

The Current Landscape of Business Analytics and Data Science at Higher Education Institutions: Who is Teaching What?

Amy L. Phelps, Duquesne University
Kathryn Szabat, LaSalle University

Other Panelists
Billie Anderson, Ferris State University
Jeffrey Camm, Wake Forest University
Aric LaBarr, North Carolina State University

Joint Statistical Meetings 2015

Why the Interest?

- SIBSIG – Statistics in Business Schools Interest Group (ASA)
- MSMESB – Making Statistics More Effective in Schools of Business (DSI)

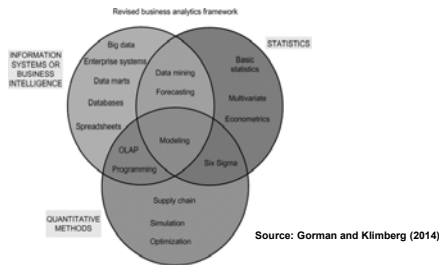
The EMPHASIS is STATISTICS Education in Schools of Business

How do we:

- keep the science of statistics in these programs
- give our students applied and sound statistical knowledge
- apply the GAISE guidelines

And not step aside in this “next wave of business” - Analytics

Statistics as an important part of the interdisciplinary Business Analytics Framework



Preparing Students for the Workplace

Business Analytics continues to become increasing important in Business and therefore in Business Education

Motivation for Organizing this Panel

Provide information and examples for those considering the development of undergraduate and graduate programs in Business Analytics

Setting the Stage for Panel Discussion

A Survey was designed to:

- Gather information from those in the trenches
 - Who is offering UG/Grad programs in Business Analytics/Data Science?
 - Who is considering adding programs in Business Analytics/ Data Science?
 - Who is teaching Business Statistics, Analytics, Data Science?
 - What software are they using?
 - How do they define Analytics?
 - What are the important skill sets?
 - Thoughts about the future importance of the media buzz.

Papers that Informed Survey Questions

- **Big Data Analytics and Data Science UG Programs**
Aasheim, C., Williams, S., Rutner, P. and Gardiner, A
(DSI, 2014)
- **Benchmarking Academic Programs in Business Analytics**
Gorman, M. and Klimberg, R.
(Interfaces, 2014)

Big Data Analytics and Data Science UG Programs

Aasheim et. al.

Literature Review

- Identified skills necessary skills in the area of big data, data science and analytics

Web Search of Universities

- To determine where in the university such programs were housed
- To understand the content of these programs in light of the identified skills

Skills Identified in Literature

- math
- statistics and probability
- data mining
- visualization techniques
- programming
- problem-solving
- knowledge of technologies and techniques for data capture
- data storage and data management
- understanding of “unstructured” data and data “quality”
- familiarity with hardware, platforms and architectures
- understanding of ethical considerations, especially privacy
- data governance policies
- business acumen
- communication skills

Where Analytics Programs Are Housed

- **Business/Data Analytics Programs**
 - Typically offered through business-related academic units
- **Data Science Programs**
 - Typically offered through computer science academic units or are interdisciplinary

Content of Programs

Business/Data Analytics Programs

- Typically require a traditional database or data warehousing course
- Generally do not require programming courses
- Require statistics courses; though less than Data Science
- Visualization, big data, data modeling, and data mining courses

Data Science Programs

- Typically require programming courses
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- Generally require more statistics courses than BA programs and higher math
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Benchmarking Academic Programs in Business Analytics

Gorman and Klimberg

Literature Review

- To highlight the evolution of Business Analytics

Web Search/Conference Attendance/Interviews

- To determine topical coverage in required and elective courses and necessary prerequisites
- To determine changes in subject area focus, student interest, and employer requests, in light of the business analytics movement

Evolution of Business Analytics

- Definition of Business Analytics seem to depend heavily on one's background
- Despite differences of opinion and the lack of a clear definition of analytics, interest in Business Analytics is popular and growing
- Academic is responding

How Programs are Changing

- Some are minimally rebranding themselves - making only minor changes, such as changing course names or adding BA or BI to their program descriptions
- More are redefining themselves and making significant changes, including new courses and programs.

The Landscape of Analytics Programs

- All programs share a common goal
 - To teach techniques and skills to transform data into insights for making better decisions.
- The landscape, however, appears to be quite heterogeneous
- A particular school's BA program focus and direction seems to be driven by:
 - Strength and expertise of faculty
 - Type of student
 - Local industries

Continuing Improvement and Development

- New courses are on the immediate horizon
- Movement to promote analytics throughout the entire curriculum

In Sum...

The intent of our survey was to gain information about business analytics/data science programs and better understand how we, those who teach Statistics in Schools of Business, contribute to...should contribute to... the preparation of business students for the current data-centric business environment and the growing field of Business Analytics.

The findings of these two papers guided the content and scope of our survey questions.

Online Qualtrics™ Survey

Three targeted audiences

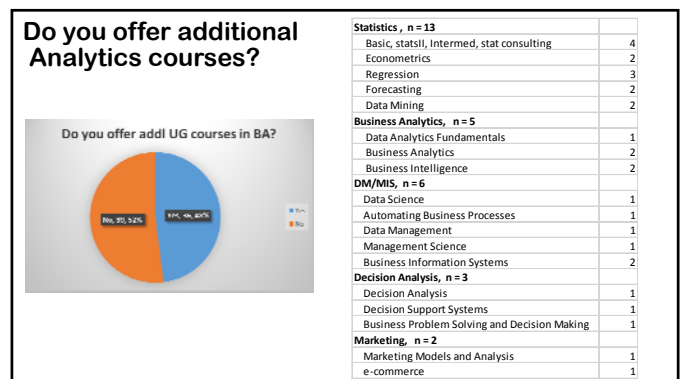
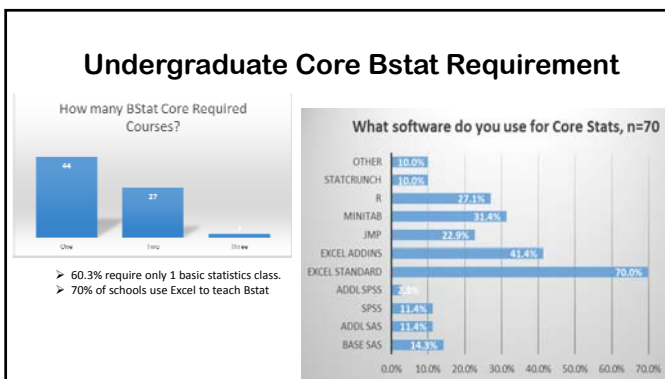
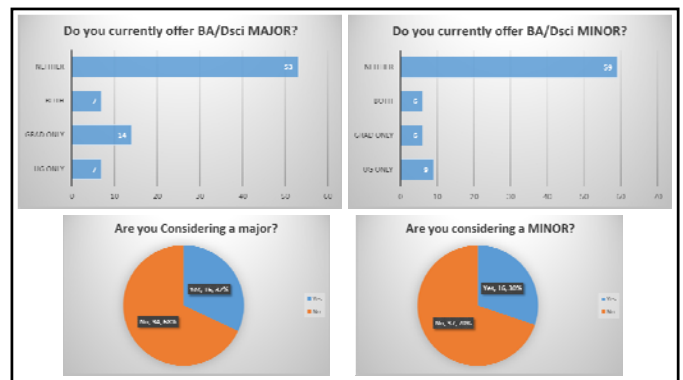
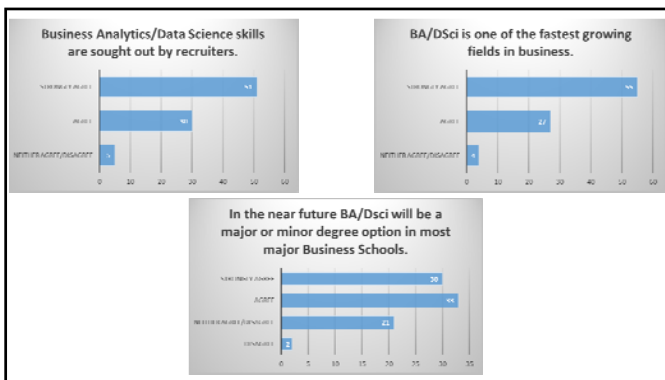
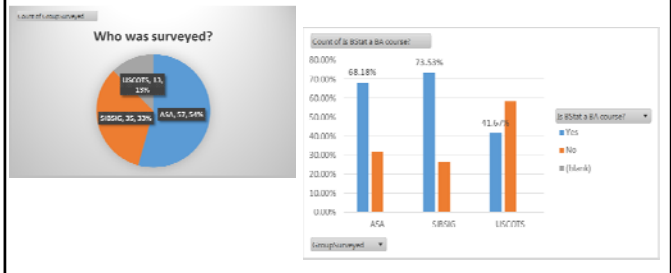
1. ASA Connect Posting
 1. Statistical Education Section
 2. Business and Economics Section
 - ✓ 92 read and consented to participate
 - ✓ 28 removed failure to participate
 - ✓ n = 51 Offered or taught Business Statistics
2. Direct SIBSIG members email request, n = 39
3. USCOTS 2015, n = 13

