Data, Dashboards & Decision Support: IR's Role in the Peer-Selection Process

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About ECU

- Public, 4-year university
- 10 degree-granting colleges/schools, including medical & dental schools
- One of 17 institutions within the UNC system
- Carnegie class: Doctoral University, High Research Activity
- Enrollment of almost 30,000; more than 2000 employees with a faculty appointment

Presentation Overview

- Context of the Study – UNC System Peer Study
- ECU's Internal Peer Study Process
- Selecting Peers Using Cluster Analysis
- Peer Selection Dashboard
- Recommendations for Peer Study

University of North Carolina System Peer Selection Process 2020

Methodological Approach

- UNC System Office conducted all quantitative analyses for the 16 constituent universities to ensure a common approach.
- Cluster analysis selected as the quantitative approach.
- Ten variables were identified for use in the cluster analysis, six of which were common variables across institutions.
- Output lists were provided to institutions for review & institutions were allowed to identify institutions they felt should be included but were not identified in the cluster analysis.
- Number of peers was restricted to 10-12; aspirational peers were not recommended.
- A final proposed list was negotiated by each institution and the UNC System Office.

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Cluster Analysis

- Began with all institutions who reported data to IPEDS, excluding private institutions and institutions who do not award bachelor's degrees.
- Any institution with a missing response for one of the 10 variables was removed from the dataset.
- All variables' values were scaled & steps were taken to normalize/standardize the spread within each variable with additional data manipulations (especially for the financial variables) to correct for skewness in the distribution.
- Large k-means clustering was used to identify outliers (with outliers ending up in clusters by themselves).
- Outliers were removed from the dataset and those remaining were re-standardized.
- New k-means clusters analysis run using an appropriate k-based value based on model measures and other key assessment criteria producing a final list of in-cluster institutions.

Recommended Uses & Timeline

- Peer lists will be used for outcomes assessment in areas such as
  - Student retention rates;
  - Graduation rates;
  - Degree production;
  - Research productivity; and
  - Other relevant metrics, particularly those associate with the UNC System strategic plan.
- Peer sets will not be used for faculty salary benchmarking.
- New peer study will be conducted in 2024-2025.

East Carolina University's Internal Peer Study Process

Representation of ECU's Peer Selection Committee

- Academic Affairs
- Health Sciences
- Research, Economic Development and Engagement
- Student Affairs
- Administration and Finance
- Chancellor's Division
- Faculty Senate
- Staff Senate
- Faculty Representative
- Associate Provost for IPAR (serving as campus contact)
- Director of IR
- Data Analyst and Statistician

ECU Peer Study Process

Step 1

- Understanding data, methodology and intended uses of peers
- Selecting variables for cluster analyses

Step 2

- Reviewing internal cluster analysis results
- Reconciling with UNC System results (IR only)

Step 3

- Comparing and selecting potential peers via dashboard
- Collecting additional input from senior administrators

Step 4

- Negotiating with UNC System Office and finalizing peers
- Updating university dashboards (IR only)

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Considerations for Variable Selection

Several unique characteristics of ECU made the peer selection challenging:

- ECU has a large enrollment. The percentage of health science degrees of total degrees conferred by ECU is exceptionally high among large institutions.
- ECU's medical school has a mission focusing more on medical education than medical research. ECU's research expenditure per FTE is significantly lower than many large institutions with a medical school.
- ECU has a distinction for providing educational access to under-served regions and student populations.

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Variables Used in Cluster Analysis for ECU

- Common to all institutions
  - FTE fall enrollment
  - Percent of UG students receiving Pell Grants
  - UG enrollment as a percent of total enrollment
  - Percent of FT faculty
  - Institutional expenditures per FTE
  - Academic program mix: self-defined by each institution; ECU chose percent of health science degrees
- Chosen from a list provided by UNC System Office
  - Percent of underrepresented minority student enrollment
  - Core operational revenue per FTE
  - Research expenditure per FTE
  - Percent of doctoral degrees awarded

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Selecting Peers Using Cluster Analysis

Do other schools use cluster analysis to select peers?

Institution that conducted the peer study	Year	Cluster analysis?	Which kind of cluster analysis?	Peers solely selected by the cluster analysis?
Austin Peay State University	2018	Yes	Hierarchical	No
NYIT School of Management	2012	Yes	Hierarchical	Yes
University of Central Florida	2003	Yes	K-means & Hierarchical	Yes, but “repeated process until satisfied”
Oregon University System	2000	Partially	List by “distance”	No

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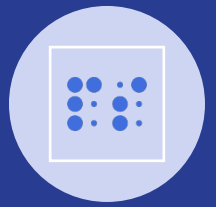
Steps in ECU Internal Cluster Analysis

1. Filter



2. Exclude schools with missing data on ten selection variables

- IPEDS Dataset – 2018
- Public 4-year or above
- Degree-granting (primarily baccalaureate or above)
- Have first-time, full-time undergraduates
- Do not have all programs offered via DE
- Carnegie Classification 2018: Doctoral Institutions (R1, R2 and Doc/Prof)
- 206 schools

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Steps in ECU Internal Cluster Analysis (Cont'd)

