CISE REU EVALUATION TOOLKIT

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Agenda

- Birds Eye View of Toolkit Components
  - Common Application, Shared Applicant Pool
  - A la Carte Survey, Faculty Survey

- Outcomes

- Future
  - Alumni Tracking Tool

History of Evaluation Project

2009 Working Group Members

Guy Alain Amousou
Andy Fagg
Sanjay Madrias

Chris Aberson
Stephen Gilbert
Joan Peckham

Wendy Cooper
Manfred Huber
Eric Wong

Teresa Dahlberg
Niels Lobo
Yu-Dong Yoa

Kevin Zeng

Needs Assessment & Study	Established Common Indicators & Tools	Research Module Inclusive Terminology Shared Applicant Pool	New Modules Faculty Study Alumni Tracker Instructional Videos
2009 Humbolt State	2010 UNC Charlotte	2013	2014-16 Toolkit Expansion Project

Online Evaluation Toolkit

- Evaluation Toolkit: reu.uncc.edu/cise-reu-toolkit
- How To videos
- Evaluation materials and resources tailored to CISE REU

Common Application

- Google Form application UNIQUE to site
- Standardized & customizable
- Aggregate descriptive statistics across CISE directorate

Shared Applicant Pool

- Managed via Google Drive & Common Applications
- Site PI "releases" unselected candidates
- All PIs have access to online folder

Surveys: A la Carte and Faculty

- Student Outcomes: modulated, valid/reliable
- Faculty Impact: Survey deploying summer 2016

Alumni Follow Up Tool

- Prototype: Review and comment!

Launching Toolkit Options

Common Application: Reply to email call outs: Oct, Nov, Dec, Jan, Feb

Shared Applicant Pool: All PIs will have access ; Includes students who have not been selected and gave permission

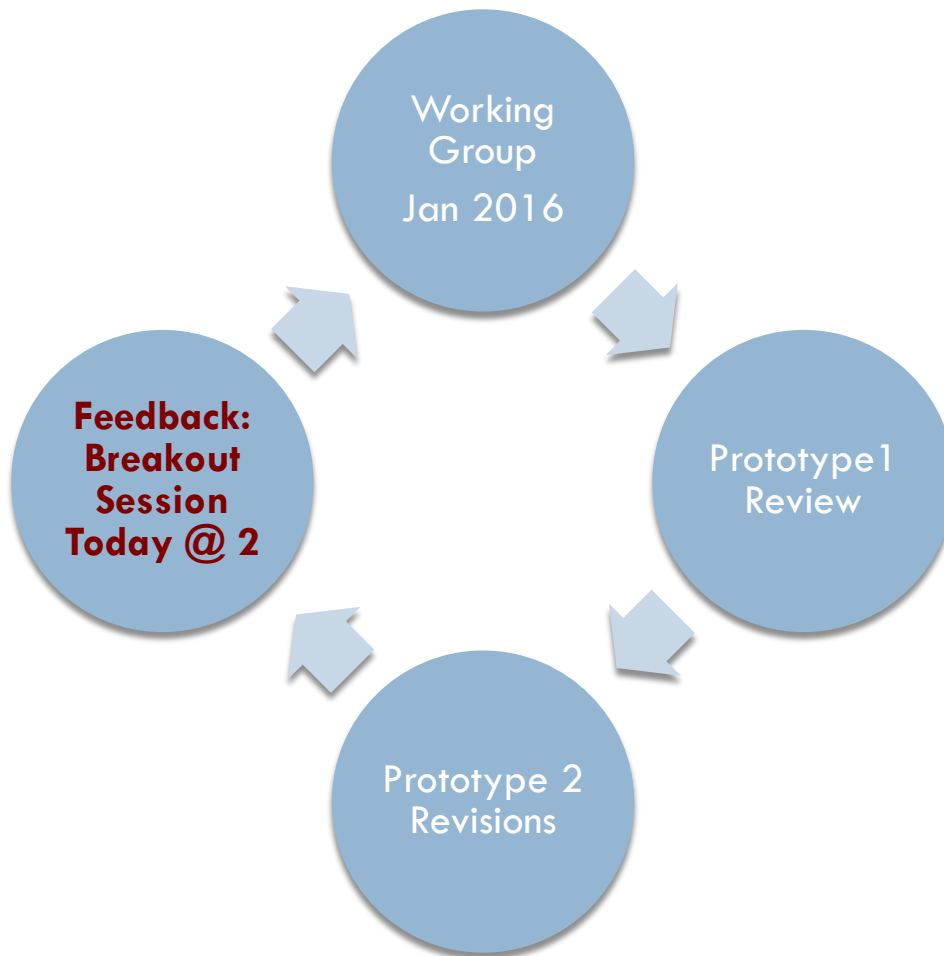**A la Carte Survey:** Reply to email call outs: April, May

Faculty Survey: Summer 2016!