Exclusions

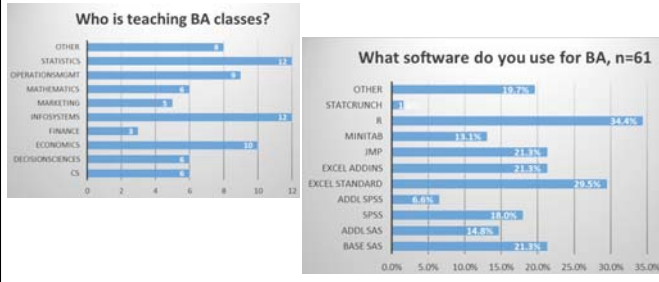
- Seven reported they did not offer Statistics to Business students.
 - Two 2 year institution or a community college
 - Thirteen institutions had duplicated responses.
 - responses were compared taking the most complete information reported, using only one record per institution to analyze curriculum offered.
- 85 Institutions were used to summarize the curriculum questions

The full dataset, n = 112 – 7 = 105 was used to summarize the opinionated questions

Is Business Analytics Statistics?



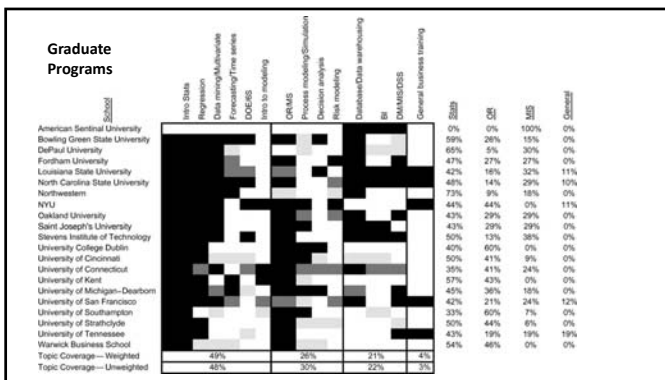
Who is teaching BA? Software Choice?



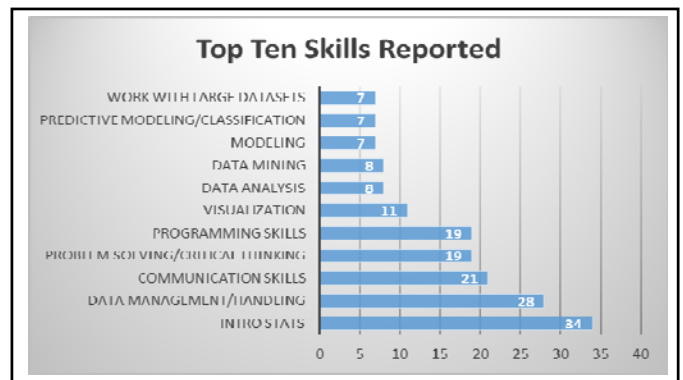
Gorman (2014) "Subject Area Mix"

- Statistics Subject Areas include:
 - *Intro Stats
 - *Data Mining/Multivariate
 - *DOE/6 sigma
 - *Regression
 - *Forecasting/Time Series
 - *Intro to Modeling
- Operations Research (OR) Subject Areas include:
 - *OR/MS
 - *Decision Analysis
 - *Process modeling/Simulation
 - *Risk Modeling
- Management Information Systems (MIS) Subject Areas include:
 - *Database/Data Warehousing
 - *DataMgmt/MIS/Decision Support Systems
 - *Business Intelligence (BI)

Graduate Programs

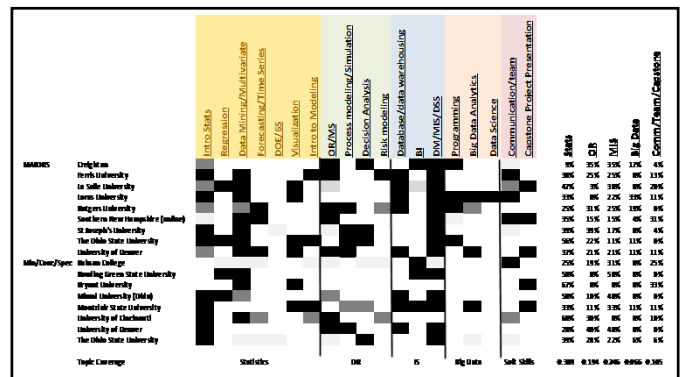


Top Ten Skills Reported



Undergraduate Programming Heat Map

- Subject Areas Added
 - > Data Analytics included: Programming, 'Big Data', Data Science
 - > 'Soft Skills' included: Communication/Team, Capstone projects presentation
- Weighting percent of subject area covered
 - > Score 1: subject is a required core course
 - > Score 0.5: subject is significant part of a required core course or a significant part of required electives
 - > Score 0.25: if subject is available in list of electives



Observations

- About 2/3 of the responding institutions report they offer no formal programs in BA/Data Science,
- While about 90% 'agree' it is sought out by recruiters and is one of the fastest growing fields in business,
 - And only about 30% responded they were considering creating a BA/Data Science major and about 26% were considering creating a minor.
- About 60% of business programs require one core statistics course and Excel standard is reportedly used in 70% of responding schools.
 - While Excel received the mode choice for undergraduate Bstat instruction, R was the modal choice for additional BA course instruction.