3. Standardization

Z-score Standardization

4. Weight variables (Optional)

5. Calculate distance

Euclidean distance

6. Select cluster analysis methodology

Hierarchical cluster analysis
Complete-linkage clustering

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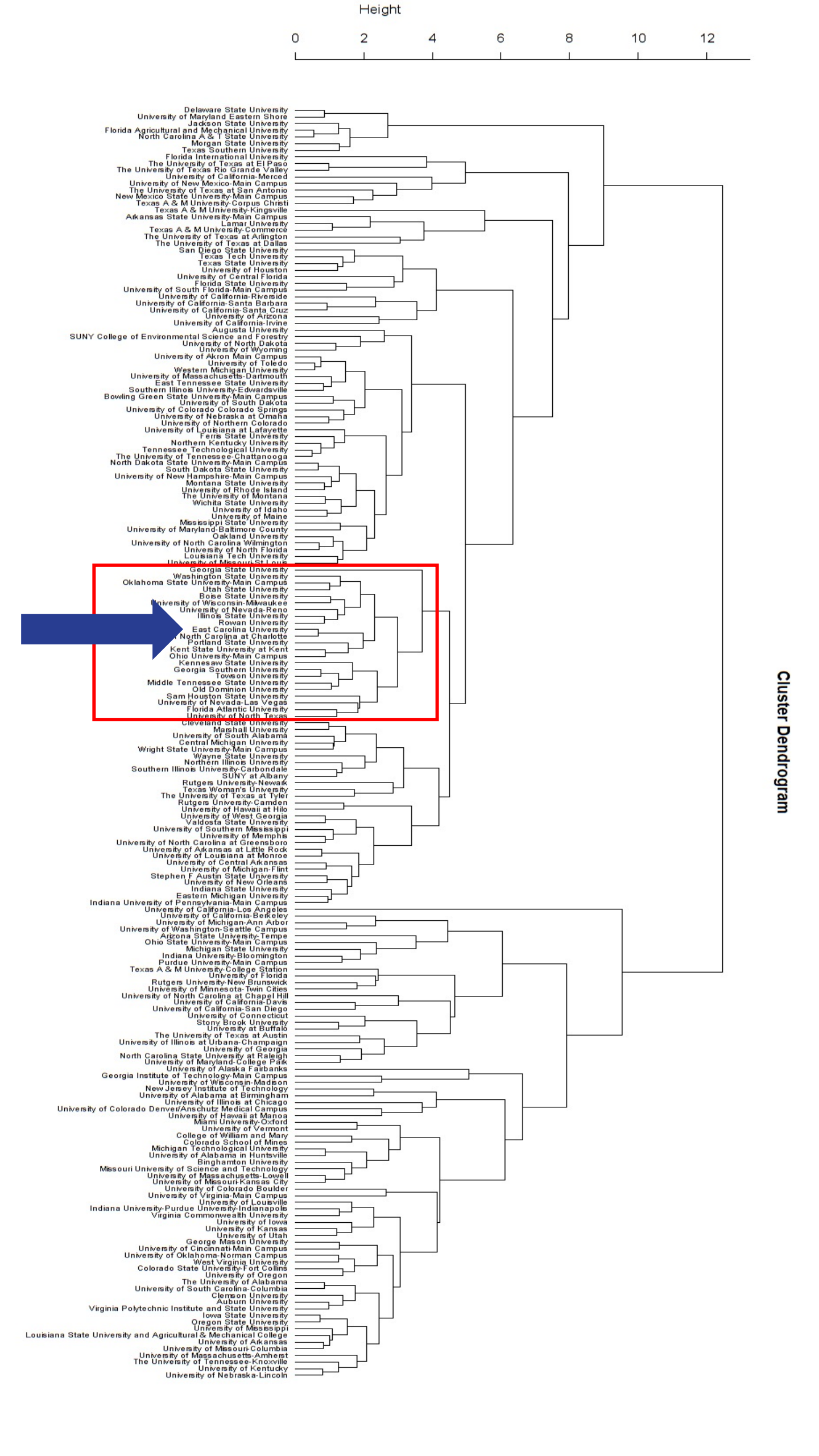
How Does the Hierarchical Cluster Analysis Result Look?

Alert: it may look messy!