Alumni Tracker Tool: under construction

OR:
Contact
audrey.rorrer
@uncc.edu

Alumni Toolkit Development

Working Group
Jan 2016

Prototype1
Review

Prototype 2
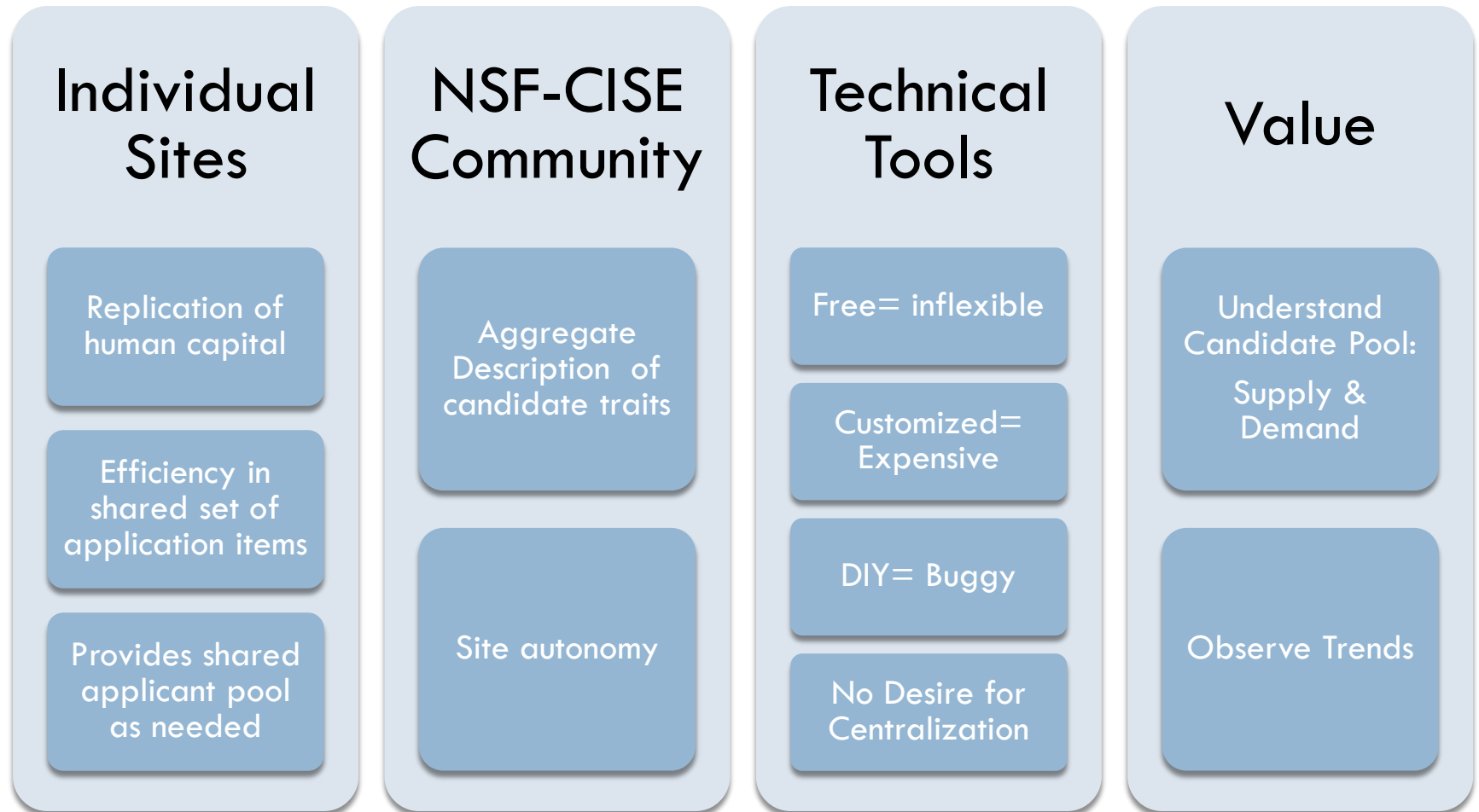Revisions

Feedback:
Breakout
Session
Today @ 2

Working Group Members:

- Lazaros Gallos, Rutgers
- Claire Duggan, Northeastern U.
- Bonnie Swan, U. Central Florida
- Stephen Gilbert, Iowa State
- Tiffany Reardon, Berkeley
- Huirong Fu, Oakland
- Jamie Payton, UNC Charlotte
- Raja Kushalnagar, RIT

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The Common Application

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Applicants: Challenges & Solutions

Individual Sites

Replication of human capital

Efficiency in shared set of application items

Provides shared applicant pool as needed

NSF-CISE Community

Aggregate Description of candidate traits

Site autonomy

Technical Tools

Free= inflexible

Customized= Expensive

DIY= Buggy

No Desire for Centralization

Value

Understand Candidate Pool: Supply & Demand

Observe Trends

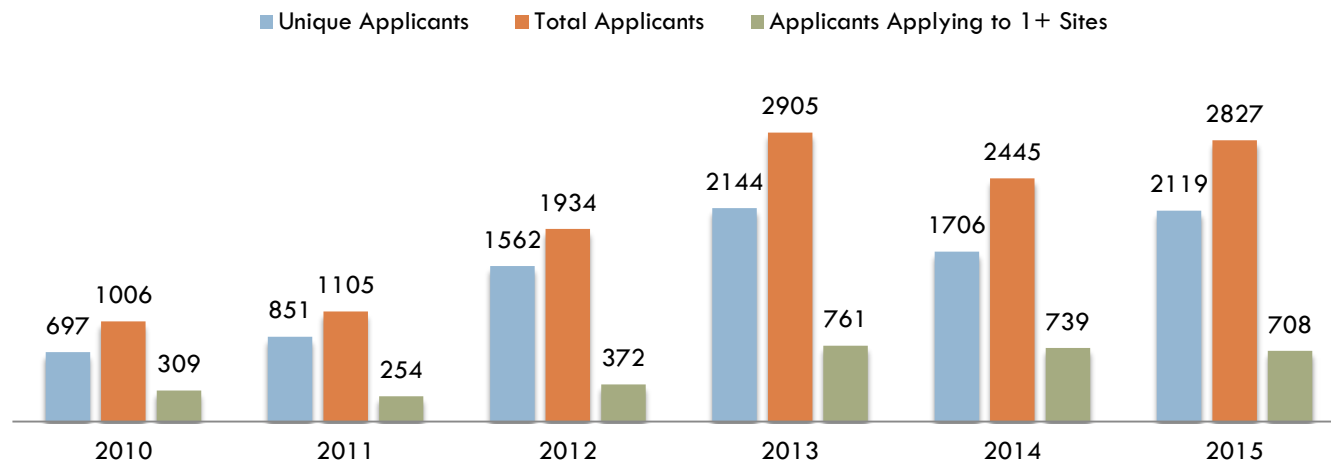NSF CISE REU PI Meeting, Orlando, FL, March 2016

