<tr>
<td>Purdue University</td>
<td>91.0%</td>
</tr>
<tr>
<td>Iowa State University</td>
<td>88.7%</td>
</tr>
<tr>
<td>Colorado State University</td>
<td>86.6%</td>
</tr>
<tr>
<td>University of Tennessee</td>
<td>85.6%</td>
</tr>
<tr>
<td>University of Nebraska</td>
<td>83.6%</td>
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<tr>
<td><strong>Louisiana State University</strong></td>
<td><strong>82.5%</strong></td>
</tr>
<tr>
<td>University of Arkansas</td>
<td>82.1%</td>
</tr>
<tr>
<td>Mississippi State University</td>
<td>78.5%</td>
</tr>
</tbody>
</table>

LSU 2013: 82.5%
LSU 2014: **82.5%**
Student Retention Project 2014

- Predictive Data Techniques – The Algorithm

- Used algorithm to reduced Baton Rouge murder rates by 26% in 2013.
- Using algorithm for parole decision making -> $1.8 million federal grant.
- Created predictive algorithm for student retention by examining over 40,000 LSU students since 2006
- LSU student retention predicted with 99.5% accuracy.
- Phone call intervention method → resulted in record student retention (85%)

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Data Sources

- **Student LSU academic records** (Midterm exam grades, Fall semester grades, withdrawals, overall GPA, individual course GPA)
- **Student LSU supplemental instruction records** (tutoring, SI, etc.)
- **Student financial records** (Tops, Purges)
- **Student high school academic records** (GPA)
- **Student admissions records** (ACT, SAT, Individual scores)
- **Student LSU activity records** (e.g., Greek)
- **Student demographic records** (age, race, gender, home address, etc.)
- **Student attendance record**
Example of Ideal “Retained” Student

- Keeps consistent GPA over time
  (independent of whether GPA high or low)
- Has medium to high GPA
- Takes fewer DFW classes in one semester
- Attends classes
- Attends tutoring or supplemental instruction
- Has low grade instability. i.e., low spread between individual class grades
  - (All B’s or C’s is better than a combination of A’s and F’s.)
- Lives on campus
- Has a family or home address close to LSU
- Not first generation student
Student Interventions

- Unsatisfied with GPA
  - Ctr. for Academic Success (SI, Tutoring, etc).
- Misaligned (unrealized goal)
  - Center for Advising and Counseling
- Registration error/misunderstanding
  - Academic Counseling
- Depression, Anxiety, trauma
  - Mental Health Services, C.A.R.E.
- Financial Problem
  - Financial Aid & Scholarship Office
- Considering other University
  - Student Recruitment Office
Evaluation of Call-Outs

- Call-Outs increase contacted student’s retention probability by 9%  
  - Equal to taking a full load of SI courses.
- Call-Out list = 1500 individual students, of which 879 were successfully contacted.
  - This action alone brought back ½ the *additional* students who returned.
- **WITH ONLY 3-WEEKS OF PREPARATION** (Call-Outs were in July)!
  - Consider result if students contacted throughout the year (e.g., Nov, Jan, etc.)
Our Approach → Predictive Analytics with Hard Data

- Measuring actual behavior, not perception or attitude.
- Complex predictive modeling
  - Amazon, Walmart, Kroger Foods, etc., crime analysis, parole & recidivism.
- Predicted Retention Score is the trigger for intervention.
  - Don’t try to define the problem before hand.
  - Instead, identify student at risk, then drill deeper with Call-Outs.
  - More cost effective than creating campus wide programs.
  - Allows you to intervene and problem solve after the problem arises, not before.

Gloria’s tech tip: Tableau
Lessons in Persistence Analysis from the Persistence Studio

- Who has access to data?
- How is data shared and acted on?
- Which programs are most impactful?
- Which are most cost effective?
- Perhaps this requires landscape analysis?
- What data is needed?
Poll Question: What kind of data would you like to have?

- How do measure track impact of stereotype threat
- Yes
- five year and 10 year plan / vision.
- What do they think science actually is
- Do they have an associates degree?
- motivation for attending college
- How many help programs have the previously been involved with
- their home zip code.
- who gives them advice
- perceptions about career choices
- What is the filename of the presentation?
- Are they using effective study techniques?
- What are student goals
- What were their favorite HS subjects?
- What high school they went to.
- number of hours working a week
- Family responsibilities
- Student involvement in extracurricular activities.
- How many hours of paid work per week
- Patterns of trouble across classes
- How many times they have retaken a class
- Work hrs vs study hrs
- How are they studying?
- Total course load
- Longitudinal - does a constellation of programs make a difference
- Family responsibilities
- number of hours they work and where