Height
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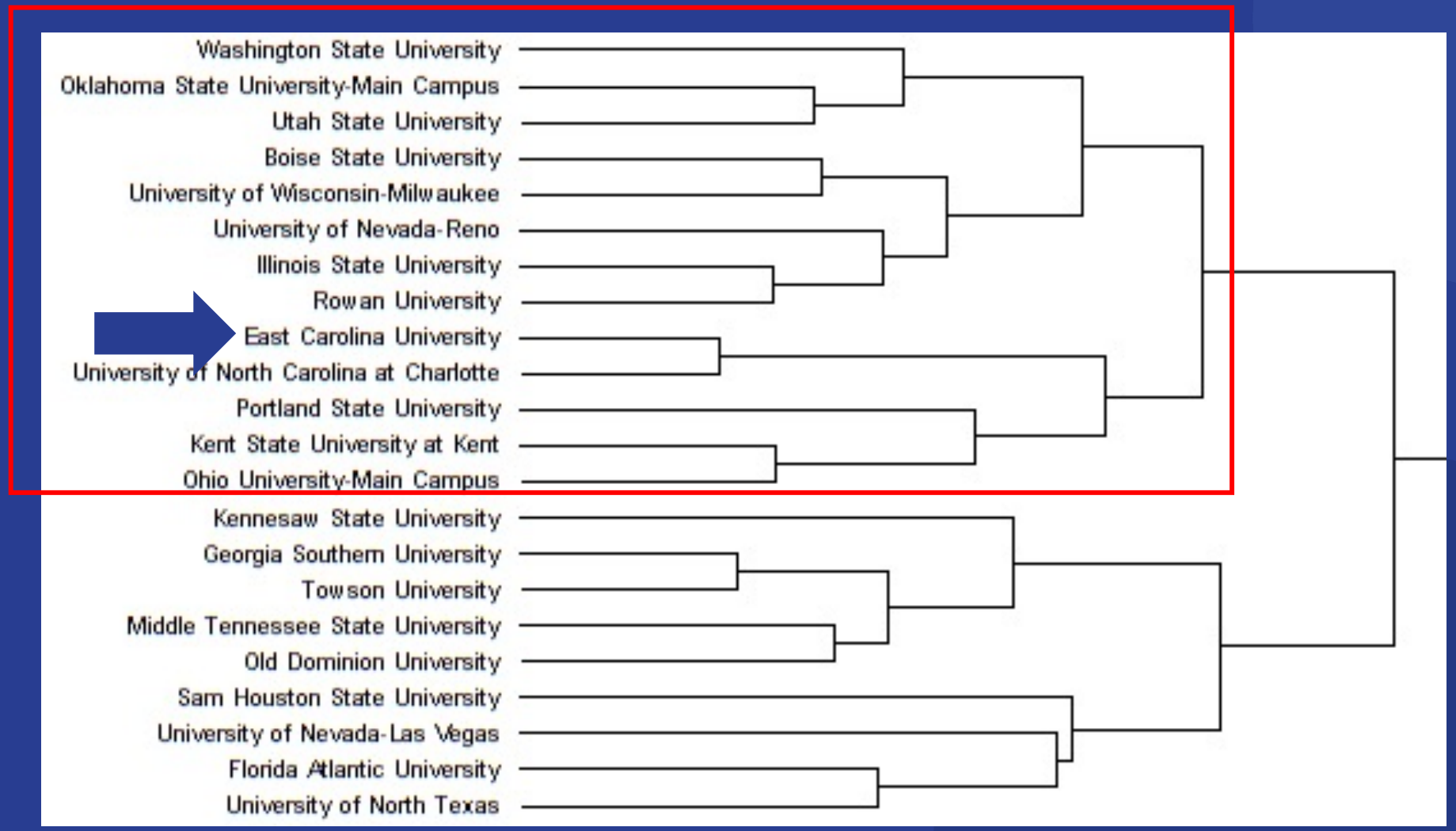
12
Delaware State University
University of Maryland Eastern Shore
Jackson State University
Florida Agricultural and Mechanical University
North Carolina A & T State University
Morgan State University
Texas Southern University
Florida International University
The University of Texas at El Paso
The University of Texas Rio Grande Valley
University of California-Merced
University of New Mexico-Main Campus
The University of Texas at San Antonio
New Mexico State University-Main Campus
Texas A & M University-Corpus Christi
Texas A & M University-Kingsville
Arkansas State University-Main Campus
Lamar University
Texas A & M University-Commerce
The University of Texas at Arlington
The University of Texas at Dallas
San Diego State University
Texas Tech University
Texas State University
University of Houston
University of Central Florida
Florida State University
University of South Florida-Main Campus
University of California-Riverside
University of California-Santa Barbara
University of California-Santa Cruz
University of Arizona
University of California-Irvine
Augusta University
SUNY College of Environmental Science and Forestry
University of North Dakota
University of Wyoming
University of Akron Main Campus
University of Toledo
Western Michigan University
University of Massachusetts-Dartmouth
East Tennessee State University
Southern Illinois University-Edwardsville
Bowling Green State University-Main Campus
University of South Dakota
University of Colorado Colorado Springs
University of Nebraska at Omaha
University of Northern Colorado
University of Louisiana at Lafayette
Ferris State University
Northern Kentucky University
Tennessee Technological University
The University of Tennessee-Chattanooga
North Dakota State University-Main Campus
South Dakota State University
University of New Hampshire-Main Campus
Montana State University
University of Rhode Island
The University of Montana
Wichita State University
University of Idaho
University of Maine
Mississippi State University
University of Maryland-Baltimore County
Oakland University
University of North Carolina Wilmington
University of North Florida
Louisiana Tech University
University of Missouri-St Louis
Georgia State University
Washington State University
Oklahoma State University-Main Campus
Utah State University
Boise State University
University of Wisconsin-Milwaukee
University of Nevada-Reno
Illinois State University
Rowan University
East Carolina University
North Carolina at Charlotte
Portland State University
Kent State University at Kent
Ohio University-Main Campus
Kennesaw State University
Georgia Southern University
Towson University
Middle Tennessee State University
Old Dominion University
Sam Houston State University
University of Nevada-Las Vegas
Florida Atlantic University
University of North Texas
Cleveland State University
Marshall University
University of South Alabama
Central Michigan University
Wright State University-Main Campus
Wayne State University
Northern Illinois University
Southern Illinois University-Carbondale
SUNY at Albany
Rutgers University-Newark
Texas Woman's University
The University of Texas at Tyler
Rutgers University-Camden
University of Hawaii at Hilo
University of West Georgia
Valdosta State University
University of Southern Mississippi
University of Memphis
University of North Carolina at Greensboro
University of Arkansas at Little Rock
University of Louisiana at Monroe
University of Central Arkansas
University of Michigan-Flint
Stephen F Austin State University
University of New Orleans
Indiana State University
Eastern Michigan University
Indiana University of Pennsylvania-Main Campus
University of California-Los Angeles
University of California-Berkeley
University of Michigan-Ann Arbor
University of Washington-Seattle Campus
Arizona State University-Tempe
Ohio State University-Main Campus
Michigan State University
Indiana University-Bloomington
Purdue University-Main Campus
Texas A & M University-College Station
University of Florida
Rutgers University-New Brunswick
University of Minnesota-Twin Cities
University of North Carolina at Chapel Hill
University of California-Davis
University of California-San Diego
University of Connecticut
Stony Brook University
University at Buffalo
The University of Texas at Austin
University of Illinois at Urbana-Champaign
University of Georgia
North Carolina State University at Raleigh
University of Maryland-College Park
University of Alaska Fairbanks
Georgia Institute of Technology-Main Campus
University of Wisconsin-Madison
New Jersey Institute of Technology
University of Alabama at Birmingham
University of Illinois at Chicago
University of Colorado Denver/Anschutz Medical Campus
University of Hawaii at Manoa
Miami University-Oxford
University of Vermont
College of William and Mary
Colorado School of Mines
Michigan Technological University
University of Alabama in Huntsville
Binghamton University
Missouri University of Science and Technology
University of Massachusetts-Lowell
University of Missouri-Kansas City
University of Colorado Boulder
University of Virginia-Main Campus
University of Louisville
Indiana University-Purdue University-Indianapolis
Virginia Commonwealth University
University of Iowa
University of Kansas
University of Utah
George Mason University
University of Cincinnati-Main Campus
University of Oklahoma-Norman Campus
West Virginia University
Colorado State University-Fort Collins
University of Oregon
The University of Alabama
University of South Carolina-Columbia
Clemson University
Auburn University
Virginia Polytechnic Institute and State University
Iowa State University
Oregon State University
University of Mississippi
Louisiana State University and Agricultural & Mechanical College
University of Arkansas
University of Missouri-Columbia
University of Massachusetts-Amherst
The University of Tennessee-Knoxville
University of Kentucky
University of Nebraska-Lincoln
Cluster Dendrogram