5 Year Trends in Common Applications

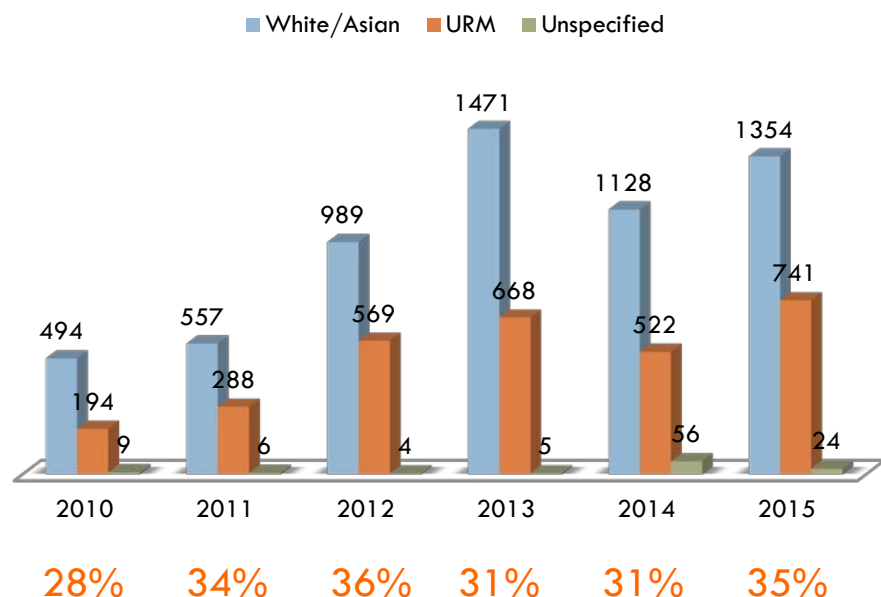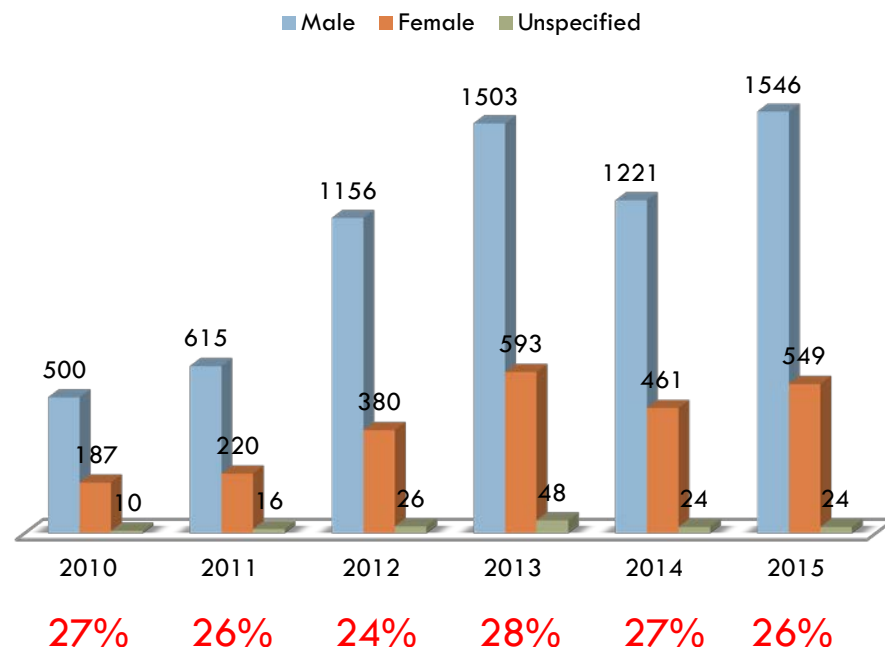| Site Descriptors	2010 (N=13)	2011 (N=20)	2012 (N=22)	2013 (N= 26)	2014 (N=25)	2015 (N= 23)
Range of # Applicants	29-152	4-176	18-212	20-299	29-232	15- 349
Avg Applications per Site	77	79	93	112	102	122
Largest # of Sites Applied to by Individual	30 (n=1)	6 (n=1)	7 (n=2)	18 (n=1)	14 (n=1)	16 (n=1)

Unique vs Multiple Site Applicants

■ Unique Applicants   ■ Total Applicants   ■ Applicants Applying to 1+ Sites

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Applicant Demographic Trends

Applicant Underrepresented Minority Distribution

■ White/Asian ■ URM ■ Unspecified

Year	White/Asian	URM	Unspecified	%
2010	494	194	9	28%
2011	557	288	6	34%
2012	989	569	4	36%
2013	1471	668	5	31%
2014	1128	522	56	31%
2015	1354	741	24	35%

Applicant Gender Distribution

■ Male ■ Female ■ Unspecified

| Year	Male	Female	Unspecified	%
2010	500	187	10	27%
2011	615	220	16	26%
2012	1156	380	26	24%
2013	1503	593	48	28%
2014	1221	461	24	27%
2015	1546	549	24	26%

Common Applications: Graduate School Plans

- Majority **plan to pursue graduate degrees**
  - 79% in 2013
  - 80% in 2014
  - 84% in 2015
- Few are first generation college students
  - Less than 20% across all 5 years
  - 17% are first person in family to attend college (2015)

