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Taking care of business and doing overtime: Teaching research methods in public affairs curricula pre-pandemic and during COVID-19

John F. Brennan
Christopher R. Prentice (prenticecr@uncw.edu)
Kirsten L. Kinzer
Jeffrey L. Brudney

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In this research, we sought to better understand important trends and developments in the teaching of quantitative and research methods courses in graduate public affairs programs. We were specifically interested in the following areas related to the teaching of quantitative and research methods: the impact of new technologies on curriculum delivery; the content of courses related to statistical analysis and research design; and the importance of numeracy, ethics, and data visualization. We surveyed quantitative and research methods instructors in graduate public affairs programs using the same survey instrument at two intervals eight years apart and analyzed results from each period side-by-side. Findings indicate some stark differences in the content and delivery of these courses. Given the timing of the second survey – Spring 2021 – findings are considered within the context of the COVID-19 pandemic.

Keywords: quantitative and research methods; online instruction, public affairs, COVID-19

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Introduction

Social statistics has long been a cornerstone in graduate public affairs curricula. NASPAA's accreditation standards highlighting the importance of research methods and quantitative analysis certainly contribute to this ubiquity, but faculty are also motivated by the desire to have students gain quantitative skills useful for policy analysis, program evaluation, and decision making (Horne, 2008). The content of quantitative and research methods courses has evolved over the last few decades, coincident with changing technologies, learning goals for students, and workforce needs. Additionally, new instructional technologies are changing the way instructors impart knowledge and skills to students.

In this research, we sought to better understand important trends and developments in the teaching of quantitative and research methods courses in graduate public affairs programs. We were specifically interested in the following areas related to the teaching of quantitative and research methods: the impact of new technologies on curriculum delivery; the content of courses related to statistical analysis and research design; and the importance of numeracy, ethics, and data visualization. We surveyed quantitative and research methods instructors in graduate public affairs programs using the same survey instrument at two intervals eight years apart and analyzed results from each period side-by-side. Findings indicate some stark differences in the content and delivery of these courses. Given the timing of the second survey – Spring 2021 – findings are considered within the context of the COVID-19 pandemic.

In the following section we review the relevant literature and highlight trends in the development of quantitative and research methods courses in graduate public affairs programs. Next, we present our methodology, including sample identification, survey design and dissemination, and statistical methods used for analysis. Finally, we present the noteworthy results from the pooled cross-sectional analysis, discuss the implications of these findings for public affairs faculty, and conclude with suggested directions for future research.

Literature Review

Survey research on the topics covered in quantitative course work in MPA programs began in the late 1970s and a series of three surveys established the field's baseline understanding of which quantitative topics are covered in MPA courses, as well as student backgrounds in statistics and math and the use of computer programs in these courses (Hy, Waugh, and Nelson, 1987; Waugh, Hy, & Brudney, 1994). A primary focus of these surveys was identifying the quantitative techniques covered in different MPA programs, ranging from descriptive statistics to PERT. Although virtually every MPA program required a quantitative course by 1984, "the types of quantitative techniques taught in graduate programs of public administration var[ied] tremendously. Some programs expose[d] a majority of their students to a wide variety of techniques, while others expose[d] them to only a very few" (Hy et al., 1987, p. 145). Despite this variation in topical coverage, the emphasis in MPA coursework remained on social science statistics rather than management science.

More recently, scholars have suggested that quantitative coursework in public affairs should expand to better prepare students for professional work as public administrators and policy analysts (Horne, 2008). Fitzpatrick (2000) argued that rather than preparing students for PhD programs, MPA programs should prepare students to complete and apply research in public management and policy decision making. To this end, Fitzpatrick rejected Waugh et al.'s (1994) argument that covering more sophisticated social statistics is the appropriate goal of MPA coursework. Similarly, Caulkins (1999) maintained that management science is more relevant to students seeking professional jobs after graduation (e.g. network modeling, forecasting, and simulation). Aristigueta and Raffel (2001) advocated for a "third path" focused on quantitative decision making, drawing from both the research design and management science traditions. Ammons and Williams (2003) considered this question from the perspective of employer needs in the 50 largest American cities and concluded that these entry level budget and program analyst positions require knowledge of basic descriptive statistics and management science rather than the more advanced social science statistics. Despite these arguments, social science statistics and research design remain the focus of quantitative courses in most public affairs programs in part because instructors are trained in this tradition and tend to "teach what they know" (Horne 2008).

This study builds from the larger body of research on the integration of quantitative topics into public affairs education and encompasses two seismic shifts in higher education: the rapid growth in NASPAA accredited programs that offer some or all courses online (Ni, 2013) and the abrupt shift to online learning as a result of the COVID-19 pandemic. The first shift was gradual and mostly voluntary driven by university preferences, student need, and instructor preference. However, the second and more abrupt shift to increased online teaching was imposed by the COVID-19 pandemic as universities increasingly moved courses online starting in Spring 2020. As McDonald (2021, p. 4) notes, "in many ways, the transition provided a referendum about online education. This referendum is worth exploring, as it likely furthered the divide between supporters and opponents to online education. Developing a successful online course is not easy and can take up to a year to complete."