Observations

The top five skills reported for BA programming

1. Statistics
2. Data management/handling
3. Communication
4. Problem Solving/Critical Thinking
5. Programming skills

Subject Area Coverage: UG and GRAD

Subject Area	UG	GRAD
Statistics	39%	49%
Operations Research	19%	26%
Information Systems	25%	21%
Big Data Analytics	7%	
Comm/Team/Capstone	11%	
General Business Training		4%

Sharing their Experiences...

**Panelists
involved in
creating and offering
Analytics Programs**

Jeffrey Camm, Wake Forest University

- Identify a few fundamental guiding principles used to develop your undergraduate Business Analytics program
- Comment on what software your program utilizes and why you opted for these choices
- Comment on how important the skills identified in our survey are in your program
- Comment on how your program covers the discipline categories in our heat map: Statistics, OR/MS, IS/IT, Big Data Analytics and General Business; and how does your program address the interdisciplinary challenges

Aric LaBarr, North Carolina State University

- Identify a few fundamental guiding principles used to develop your graduate program in Analytics
- Comment on desirable/undergraduate training of prospective program candidates
- Comment on the level of training your program provides in Statistics, OR/MS, IS/IT, Big Data Analytics and General Business

Billie Anderson, Ferris State University

- Comment on the extent to which the skills identified in our survey are utilized in your course/certification program
- Comment on how soft skills are incorporated in your course; how you assess mastery of problem formulation
- Comment on classroom pedagogy that makes partnerships with industry work
- Comment on job opportunities that are available for students with the skills/knowledge gained from your course/program



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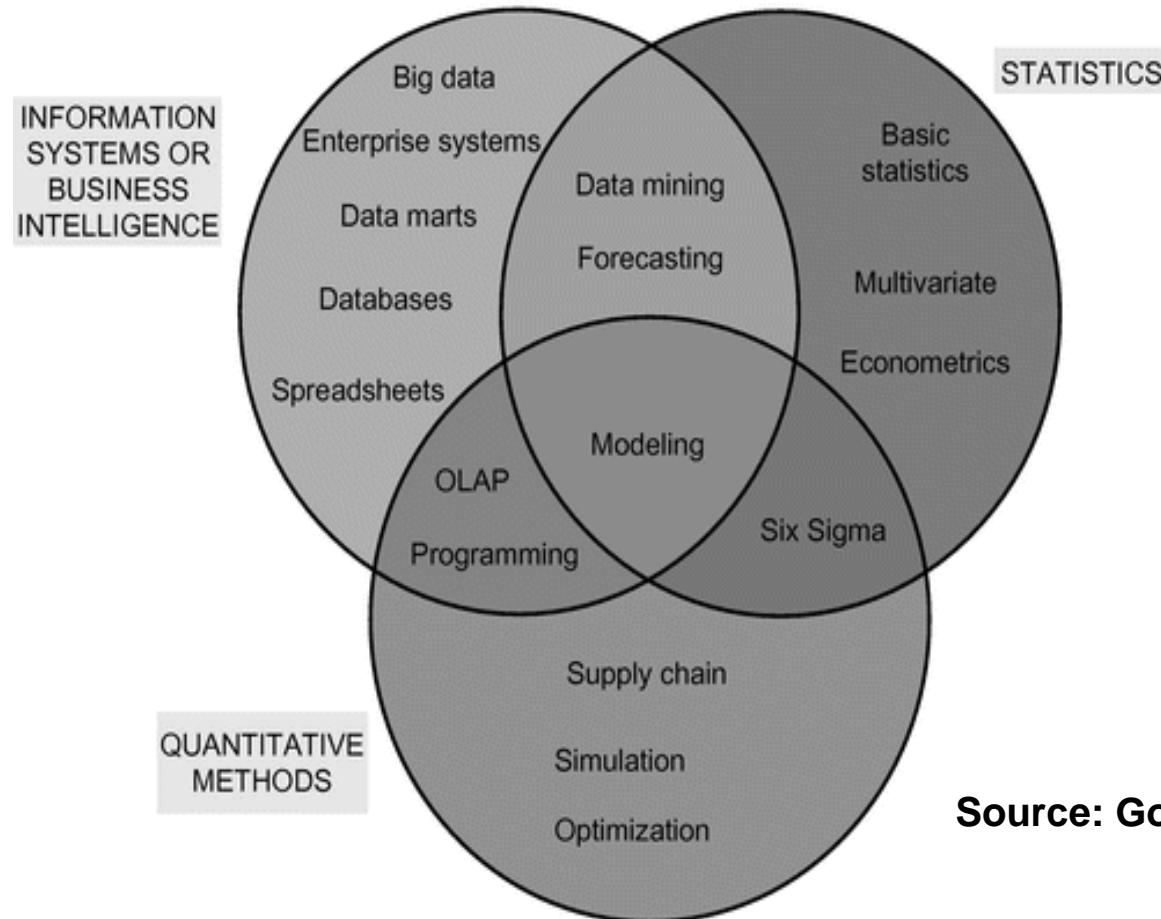
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Statistics as an important part of the interdisciplinary Business Analytics Framework

Revised business analytics framework



Source: Gorman and Klimberg (2014)