Internal Cluster Analysis - Trial Run Example



Steps in ECU Internal Cluster Analysis (rewind)

1. Filter

2. Exclude schools with missing data on ten selection variables

3. Standardization

4. Weight variables (Optional)

5. Calculate distance

6. Select cluster analysis methodology

Sim Rank	Institution Name
0	East Carolina University
1	Central Michigan University
2	Georgia Southern University
3	Ball State University
4	Washington State University
6	University of Wisconsin-Milwaukee
7	Ohio University-Main Campus
8	Northern Arizona University
9	Western Michigan University
10	University of Mississippi
11	Illinois State University
12	Oregon State University
13	Oklahoma State University-Main Campus
14	Northern Illinois University

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Steps in ECU Internal Cluster Analysis (rewind)

1. Filter

2. Exclude schools with missing data on ten selection variables

3. Standardization

4. Weight variables (Optional)

5. Calculate distance
DONE!

6. ~~Select cluster analysis methodology~~

Sim Rank	Institution Name
0	East Carolina University
1	Central Michigan University
2	Georgia Southern University
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4	Washington State University
6	University of Wisconsin-Milwaukee
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14	Northern Illinois University

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Steps in ECU Internal Cluster Analysis (rewind)

1. Filter (Optional)

2. Exclude schools with missing data on ten selection variables

3. Standardization

4. Weight variables (Optional)

5. Calculate distance
DONE!

6. ~~Select cluster analysis methodology~~

Sim Rank	Institution Name
0	East Carolina University
1	Central Michigan University
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Peer Selection Methodology Comparison

	K-means	Hierarchical	Partial (Rank by distance)
Complexity?	**Medium**	**Medium**	**Medium - low**
Easy to interpret?	**No**	**No**	**Yes**
Generate a specific number of peers?	**No**	**No**	**Yes**
Repeatable?	**No**	**Yes**	**Yes**
Does the result look good?	**It depends...**	**Yes**	**Yes**