Findings from previous studies that compare online to in-person quantitative and research methods courses in public affairs programs are mixed. In several small studies, scholars found online quantitative methods courses to be superior to in person courses in some ways. Ni (2013) concluded that both the quality and quantity of interaction is higher in online public administration research methods courses in comparison to in-person courses covering the same material. Similarly, Harris and Nikitenko (2014) compared online and in-person quantitative methods courses across three cohorts and found that online students performed 28% higher on writing assignments. They attribute this performance difference to the self-directed learning inherent to online courses. Online courses also expand access to graduate education in public affairs because they provide the flexibility that adult learners need to fit coursework into their lives (Nollenberger, 2015). Conversely, scholars have illuminated a range of ways online courses in public administration do not perform as well as in-person courses, including most notably lower student persistence (Ni, 2013; Moody, 2004). Reduced student motivation and enrollment attrition have also been cited as more persistent issues in online courses when compared to courses taught in-person (Gigliotti, 2016). The abrupt shift online for many instructors and students during COVID-19 likely impact student engagement and learning, but may have also influenced content coverage in quantitative and research methods courses. We explored these possibilities in this study; the next section presents our methods and analytical approach.

Materials and Methods

Much of what we know about the evolution of quantitative and research methods courses in graduate public affairs programs was built through studies performed at various intervals over the last few decades by scholars loosely replicating prior research in order to elucidate trends. We adopted that tradition of employing similar techniques over time and sought to improve upon it by performing a pooled cross-sectional analysis on data gathered by the research team eight years apart. By maintaining consistency in our instrument and data collection methods, we were able to control for potential methodological variations and improve the comparability of findings from the different collection periods.

Survey

Our primary data emanate from surveys distributed eight years apart (spring of 2013 and spring of 2021). The surveys sought information about the content and delivery mode of the graduate quantitative and research methods courses offered by the respondents' programs. The first section of the instrument asked respondents to supply information regarding the format of their methods course – i.e., whether it is offered in-person or online – and whether the move online had influenced student interaction, instructor responsibilities, or student learning. The next four sections of the instrument sought detailed information about course content with one section dedicated to each of the following areas: course topics, numeracy, ethics, and data visualization. The course topics section of our survey is modeled after Hy et al. (1987) and Waugh et al. (1994); however, the latter three sections – numeracy, ethics, and data visualization – are newer contributions.

Respondents were asked to respond to four matrix-style questions (one question for each of the sections) using a 5-point Likert scale corresponding to whether they spent no time to significant time covering each of the items under consideration. For example, respondents were asked whether they spent "none," "a little," "a moderate amount," "a lot," or "a great deal" of class time on the following ethical principles: confidentiality, honesty, objectivity, plagiarism, etc. After data collection, results were recoded and reduced to three categories – i.e., "no time," "some time," or "significant time" – given the low number of counts and unequal variances for some items. Table 1 presents the items respondents were asked to score for each of the four content-specific sections in the survey. Respondents were also afforded the opportunity to enter additional information through free response questions in each of the sections of the survey.

>>Insert Table 1 here<<

Our university's policies on human subjects research require Institutional Review Board (IRB) approval before commencing data collection. Hence, we sought and gained IRB approval for our research proposal, survey instrument, methods of communication, and incentive protocol before distributing our survey in 2013 and again before survey distribution in 2021.

Samples

The study's samples comprised the population of NASPAA members that offer a graduate degree program. We compiled a list of names and contact information for faculty who teach quantitative and research methods courses in the NASPAA member's graduate degree program by perusing college and university webpages. Where it was not possible to ascertain who taught methods courses in the program, we instead collected the program director's name and contact information. Electronic surveys were distributed via email to each of the respondents on our compiled lists (n = 318 in 2013 and n = 301 in 2021).

The first cross-sectional survey was constructed using SurveyMonkey and disseminated to respondents via email in Spring 2013. The second cross-sectional survey was constructed using Qualtrics and disseminated to respondents via email in Spring 2021. Data collection yielded 167 and 122 usable responses from the first and second survey waves, respectively.

Analysis

Our analytic approach involved comparing survey data from the two periods. First, we generated frequencies for every variable in 2013 and 2021, and then compared them to determine whether significant differences emerged. Crosstabs were performed for each of the survey items listed in Table 1 to ascertain whether faculty are dedicating more or less time on these concepts over time. Subsequently, we compared means via independent-samples t-tests to determine whether the average overall time spent on numeracy, topics, ethics, and data visualization had increased or decreased over time. Finally, we focused on the results from the second survey and analyzed whether COVID-19 influenced the coverage of course content.