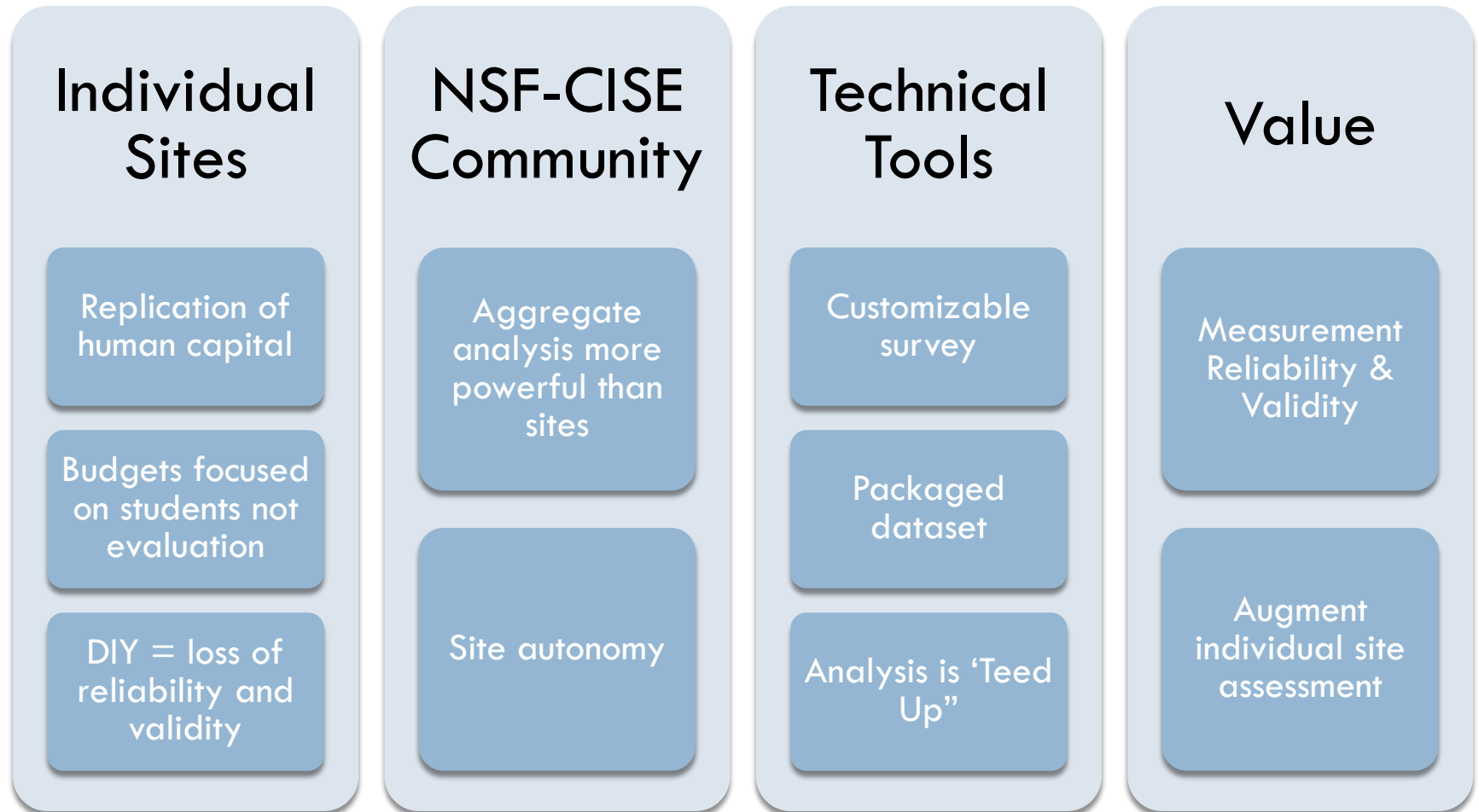# A Geographical Look

Count by State, and Category   2015 Common Applications
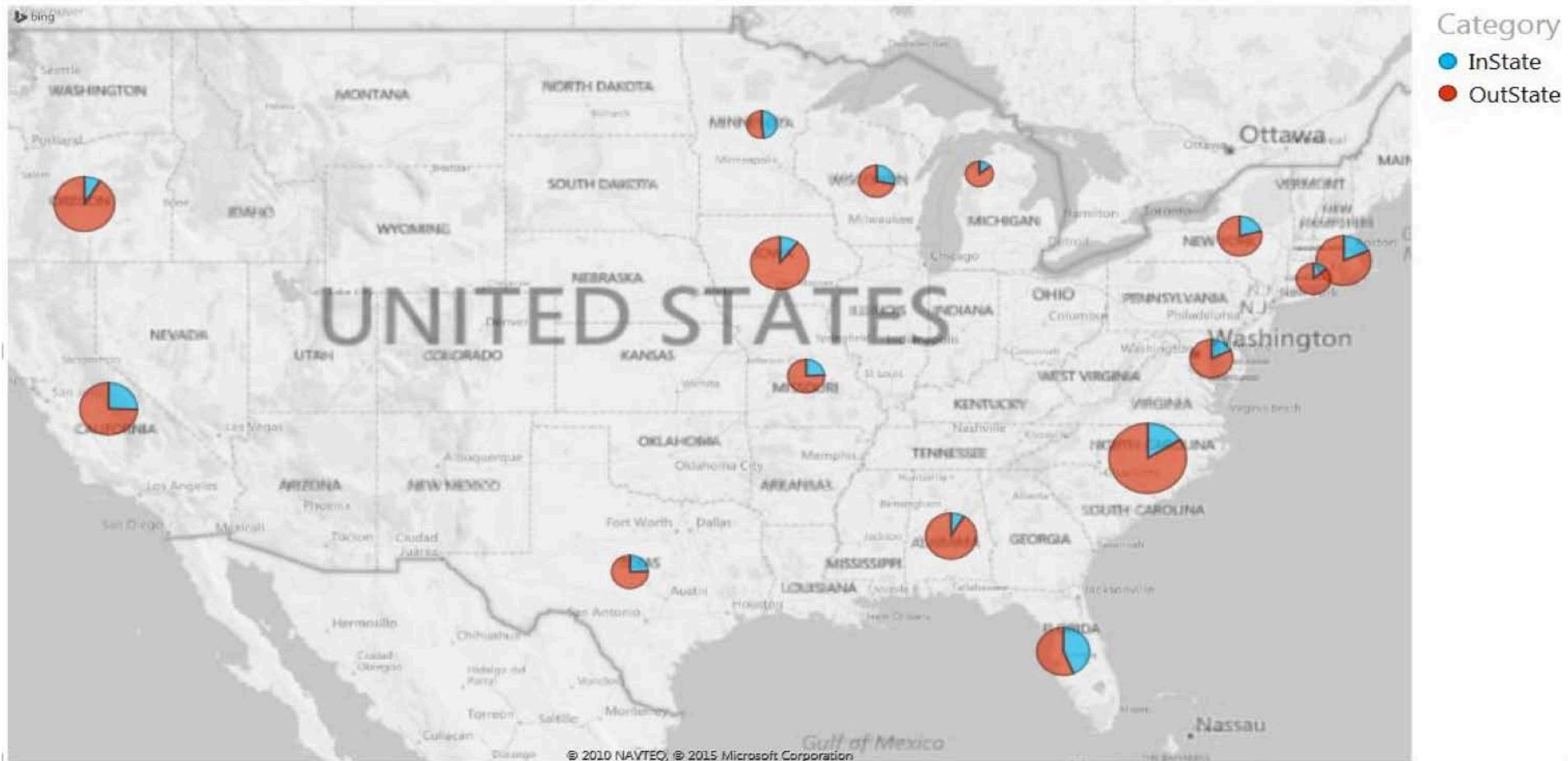
The A la Carte Student Survey