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Peer Selection Dashboard

Created for ECU's Peer Selection Advisory Group

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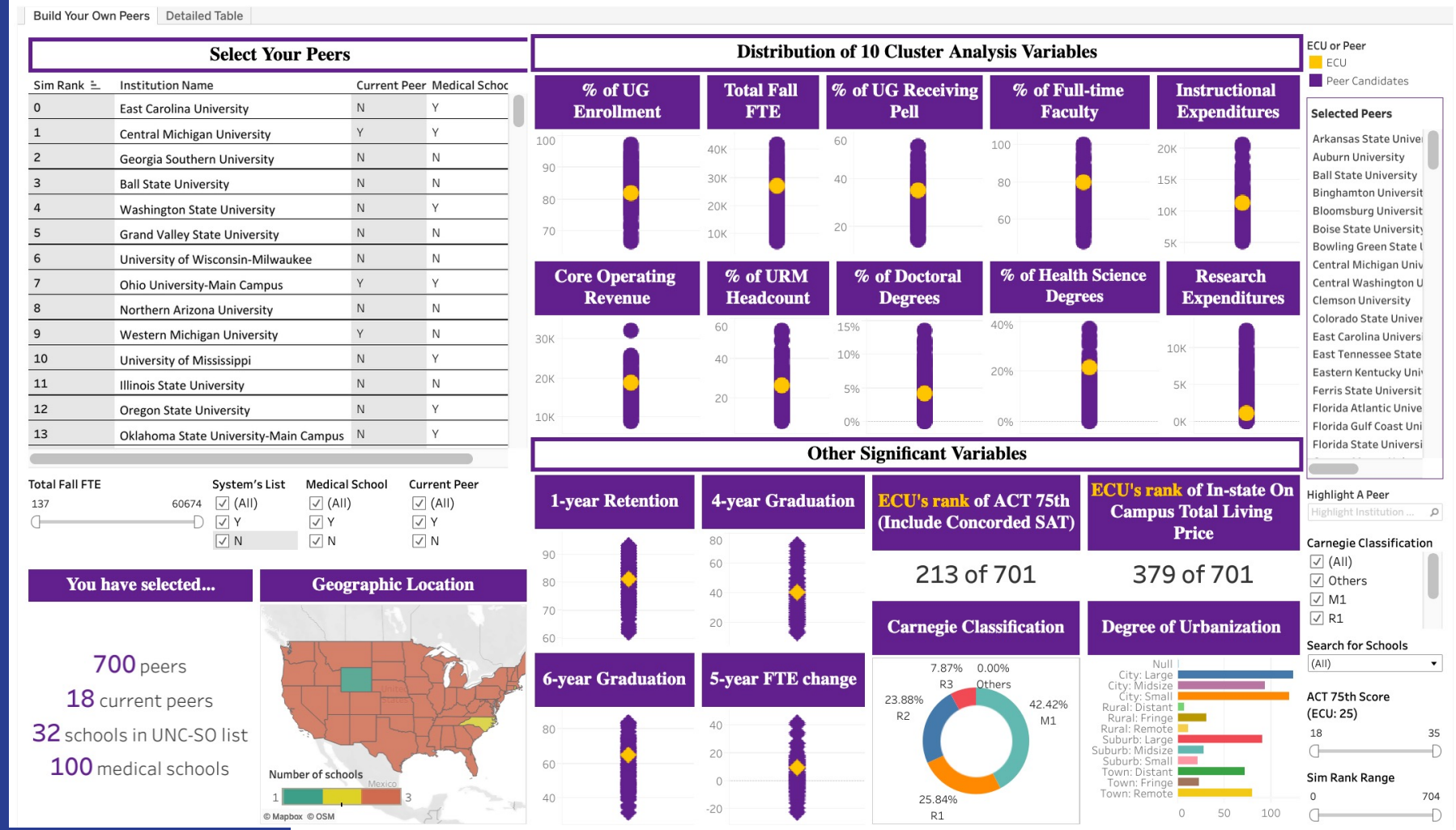
Peer Selection Dashboards

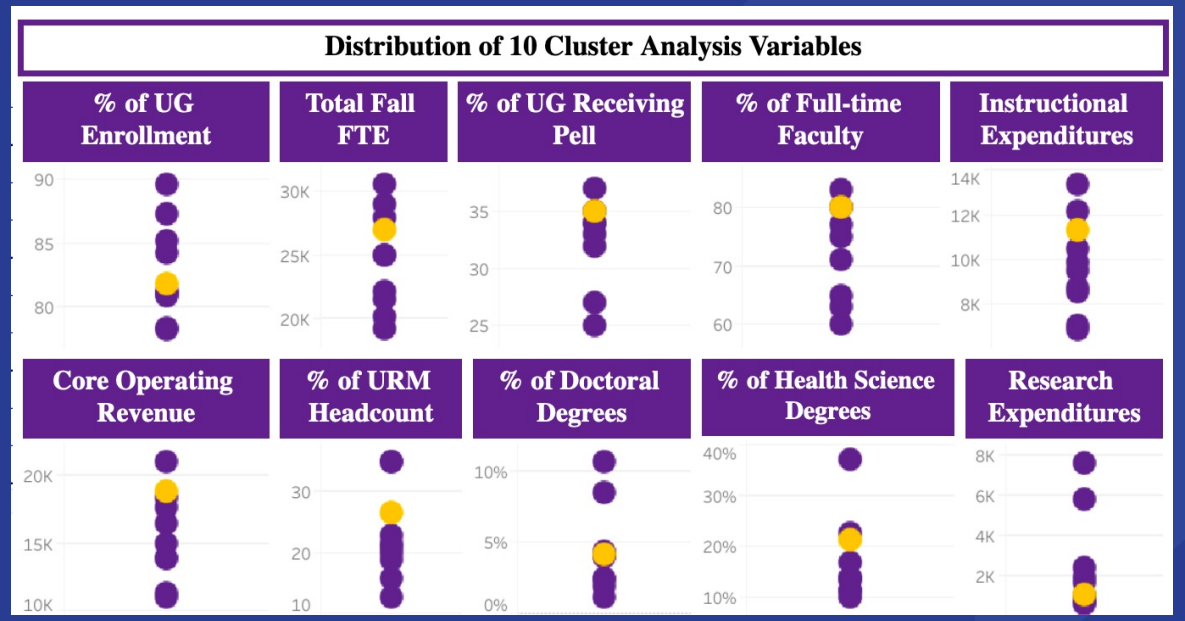
- *A series of three dashboards to guide the committee through the selection process*
- *Initial dashboard including 700 public 4-year universities*
- *Filters and gliding bars to refine peer list*