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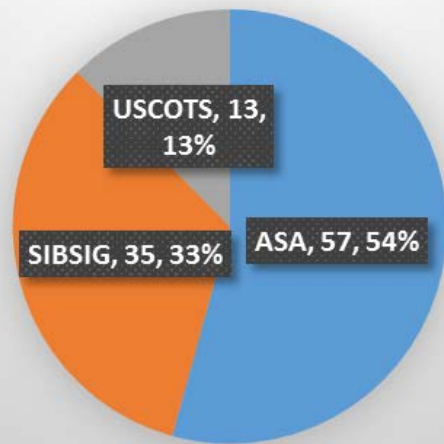
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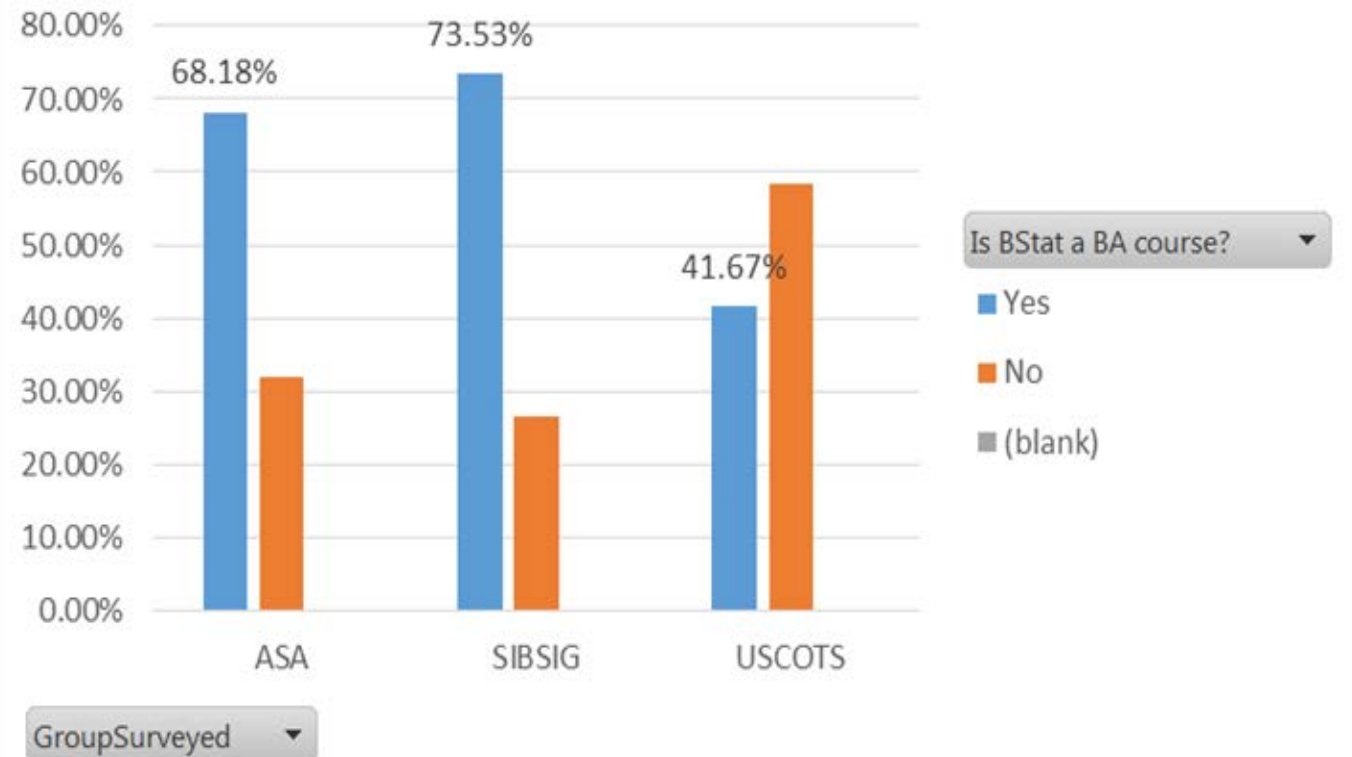
Is Business Analytics Statistics?

Count of GroupSurveyed

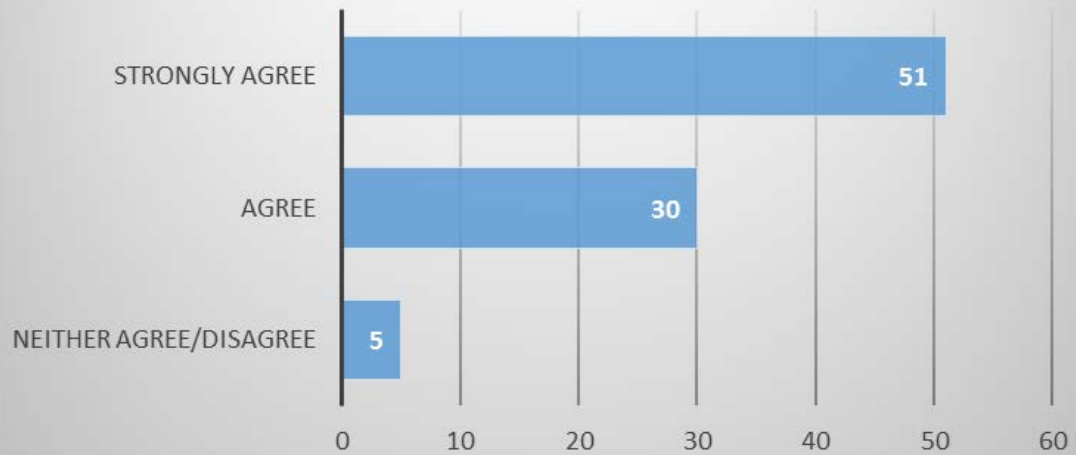
Who was surveyed?



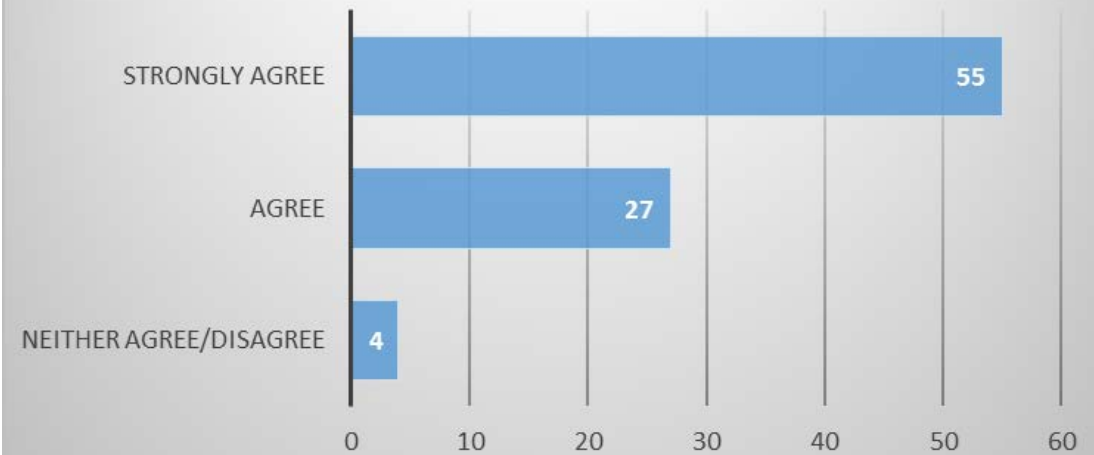
Count of Is BStat a BA course?



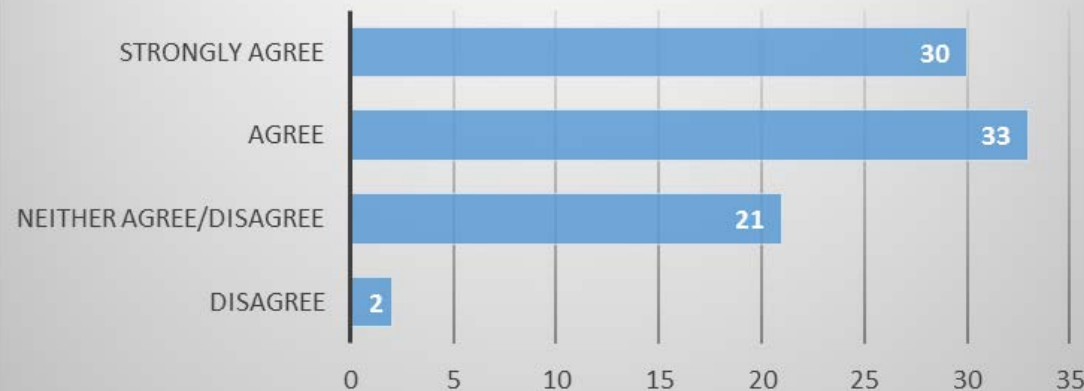
Business Analytics/Data Science skills are sought out by recruiters.