Rorrer, A.S. (2016). An evaluation capacity building toolkit for principal investigators of undergraduate research experiences: A demonstration of transforming theory into practice, Evaluation and Planning, 55(April 2016), 103-111.

Student Outcomes: Challenges & Solutions

Individual Sites

Replication of human capital

Budgets focused on students not evaluation

DIY = loss of reliability and validity

NSF-CISE Community

Aggregate analysis more powerful than sites

Site autonomy

Technical Tools

Customizable survey

Packaged dataset

Analysis is 'Teed Up"

Value

Measurement Reliability & Validity

Augment individual site assessment

A la Carte Student Survey

Modular, pre/post assessment of student outcomes

- Self Efficacy
  - I can formulate a research problem
- Intent to attend graduate school
  - I plan to apply to graduate school in a computing discipline
- Attitudes towards computing
  - I like to use computer science to solve problems
- Help seeking/coping skills
  - When I do poorly on an exam, typically I….skip class

- Research Skills
  - Formulate a research hypothesis
  - Write a research paper for publication
- Leadership in Science
  - I know how to be good team member
  - I know how to encourage team performance
- Professional Identity as Scientist
  - I feel like I belong in science
- Mentoring Satisfaction (post-only)
  - My mentor was helpful in providing direction and guidance on research project issues

A la Carte 2015 Outcomes

Significant Effects *for Time (pre- and post- surveys,* *(p<.05) in Self-Efficacy,
Research Knowledge, and Leadership

Construct	Pre (SD) N=187	Post (SD) N=169
Self-Efficacy	3.87 (.64)	4.34 (.59)*
Intent to Grad School	3.86 (.79)	3.78 (.89)
Attitudes	4.33 (.55)	4.23 (.66)
Help-Seeking/ Coping	3.99 (.49)	4.01 (.51)
Research Knowledge	3.37 (.69)	4.04 (.61)*
Scientific Identity	3.62 (.88)	3.81 (1.06)
Leadership	4.24 (.57)	4.37 (.56)*
Mentorship	Not applicable	4.47 (.74)

- 38% Female
- 32% multi-ethnic minority groups

- Predominantly Rising Juniors and Seniors

Note: 5 pt Likert scale

A la Carte 2015: Interactions

Main effects for Gender and Minority Groups were observed *Significant differences (p<.05)

Women: Higher Help-seeking/coping

Construct	Male (SD)	Female (SD)
Help-Seeking/ Coping	3.92 (.52)	4.13 (.51)*

Caveat: The effect sizes were very small (<.07)

Minority Groups: Higher Help-seeking/coping, Efficacy, Leadership and Research

Construct	Majority (SD)	URM (SD)
Help-Seeking/ Coping	3.93 (.50)	4.17 (.53)*
Self-efficacy	4.26 (.70)	4.50 (.47)*
Leadership	4.26 (.58)	4.60 (.47)*
Research Knowledge	3.93 (.64)	4.20 (.55)*

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Post Program Evaluation 2015

Item	Mean	SD
Your Faculty Advisor	4.33	1.09
Your Housing arrangements (if applicable)	4.19	1.03
The program in general	4.31	.97
Your research experience	4.42	.87
Your interaction with project staff	4.37	.89
Your interaction with other students	4.65	.72

Post Program Evaluation

Most rewarding experiences:
- Connections with faculty and peers
  - "working with faculty and other students"
  - "friends + research"
- Mentoring
  - "one on one with my faculty advisor"
- Learning
  - "learning new skills"
  - "learning what grad research is like"

Most frustrated experiences:
- Lack of understanding; Time Constraints
  - "having to work on a subject I didn't understand"
  - " the initial amount of reading to understand basic concepts"
  - "Rushing"

Take Aways

- Students are reporting statistically significant gains in Self-Efficacy, Research Knowledge, and Leadership

- No causal link but
  - Students are developing and exploring research skills
  - Long-term follow up needed
  - Deeper Studies!!!