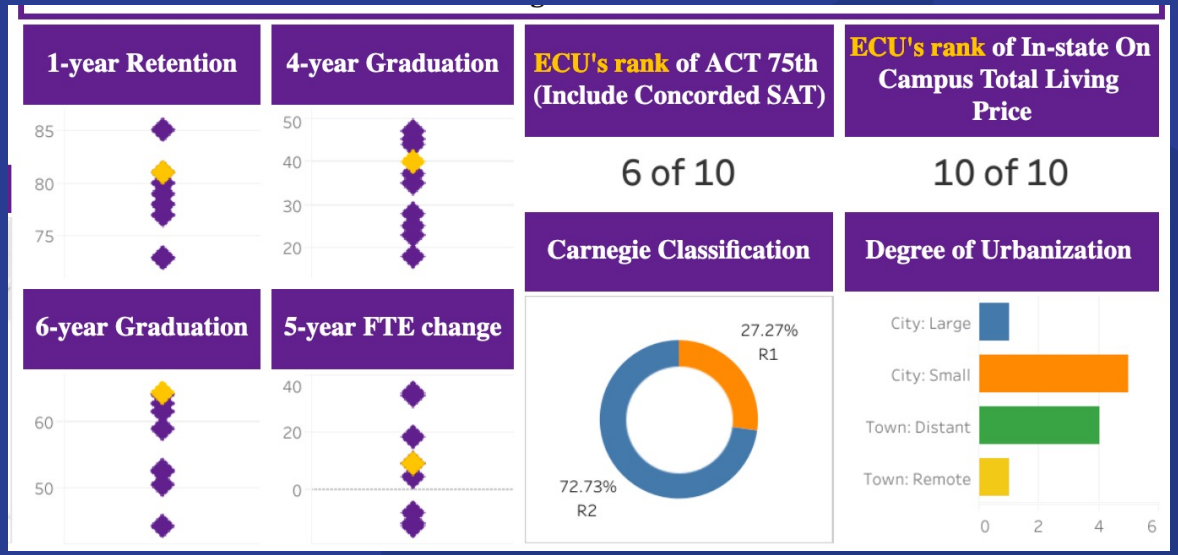


Selected Features

Select Your Peers

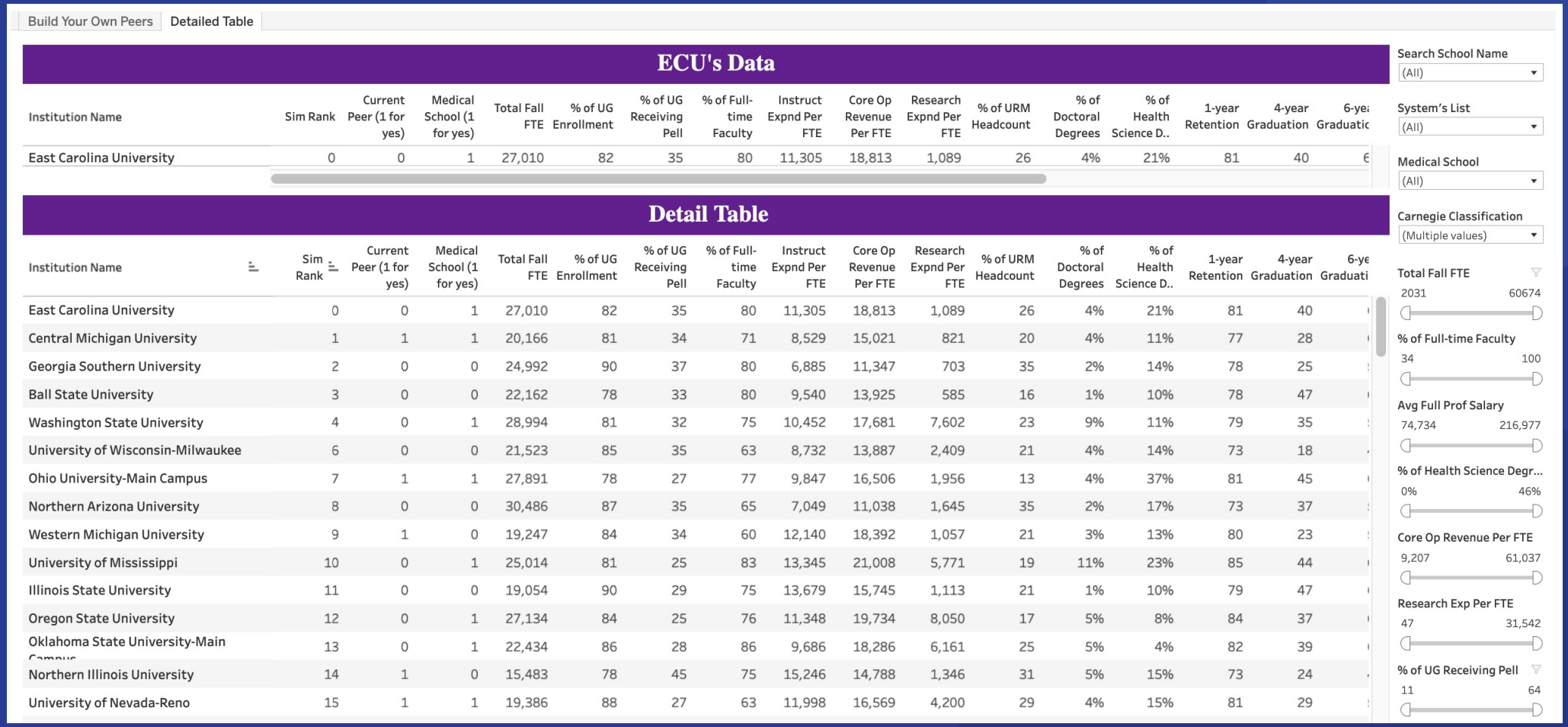
Sim Rank	Institution Name
0	East Carolina University
1	Central Michigan University
2	Georgia Southern University
3	Ball State University
4	Washington State University
6	University of Wisconsin-Milwaukee
7	Ohio University-Main Campus
8	Northern Arizona University
9	Western Michigan University
10	University of Mississippi
11	Illinois State University
12	Oregon State University
13	Oklahoma State University-Main Campus
14	Northern Illinois University