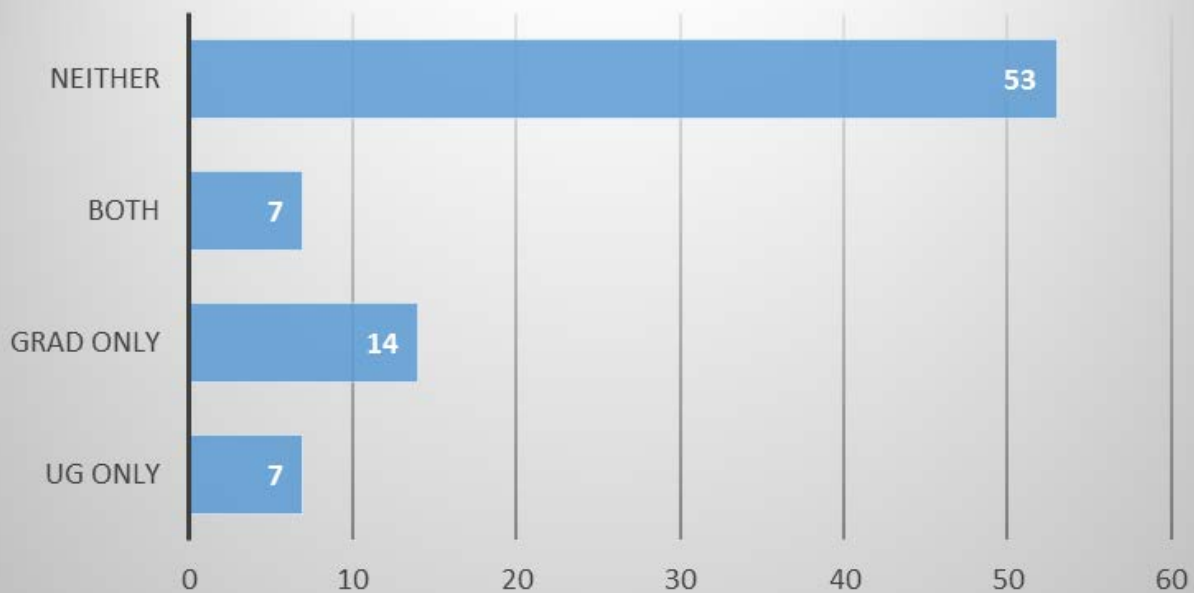
BA/DSci is one of the fastest growing fields in business.



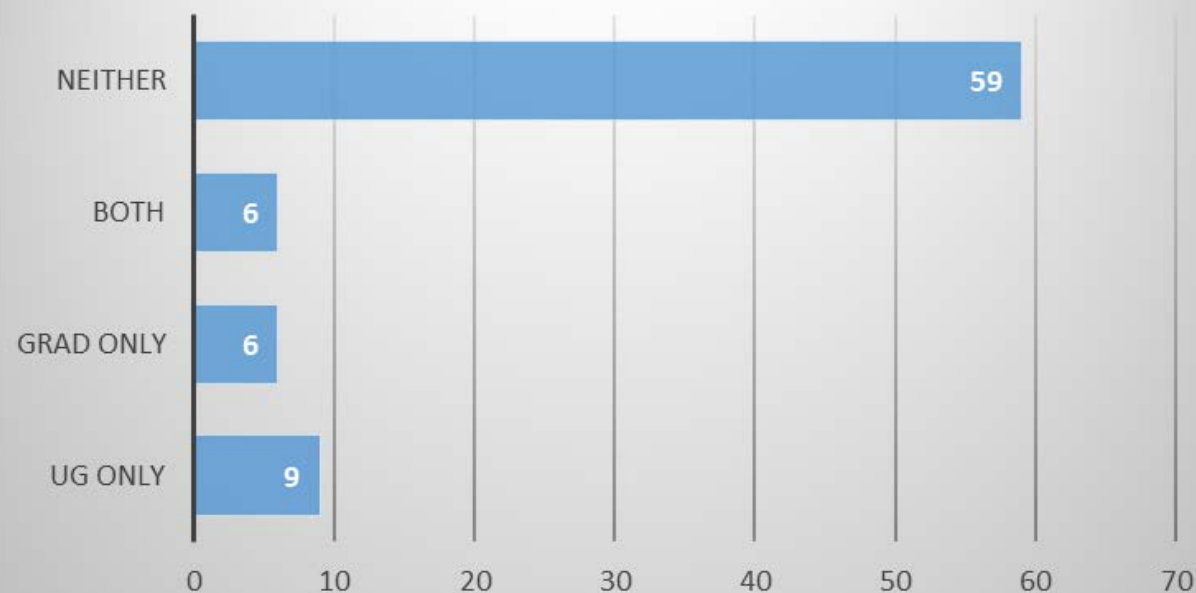
In the near future BA/Dsci will be a major or minor degree option in most major Business Schools.



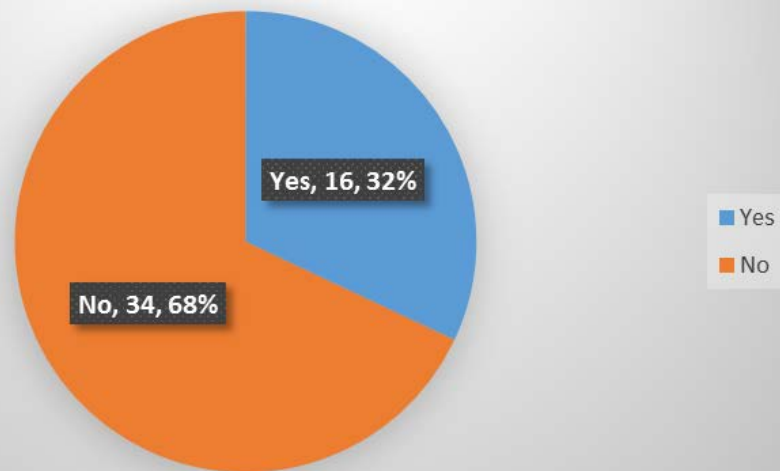
Do you currently offer BA/Dsci MAJOR?



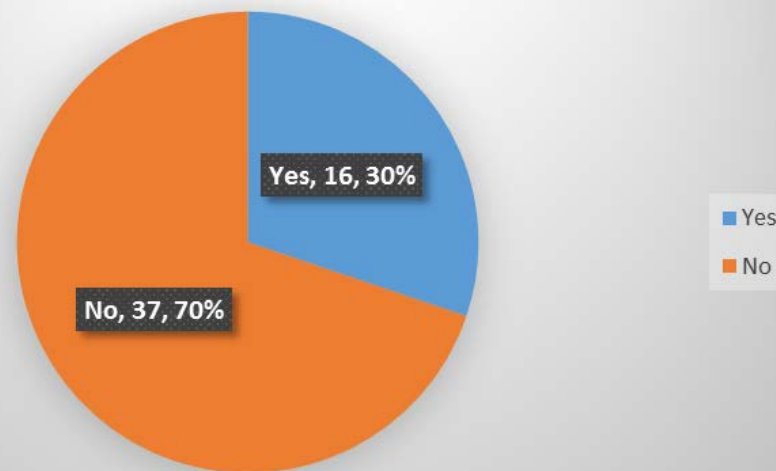
Do you currently offer BA/Dsci MINOR?



Are you Considering a major?



Are you considering a MINOR?