Faculty Survey

Faculty Impact

- Survey in Fall 2014
  - Research Questions:
    - How do faculty administer their sites
      - Recruiting and selection practices
      - Mentoring and Collaboration practices
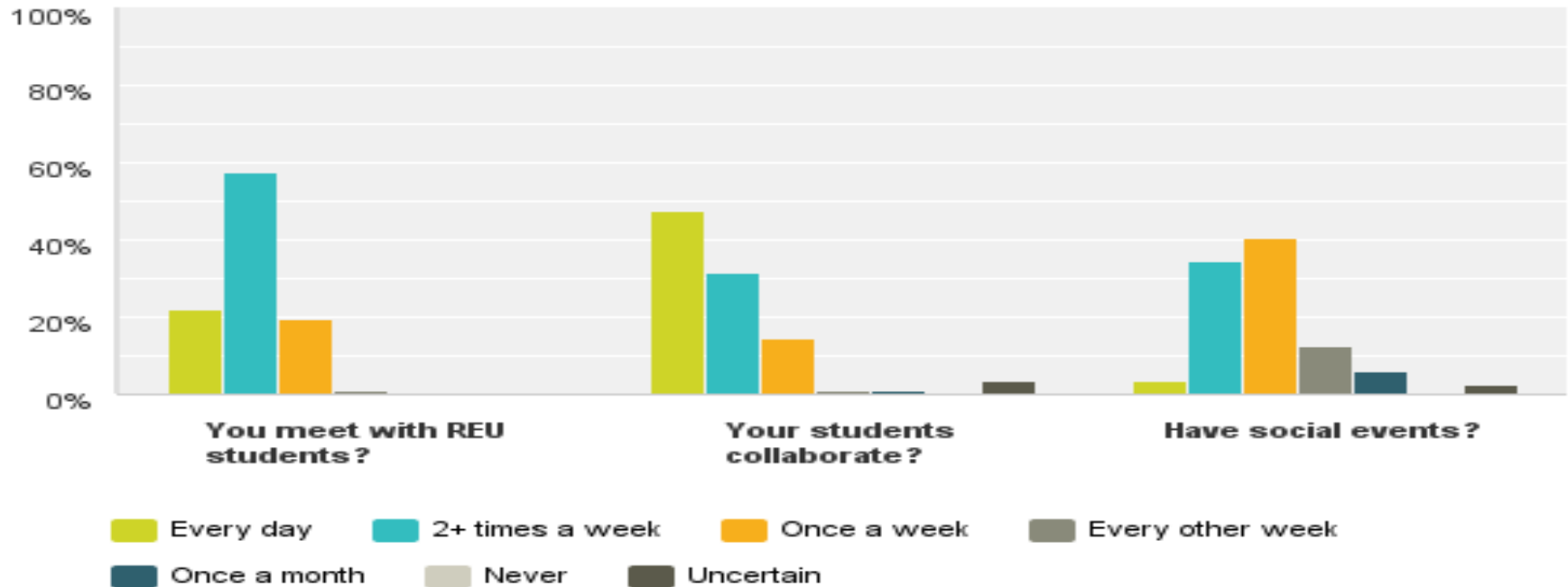- Summer Fall 2016
  - NEW to address organizational structure, best practices
  - Qualitative underway- **RIGHT NOW**
  - Research Questions:
    - How do faculty benefit from running REUs

Faculty Survey 2014

- Snowball sample (no response rate)= 92 participants

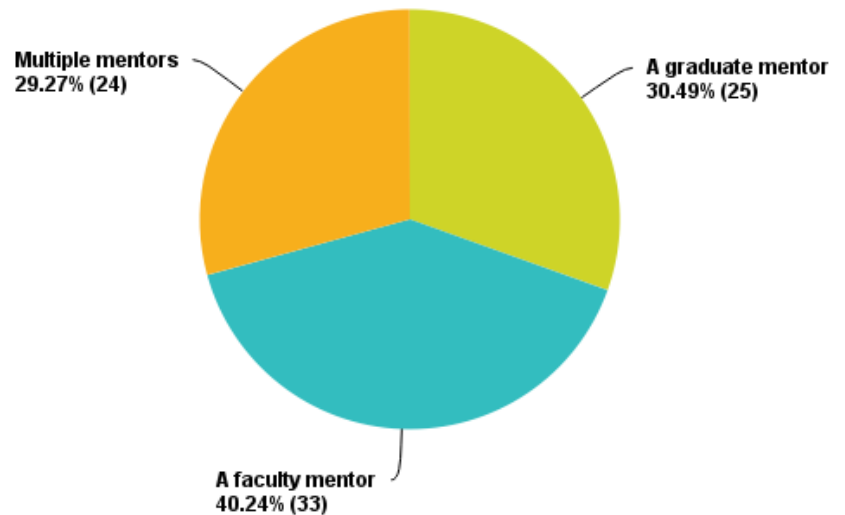**Q22 How often did:**

Answered: 82   Skipped: 10

You meet with REU students? Your students collaborate? Have social events?

Legend: Every day | 2+ times a week | Once a week | Every other week | Once a month | Never | Uncertain

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Collaborations: Peer & Faculty

Q24 How were your students organized for their research projects?