Peer Selection Dashboards:

Downloadable Data Lookup Table



Build Your Own Peers | Detailed Table

ECU's Data

Institution Name	Sim Rank	Current Peer (1 for yes)	Medical School (1 for yes)	Total Fall FTE	% of UG Enrollment	% of UG Receiving Pell	% of Full-time Faculty	Instruct Expnd Per FTE	Core Op Revenue Per FTE	Research Expnd Per FTE	% of URM Headcount	% of Doctoral Degrees	% of Health Science D..	1-year Retention	4-year Graduation	6-yea Graduatic
East Carolina University	0	0	1	27,010	82	35	80	11,305	18,813	1,089	26	4%	21%	81	40	6

Detail Table

Institution Name	Sim Rank	Current Peer (1 for yes)	Medical School (1 for yes)	Total Fall FTE	% of UG Enrollment	% of UG Receiving Pell	% of Full-time Faculty	Instruct Expnd Per FTE	Core Op Revenue Per FTE	Research Expnd Per FTE	% of URM Headcount	% of Doctoral Degrees	% of Health Science D..	1-year Retention	4-year Graduation	6-ye Graduati
East Carolina University	0	0	1	27,010	82	35	80	11,305	18,813	1,089	26	4%	21%	81	40	
Central Michigan University	1	1	1	20,166	81	34	71	8,529	15,021	821	20	4%	11%	77	28	
Georgia Southern University	2	0	0	24,992	90	37	80	6,885	11,347	703	35	2%	14%	78	25	
Ball State University	3	0	0	22,162	78	33	80	9,540	13,925	585	16	1%	10%	78	47	
Washington State University	4	0	1	28,994	81	32	75	10,452	17,681	7,602	23	9%	11%	79	35	
University of Wisconsin-Milwaukee	6	0	0	21,523	85	35	63	8,732	13,887	2,409	21	4%	14%	73	18	
Ohio University-Main Campus	7	1	1	27,891	78	27	77	9,847	16,506	1,956	13	4%	37%	81	45	
Northern Arizona University	8	0	0	30,486	87	35	65	7,049	11,038	1,645	35	2%	17%	73	37	
Western Michigan University	9	1	0	19,247	84	34	60	12,140	18,392	1,057	21	3%	13%	80	23	
University of Mississippi	10	0	1	25,014	81	25	83	13,345	21,008	5,771	19	11%	23%	85	44	
Illinois State University	11	0	0	19,054	90	29	75	13,679	15,745	1,113	21	1%	10%	79	47	
Oregon State University	12	0	1	27,134	84	25	76	11,348	19,734	8,050	17	5%	8%	84	37	
Oklahoma State University-Main Campus	13	0	1	22,434	86	28	86	9,686	18,286	6,161	25	5%	4%	82	39	
Northern Illinois University	14	1	0	15,483	78	45	75	15,246	14,788	1,346	31	5%	15%	73	24	
University of Nevada-Reno	15	1	1	19,386	88	27	63	11,998	16,569	4,200	29	4%	15%	81	29	

Search School Name: (All)

System's List: (All)

Medical School: (All)

Carnegie Classification: (Multiple values)