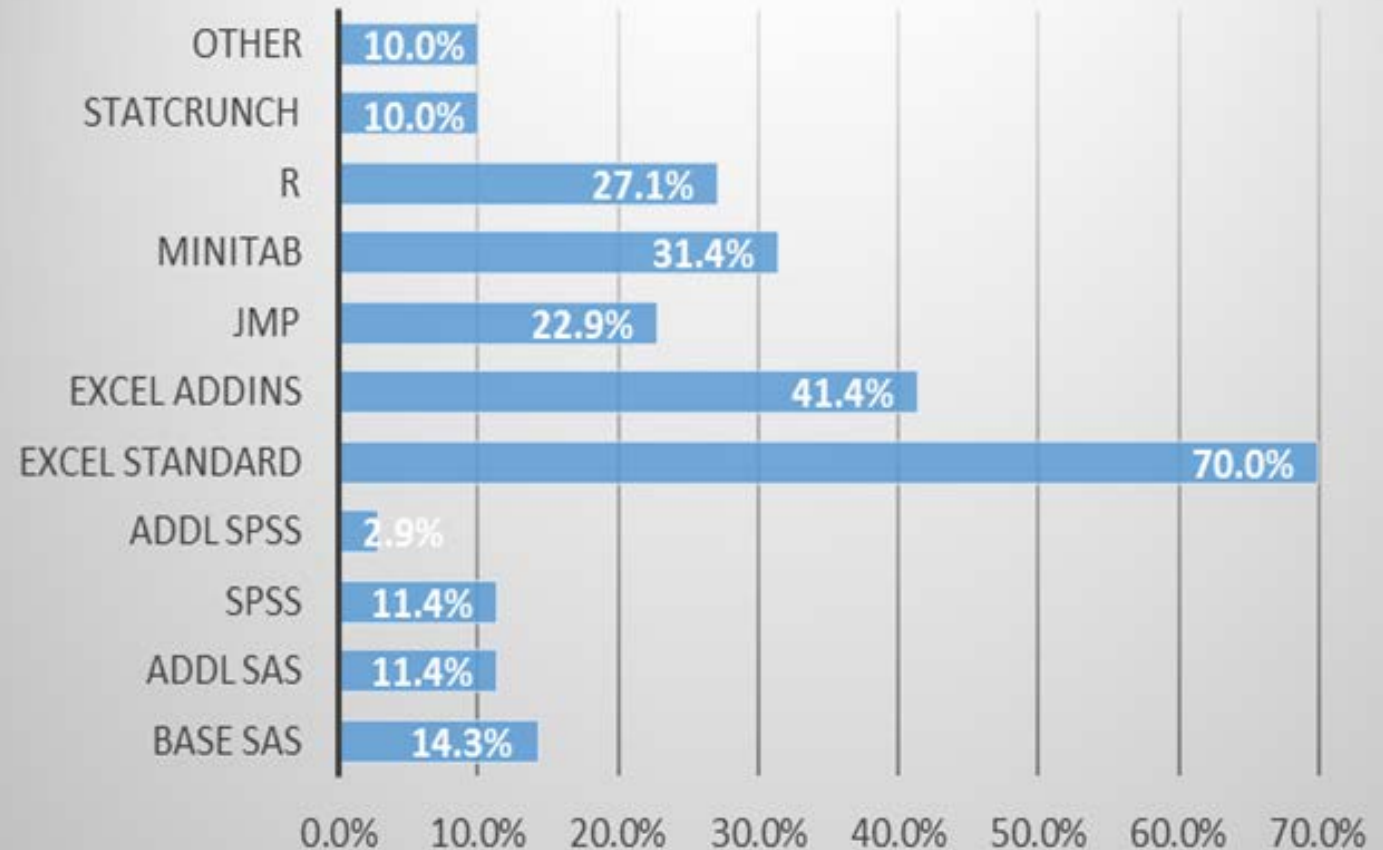
Undergraduate Core Bstat Requirement

How many BStat Core Required Courses?

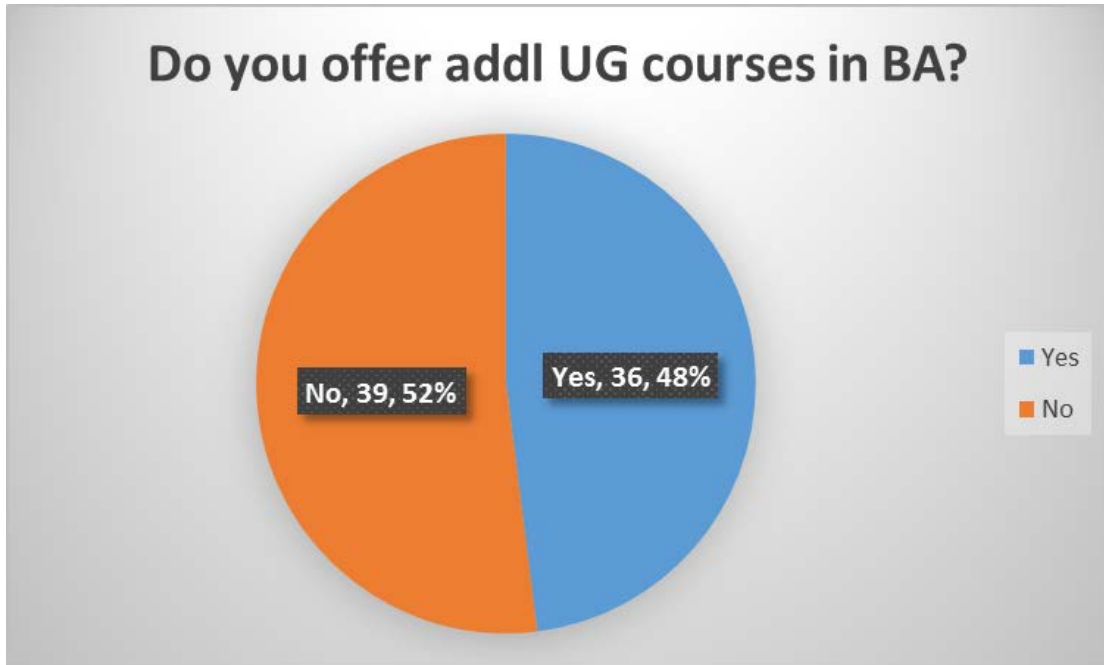


- 60.3% require only 1 basic statistics class.
- 70% of schools use Excel to teach Bstat