Answered: 81   Skipped: 11

Individual
24.69% (20)

Small groups (how many students per group?)
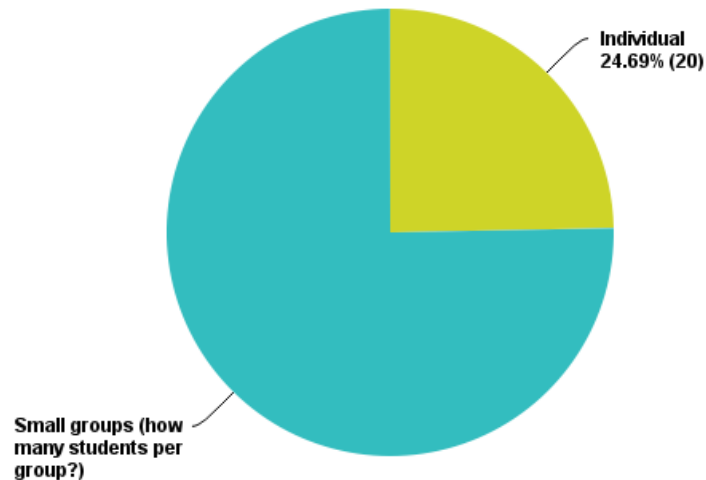
Q25 Who met most frequently with the REU students?

Answered: 82   Skipped: 10

Multiple mentors
29.27% (24)

A graduate mentor
30.49% (25)

A faculty mentor
40.24% (33)

Alumni Tracker

Implementation Fall 2016

Alumni Tracker: Challenges & Solutions
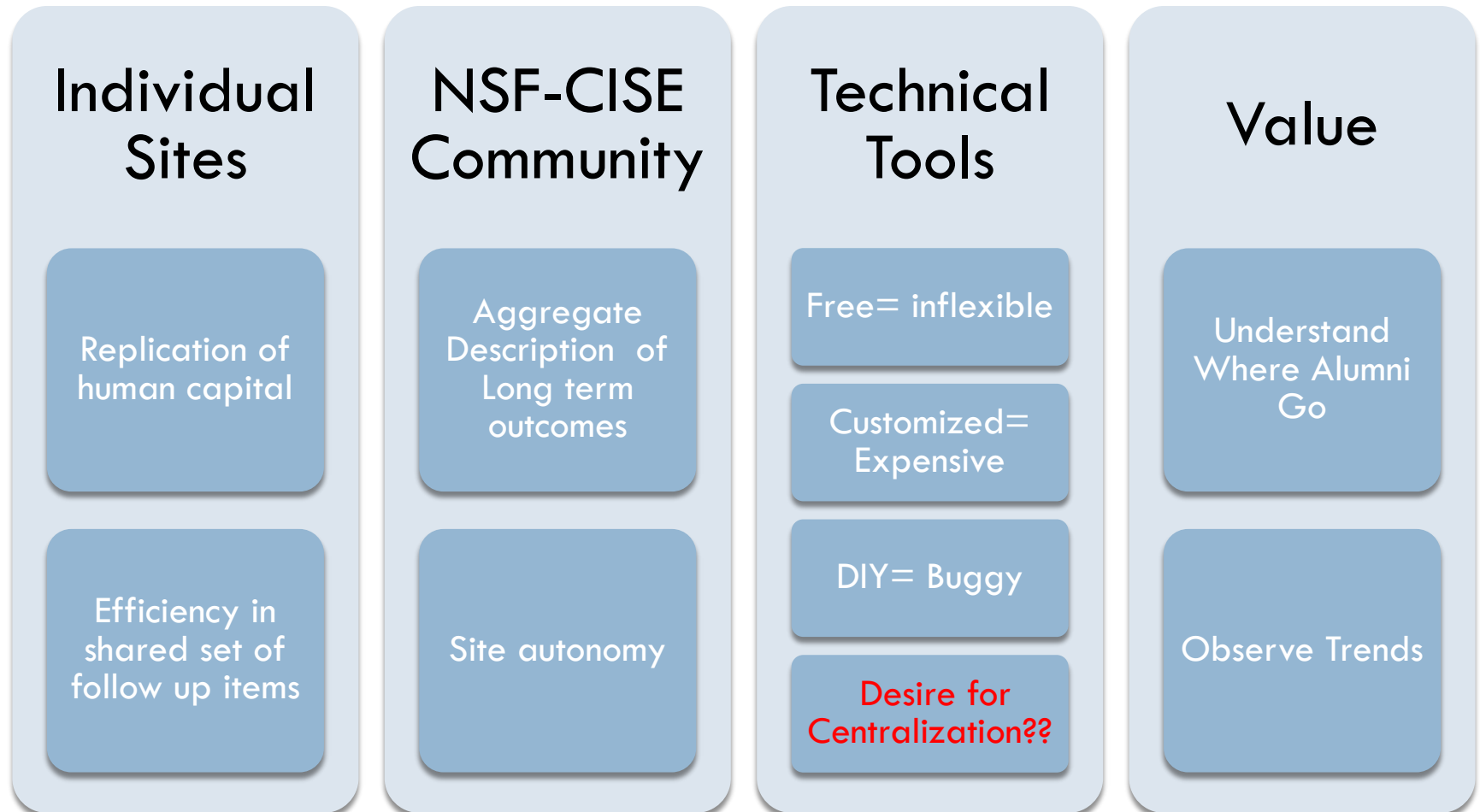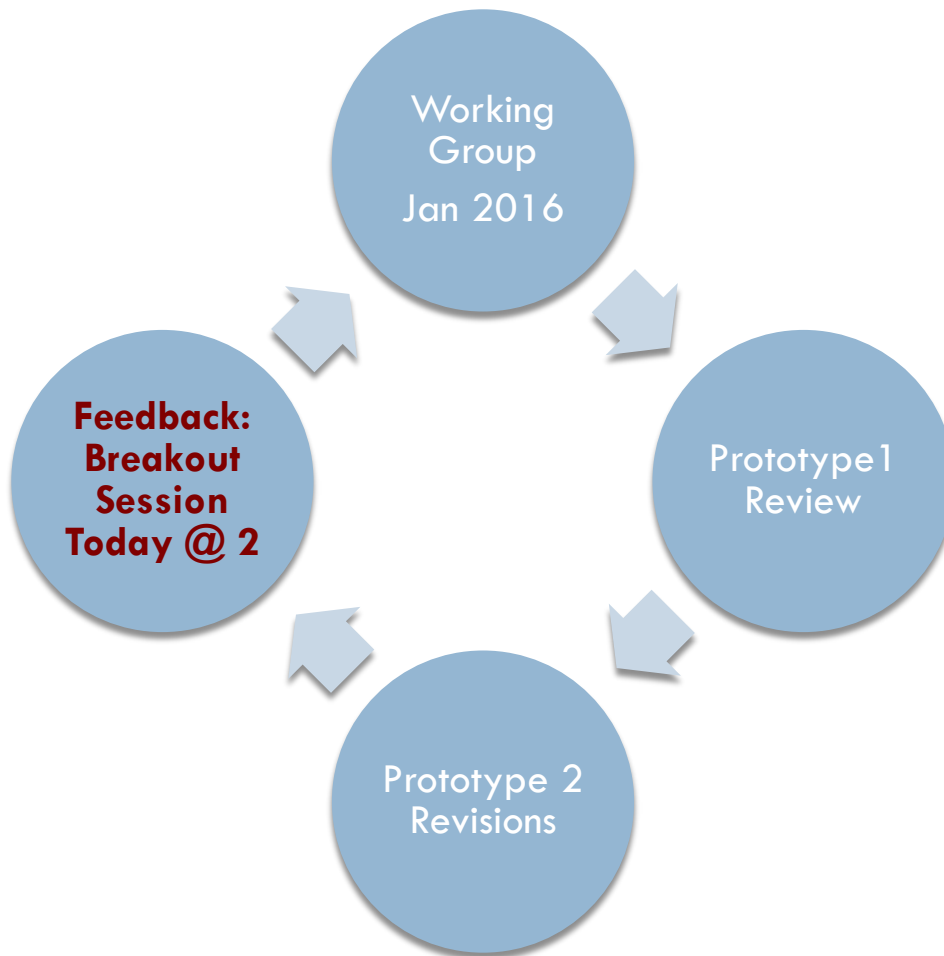
Individual Sites