Total Fall FTE: 2031 – 60674

% of Full-time Faculty: 34 – 100

Avg Full Prof Salary: 74,734 – 216,977

% of Health Science Degr...: 0% – 46%

Core Op Revenue Per FTE: 9,207 – 61,037

Research Exp Per FTE: 47 – 31,542

% of UG Receiving Pell: 11 – 64

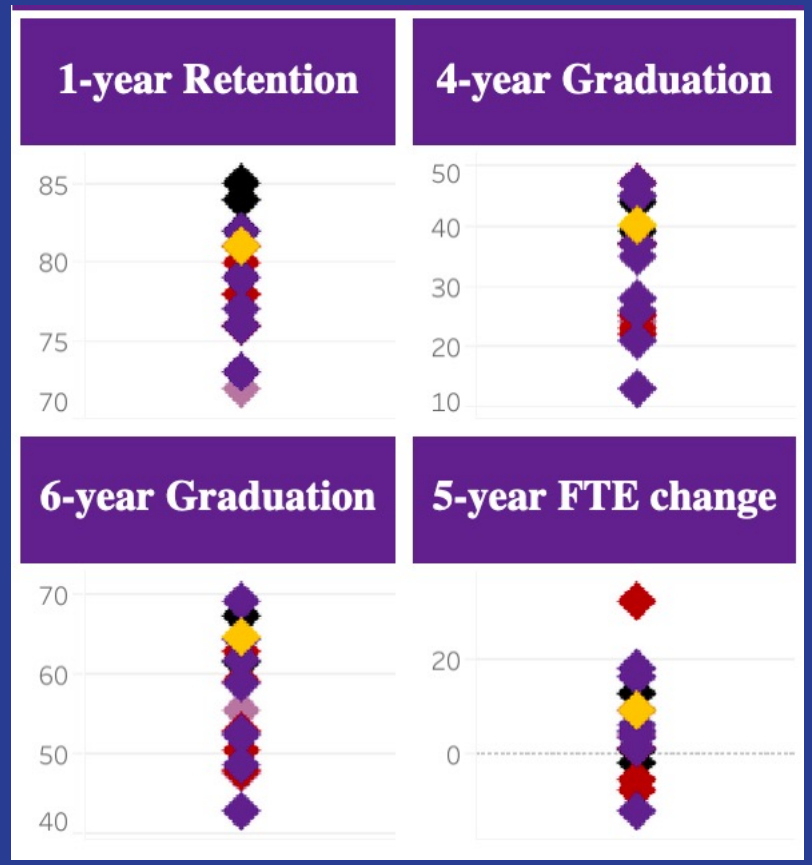
Selection Process

- Each committee member, using the dashboard, selected 10-14 candidate institutions.
- A second Peer Selection Dashboard was then deployed to focus on those institutions identified by at least one advisory group member.
- At a follow-up meeting, the Committee took special consideration of:
    - total fall FTE,
    - % of full-time faculty,
    - average full professor salary,
    - research expenditure per FTE, and
    - medical school.

Peer Candidates

Vote	Sim	Institution Name	System	Current	Medical
7	0	East Carolina University	N	N	Y
			Y	N	Y
6	1	Central Michigan University	Y	Y	Y
5	7	Ohio University-Main Campus	N	Y	Y
4	4	Washington State University	Y	N	Y
	13	Oklahoma State University-Main Cam..	Y	N	Y
	15	University of Nevada-Reno	Y	Y	Y
	27	Florida Atlantic University	N	N	Y
3	11	Illinois State University	Y	N	N
	12	Oregon State University	Y	N	Y
	14	Northern Illinois University	Y	Y	N
	30	Mississippi State University	Y	N	Y
	46	Texas Tech University	Y	Y	N
	54	Utah State University	Y	N	Y
	56	University of Nevada-Las Vegas	Y	N	Y
2	8	Northern Arizona University	N	N	N
	9	Western Michigan University	Y	Y	N
	19	University of Oregon	Y	N	N

Third Dashboard for Final Review



Peer Candidates

Sim	Institution Name	SO Review	Current	Medical
0	East Carolina University	ECU	N	Y
1	Central Michigan University	Approved	Y	Y
2	Georgia Southern University	Suggested	N	N
3	Ball State University	Suggested	N	N
4	Washington State University	Approved	N	Y
7	Ohio University-Main Campus	Approved	Y	Y
8	Northern Arizona University	Approved	N	N
9	Western Michigan University	Suggested	Y	N
11	Illinois State University	Approved	N	N
12	Oregon State University	Excluded	N	Y
13	Oklahoma State University-Main ..	Excluded	N	Y
23	Virginia Commonwealth University	Excluded	Y	Y
26	University of Toledo	Additional	N	Y
27	Florida Atlantic University	Approved	N	Y
29	Kent State University at Kent	Suggested	N	N
50	University of Memphis	Suggested	N	N
54	Utah State University	Approved	N	Y

You have selected...

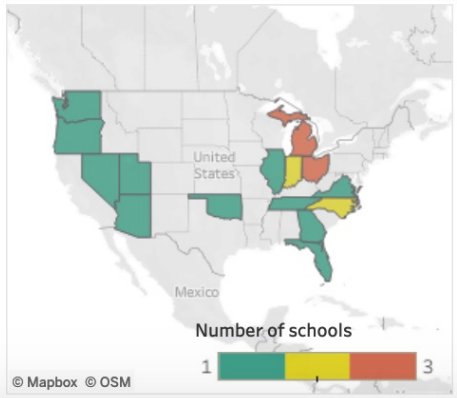
19 peers

4 current peers

10 schools in UNC-SO list

12 medical schools

Geographic Location



Search School Name

(All)

Legend

- ECU
- Approved
- Suggested
- Excluded
- Additional

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Final list of peer institutions for ECU

- Ball State University (R2)
- Central Michigan University (R2)
- Florida Atlantic University (R2)
- Illinois State University (R2)
- Kent State (R2)
- Northern Arizona University (R2)
- Ohio University (R2)
- University of Nevada-Las Vegas (R1)
- Utah State University (R2)
- Washington State University (R1)
- Western Michigan (R2)

Recommendations for Peer Study

- Select a representative advisory group
- Reach consensus regarding the use and limitation of peers
  - Recognize complexity of a large institution
  - If the peer list is short, do not recommend to use it for salary benchmark
- Selection of Variables and Methodology
  - Reflect institutional mission and distinctions
  - Align with the intended uses of peers
  - Do not recommend k-means for peer study
- Peer Candidates
  - Appropriate candidate pool to start with
  - Geographic location can be important
  - University system and consortial membership

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Data, Dashboards & Decision Support: IR's Role in the Peer-Selection Process

Q & A

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