What software do you use for Core Stats, n=70



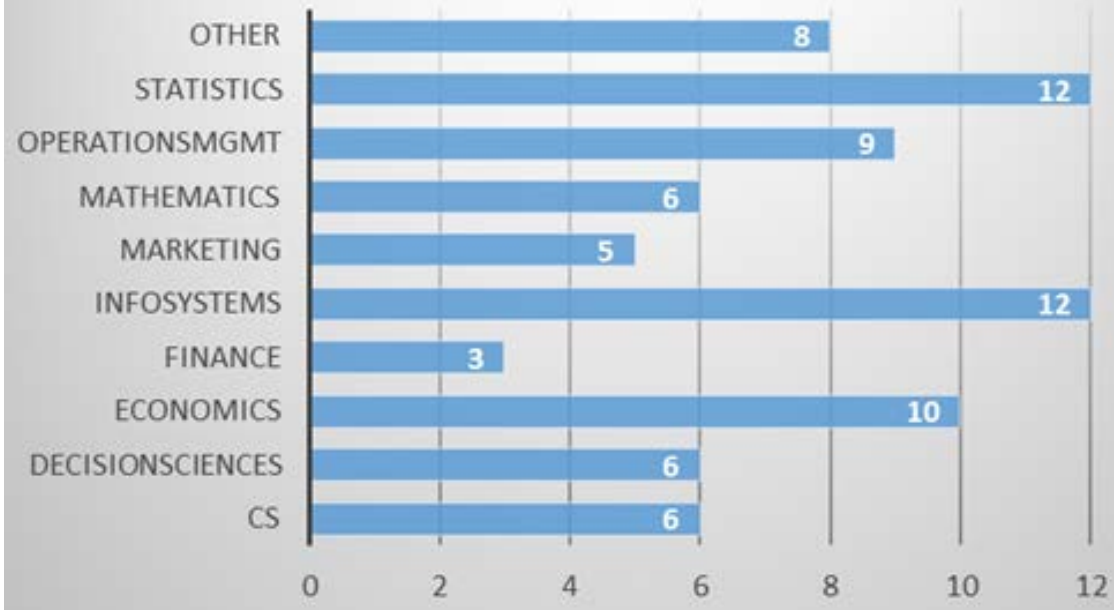
Do you offer additional Analytics courses?



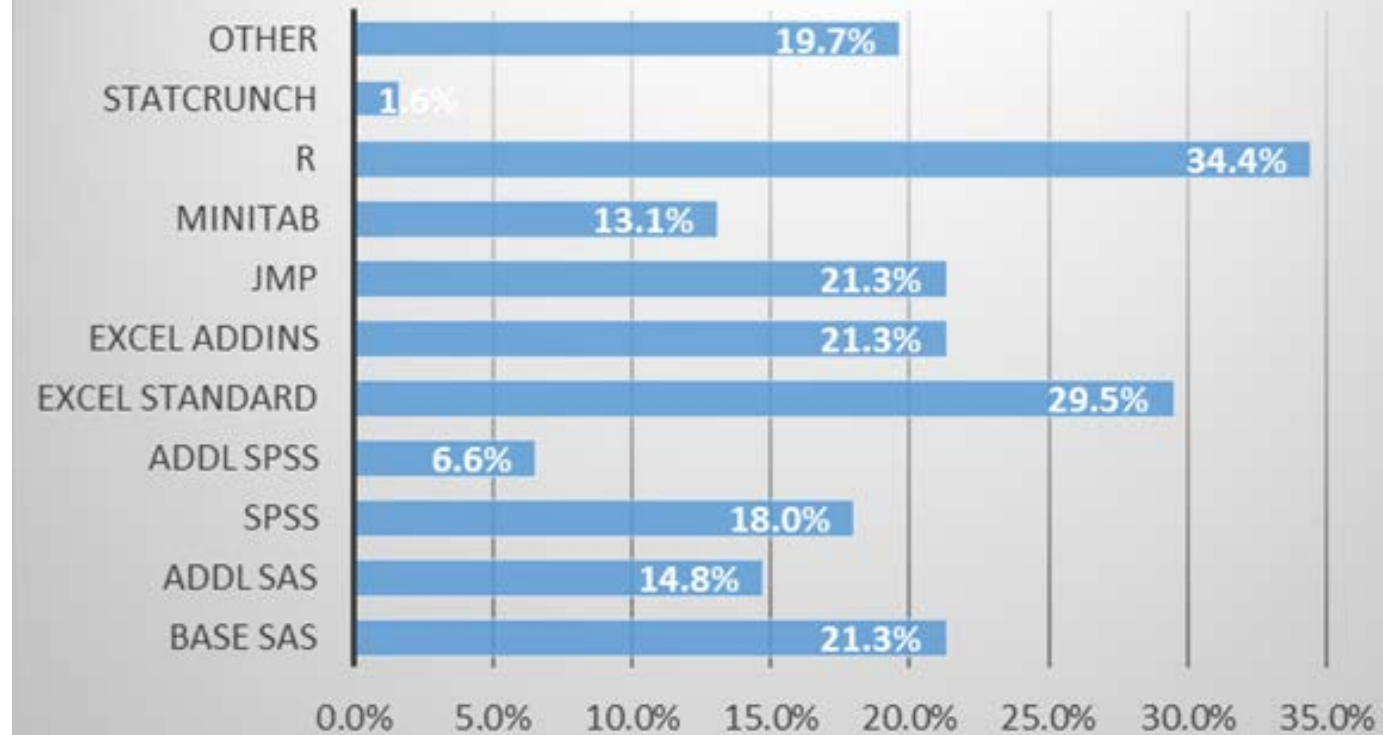
Statistics , n = 13	
Basic, statsII, Intermed, stat consulting	4
Econometrics	2
Regression	3
Forecasting	2
Data Mining	2
Business Analytics, n = 5	
Data Analytics Fundamentals	1
Business Analytics	2
Business Intelligence	2
DM/MIS, n = 6	
Data Science	1
Automating Business Processes	1
Data Management	1
Management Science	1
Business Information Systems	2
Decision Analysis, n = 3	
Decision Analysis	1
Decision Support Systems	1
Business Problem Solving and Decision Making	1
Marketing, n = 2	
Marketing Models and Analysis	1
e-commerce	1

Who is teaching BA? Software Choice?

Who is teaching BA classes?



What software do you use for BA, n=61



Gorman (2014) “Subject Area Mix”

❖ Statistics Subject Areas include:

- *Intro Stats
- *Regression
- *Data Mining/Multivariate
- *Forecasting/Time Series
- *DOE/6 sigma
- *Intro to Modeling

❖ Operations Research (OR) Subject Areas include:

- *OR/MS
- *Process modeling/Simulation
- *Decision Analysis
- *Risk Modeling

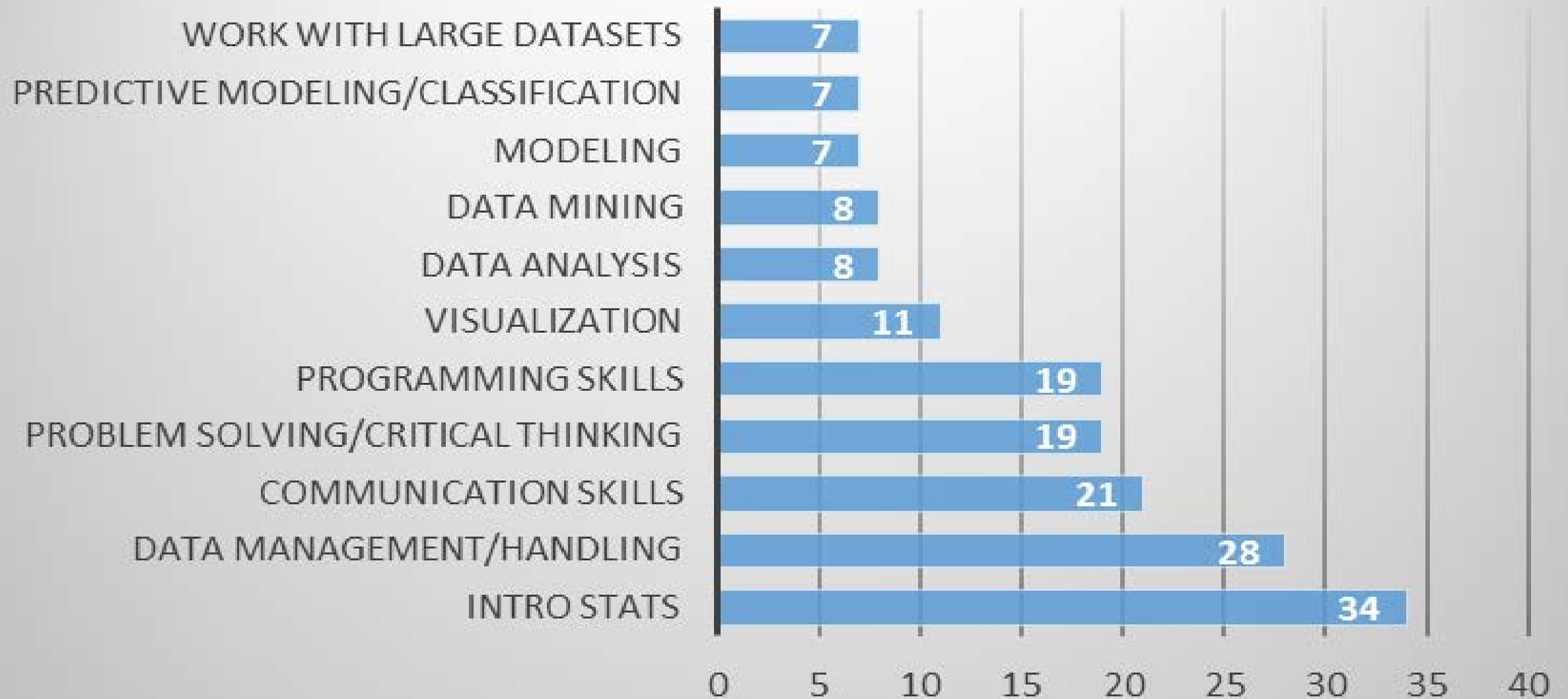
❖ Management Information Systems (MIS) Subject Areas include

- *Database/Data Warehousing
- *Business Intelligence (BI)
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Graduate Programs

<u>School</u>	Intro Stats	Regression	Data mining/Multivariate	Forecasting/Time series	DOE/6S	Intro to modeling	OR/MS	Process modeling/Simulation	Decision analysis	Risk modeling	Database/Data warehousing	BI	DM/MIS/DSS	General business training	<u>Stats</u>	<u>OR</u>	<u>MIS</u>	<u>General</u>
American Sentinal University															0%	0%	100%	0%
Bowling Green State University															59%	26%	15%	0%
DePaul University															65%	5%	30%	0%
Fordham University															47%	27%	27%	0%
Louisiana State University															42%	16%	32%	11%
North Carolina State University															48%	14%	29%	10%
Northwestern															73%	9%	18%	0%
NYU															44%	44%	0%	11%
Oakland University															43%	29%	29%	0%
Saint Joseph's University															43%	29%	29%	0%
Stevens Institute of Technology															50%	13%	38%	0%
University College Dublin															40%	60%	0%	0%
University of Cincinnati															50%	41%	9%	0%
University of Connecticut															35%	41%	24%	0%
University of Kent															57%	43%	0%	0%
University of Michigan–Dearborn															45%	36%	18%	0%
University of San Francisco															42%	21%	24%	12%
University of Southampton															33%	60%	7%	0%
University of Strathclyde															50%	44%	6%	0%
University of Tennessee															43%	19%	19%	19%
Warwick Business School															54%	46%	0%	0%
Topic Coverage— Weighted															49%	26%	21%	4%
Topic Coverage— Unweighted															48%	30%	22%	3%

Top Ten Skills Reported



Undergraduate Programming Heat Map

❖ Subject Areas Added

- Data Analytics included: Programming, 'Big Data', Data Science
- 'Soft Skills' included: Communication/Team, Capstone projects presentation

❖ Weighting percent of subject area covered

- Score 1: subject is a required core course
- Score 0.5: subject is significant part of a required core course or a significant part of required electives
- Score 0.25: if subject is available in list of electives

		<u>Intro Stats</u>	<u>Regression</u>	<u>Data Mining/Multivariate</u>	<u>Forecasting/Time Series</u>	<u>DOE/6S</u>	<u>Visualization</u>	<u>Intro to Modeling</u>	<u>OR/MS</u>	<u>Process modeling/Simulation</u>	<u>Decision Analysis</u>	<u>Risk modeling</u>	<u>Database/data warehousing</u>	<u>BI</u>	<u>DM/MIS/DSS</u>	<u>Programming</u>	<u>Big Data Analytics</u>	<u>Data Science</u>	<u>Communication/team</u>	<u>Capstone Project Presentation</u>	<u>Stats</u>	<u>OR</u>	<u>MIS</u>	<u>Big Data</u>	<u>Comm/Team/Capstone</u>
MAJORS	Creighton																				9%	35%	35%	17%	4%
	Ferris University																				38%	25%	25%	0%	13%
	La Salle University																				47%	3%	30%	0%	20%
	Loras University																				33%	0%	22%	33%	11%
	Rutgers University																				25%	31%	25%	19%	0%
	Southern New Hampshire (online)																				35%	15%	15%	4%	31%
	St Joseph's University																				39%	39%	17%	0%	4%
	The Ohio State University																				56%	22%	11%	11%	0%
	University of Denver																				37%	21%	21%	11%	11%
Min/Conc/Spec	Babson College																				25%	19%	31%	0%	25%
	Bowling Green State University																				50%	0%	50%	0%	0%
	Bryant University																				67%	0%	0%	0%	33%
	Miami University (Ohio)																				50%	10%	40%	0%	0%
	Montclair State University																				33%	11%	33%	11%	11%
	University of Cincinnati																				60%	30%	0%	0%	10%
	University of Denver																				20%	40%	40%	0%	0%
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	Topic Coverage																					0.389	0.194	0.246	0.066

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involved in
creating and offering
Analytics Programs**

Jeffrey Camm, Wake Forest University

- Identify a few fundamental guiding principles used to develop your undergraduate Business Analytics program
- Comment on what software your program utilizes and why you opted for these choices
- Comment on how important the skills identified in our survey are in your program
- Comment on how your program covers the discipline categories in our heat map: Statistics, OR/MS, IS/IT, Big Data Analytics and General Business; and how does your program address the interdisciplinary challenges

Aric LaBarr, North Carolina State University

- **Identify a few fundamental guiding principles used to develop your graduate program in Analytics**
- **Comment on desirable skills/undergraduate training of prospective program candidates**
- **Comment on the level of training your program provides in Statistics, OR/MS, IS/IT, Big Data Analytics and General Business**

Billie Anderson, Ferris State University

- **Comment on the extent to which the skills identified in our survey are utilized in your course/certification program**
- **Comment on how soft skills are incorporated in your course; how you assess mastery of problem formulation**
- **Comment on classroom pedagogy that makes partnerships with industry work**
- **Comment on job opportunities that are available for students with the skills/knowledge gained from your course/program**