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Efficiency in shared set of follow up items

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Aggregate Description of Long term outcomes

Site autonomy

Technical Tools

Free= inflexible

Customized= Expensive

DIY= Buggy

Desire for Centralization??

Value

Understand Where Alumni Go

Observe Trends

Alumni Toolkit Development

Working
Group
Jan 2016

Prototype1
Review

Prototype 2
Revisions

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Alumni Tracker Tool: Reply to email call outs: Sept, Dec, Feb

Faculty Survey: Summer 2016!

OR:
Contact
audrey.rorrer
@uncc.edu

Thank you

audrey.rorrer@uncc.edu

Appendices

Toolkit Expansion Project

Expanded Initiatives

- Add student survey modules
  - Leadership, Mentoring, Professional Development
- New Tool for Alumni Tracking
- 3 Studies
  - Faculty Career Impact
  - Comparative longitudinal study of alumni vs applicants
  - Student outcomes related to site characteristics

Research Questions

- What do students gain through REUs?
- Where do they go?

- How do faculty engage in REU sites, and how are they impacted?
- How do REU Applicants compare to Participants over time?
- What site characteristics contribute to student success?

Participating Sites

Year	Common Application	A la Carte Survey
2015	23	28
2014	25	22
2013	26	30
2012	22	23
2011	20	18
2010	13	20

Survey Instruments Available

- SURE- Survey of Undergraduate Research Experiences
  - D. Lapatto at Washington University
- URSSA- Undergraduate Research Student Self Assessment
  - University of Colorado Boulder, NSF

  - Both are free for research programs and courses
  - Adapation made for the A la Carte

Origin of A la Carte Construct Scales

SURE & URSSA adaptation

- **Self-Efficacy**: based on Bandura's work; adapted from Arizona State University
- Graduate School Intent
- Computing Attitudes
- Help-Seeking/Coping
- Research Skills

Additional Instrument Adaptations

- **Mentoring**: Mentorship Effectiveness Scale, originally developed by Johns Hopkins University
- **Leadership and Scientific Identity**: Chemers, Zurbriggen, Syen, Goza, and Bearman (2011)

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A la Carte Methodology

- Items
  - 4 point Likert type scale, 4 being positive in 2010/2011
  - Converted to 5 point scale in 2012
  - Some items were reverse scored
  - Collapsed into construct means representing 4 variables
  - Ethnicity collapsed into URM status
- Reliability
  - Coefficient alphas above .547
- 2015 results presented to CISE REU PI meeting
  - To test hypothesis that there would be differences between means based on time, gender, URM status:
    - T Test on means scores on TIME (pre/post)
  - gender, URM status
    - ANOVA on interactions

A la Carte Student Survey Participation

Summer (# of Sites Using)	Pre Survey	Post Survey	Response Rate*	% Female	% URM
2015 (28)	180	169	60%	38%	32%
2014 (22)	226	149	66%	42%	23%
2013 (30)	217	209	70%	38%	22%
2012 (23)	167	151	66%	37%	25%
2011 (18)	199	137	76%	37%	31%
2010 (20)	196	144	72%	30%	31%

*Calculated from Post Survey responses; estimates based upon 10 students per site (e.g., 2010: 200 students; 2011: 180 students; 2012: 230 students; 2013: 300 students; 2014: 220 students; 2015: 280 students)

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Considerations for Alumni Tracker

Site Administered

- ✓ Higher response rate from alumni
- ✓ Stronger sense of community
- ✓ PI controlled timeline
- ✓ Immediate access
- ✧ Lack of aggregate information

Toolkit Administered

- ✧ Lack of connection to the alumni; low response likely
- ✓ Routine and systematic
- ✓ Aggregate information
- ✓ Provide service to PIs already burdened with administrative responsibilities