- Study groups
- Reasons for not attending class
- attendance, did they purchase text
- Commuting time
- Why students choose not to continue
- Performance in course compared to performance in prerequisite course
- What is expected from other classes
- hours spent at a job each week
- High school or community college district.
- Test scores
- Socioeconomic info
- Types of Classes taking
- number of hours spent working on academics each week
- Correlate HS grades/coursework with first year science course success.
- number of times they repeat a class - on and off campus
- Social engagement on campus
- tutoring, attendance
- Class Participation
- Family history
- study habits
- Financial situation
- Course engagement
- How much they work per week outside of school.
- Attendance
- ethnicity
- attendance
- pell grant recipients
Approaching Action for Institutional Change

Step 1: Landscape Analysis

### Institutional Landscape for STEM Persistence

#### Curriculum and Learning
- Curricular alignment
- Active learning
- Assessment
- Learning communities
- Research opportunities

#### Faculty Practice
- Scientific teaching
- Cultural competence
- Mentoring

#### Community and Climate
- Structural diversity goals and progress
- Culture of student development and success
- Student support
- Student advising
- Transformative dialogues
- Committed leadership
Issues and Needs

1. Need a personalized framework and implementation plan for your program(s)

2. At the same time, there is a desire to see what others are doing and trade techniques

3. If persistence is an overall lens, then what is your program intending to do and how would you measure it?
   – Using the worksheet allows you to visualize the extent to which your separate institutional programs are unified or grounded across the persistence framework
   – These worksheets can then be compared within and between institutions

4. Need continued and more targeted evaluation and assessment strategies
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<th>Stewardship</th>
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<td>Mentoring</td>
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Practicing Landscape Assessment

Remember the list of programs on your campus that contribute to institutional support for student persistence and success

- Organize into groups of three and allow each person to describe the program and its stewardship
- Consider the evidence of program impact and what your institution does with the information?

Plane work: Where are the opportunities for further development of a persistence landscape at your institution?

Campus work: Host a conversation to talk about conducting a comprehensive landscape analysis to identify opportunities for institutional improvement.
Suggestions for Moving Forward

1. **To Understand Program Effects.** Use persistence framework as a lens to view all programs holistically and collaboratively, especially in ways that connect programs to outcomes.

2. **To convince administrators to invest in sustaining programs.** Use as a tool to share where investment is needed and where data is missing.

3. **To Understand What Colleagues Are Doing.** Use as a visual platform to share: practical solutions to program challenges; inter-campus comparisons; assessment strategies; measures of successes;

4. **Cost Effectiveness.** Where programs are mature (e.g., Myerhoff at UMBC; LSU’s LA-STEM; Biology Scholars Program at Berkeley) look for redundancy, efficiency, or scale-up.
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• HHMI Studio A attendees
• Howard Hughes Medical Institute
  – David Asai
  – Cynthia Bauerle
  – Multiple program directors

Presentation

• Emory Center for Science Education
  – Pat Marsteller, Director
  – Drew Kohlhorst, Associate Director
• LSU Strategic Initiatives
  – Isiah Warner
  – Gloria Thomas
  – Ashleigh Wright
• HHMI Studio A attendees
  • Mark Graham, Yale
  • Cynthia Bauerle, HHMI
  • Ed Shihadeh, LSU
Path to Developing a Strategic Plan for V&C Implementation in Your Department or Program:

- Conduct a thorough department/program evaluation relative to V&C recommendations using the PULSE Self Assessment Rubrics. Also available is a shorter PULSE Departmental Evaluation Rubric.
- Establish departmental goals that align with V&C goals.
- Align departmental goals with institutional goals.
- Develop a plan to accomplish departmental goals (e.g. specific curricular reforms).
- Develop enabling mechanisms to implement the plan (e.g. technical support staff, resources, equipment, faculty development, incentives, etc.).
- Prioritize enabling mechanisms and prepare a detailed financial plan for funding enabling mechanisms, including funding from both intra- and extramural agencies.
- Plan metrics for achieving goals and plan both short and long term assessment mechanisms for these metrics.
- Prepare clear and detailed presentations of the Strategic Plan to departments/staff/administrators, seeking advice and input from all relevant stakeholders.
- Revise Plan and arrange follow-up meetings to seek support and committment, including financial support, from all relevant stakeholders.
- Implement as much of the V&C Strategic Plan as possible in a stepwise fashion, based on careful prioritization of enabling mechanisms.
- Assess the impact of any V&C reforms on student retention, learning, etc..

http://www.pulsecommunity.org/pacs/online-workshop