Results

Results from our two cross-sectional surveys indicate faculty are spending less time covering the material listed in Table 1. We present the frequencies and Pearson chi-square statistics for each of the items across the two periods in Tables 2a-e below. Among the numeracy concepts, findings indicate that faculty are dedicating significantly less time to weighted averages and indexes. For example, whereas 42% of respondents in 2013 indicated that they spent significant time on weighted averages, by 2021 that number dropped to just 25%. Similarly, whereas only 31% of respondents indicated spending no time on indexes in 2013, the number increased to 52% in 2021. The other numeracy concepts do not show statistically significant differences across periods, but many items appear to be trending down suggesting less overall coverage. Indeed, the average amount of time dedicated to numeracy concepts did see a statistically significant decline from 2013 to 2021 ($t(196) = 2.45$, $p = 0.02$).

>>Insert Universal Tables 2a-e here<<

Findings for the items listed in the course topics section (Table 2c) of the survey also appear to indicate faculty are dedicating less coverage in 2021 than in 2013. Faculty are spending significantly less time covering quasi-experimental designs, probability distributions, and non-experimental designs. For example, 52% of faculty in 2013 indicated they spent significant time covering probability distributions (e.g., normal and student's-t), but that number dropped to 35% in 2021. Similarly, 24% of faculty reported spending little to no time on non-experimental designs in 2013, but that number rose to 39% in 2021. Consistent with the trend in numeracy, overall time dedicated to these topics appeared to decline between the two cross-sectional surveys but analyses do not indicate those differences as statistically significant.

Results reported in Table 2d show that the ethical concepts under consideration did not show statistically significant differences between periods. The trends indicated in crosstabs and other tests show a generally negative trend, with less time dedicated to many of the individual concepts and for the average amount of time overall. However, unlike the other three sections of the survey these differences do not appear to be significant.

On the other hand, respondents reported spending significantly less time on several data visualization concepts (Table 2e). Results show that faculty dedicate significantly less time covering stem-and-leaf diagrams, histograms, graduated symbol maps, and dot density maps. For example, whereas 56% of respondents spent some or significant time covering stem-and-leaf diagrams in 2013, only 33% of respondents reported similarly in 2021. The concept that bucks the trend most notably is advanced table design (e.g., crosstabs), where the change appears curvilinear. Respondents in 2021 reported spending significant time or no time at significantly higher rates than their counterparts in 2013. Consistent with the other sections of the survey, the average amount of overall time dedicated to data visualization is lower in 2013 than in 2021. However, unlike with numeracy the observed difference does not appear statistically significant.

Course Delivery and the Impact of COVID-19

Results from our questions pertaining to the means of course delivery show that significantly more quantitative and research methods courses are being taught online now compared to 2013 (X^2 (1, N = 275) = 82.49, p = 0.00), which may account for some of the changes in course content. Only 27% of respondents taught methods online in 2013, but that number climbed to 82% in 2021. Faculty also reported that teaching online affected content and student engagement. When compared to a traditional face-to-face delivery, faculty in 2021 were significantly more likely to report less student interaction (X^2 (2, N = 126) = 13.34, p = 0.00), completing fewer computational exercises (X^2 (2, N = 123) = 5.32, p = 0.07), and less instructor feedback on student progress (X^2 (2, N = 126) = 5.29, p = 0.07) than their 2013 counterparts.

Some of this variance is likely a consequence of the COVID-19 pandemic. Respondents in both survey waves were asked to report the motivation for teaching methods online, rather than face-to-face, and nearly half of those who answered this question in 2021 indicated in their free response that the pandemic was a factor. In order to explore the extent to which COVID-19 may have influenced course delivery and content, we replicated the analyses performed above and confined our focus to the 2021 survey wave. We created a binary variable that assigned a value of 1 to respondents who mentioned COVID-19 as a motivation for teaching online, and 0 to all others. Faculty who cited the pandemic as a motivator for teaching online reported that compared to face-to-face delivery their online course had significantly less student interaction (X^2 (2, N = 91) = 8.10, p = 0.02), fewer computational exercises (X^2 (2, N = 91) = 4.95, p = 0.08), more instructor time spent in preparation (X^2 (2, N = 91) = 5.39, p = 0.07), more instructor time spent grading (X^2 (2, N = 91) = 5.22, p = 0.07), and less overall class attainment of learning objectives (X^2 (2, N = 91) = 10.38, p = 0.01).

We also explored whether individuals who noted COVID-19 as a motivation for teaching online responded differently than their counterparts in 2021 to the content-related items listed in Table 1. As expected, some stark differences emerged and those who noted COVID-19 as a motivation reported covering significantly less material. Table 3 below reports only the crosstabs that achieved statistical significance. When the pandemic was a motivator for moving online, those faculty reported spending significantly less time covering numeracy concepts of aggregation of data and indexes. They also reported significantly less time on the topics of qualitative methods, sampling, descriptive statistics, probability distributions, hypothesis testing, correlation, linear regression, multiple regression. Ethics and data visualization were likewise affected with faculty citing the pandemic reporting spending significantly less time covering honesty, plagiarism, and time-series line graphs. Taken together, the average amount of time dedicated to data visualization ($t(104) = 2.09$, $p = 0.04$) and course topics ($t(104) = 2.78$, $p = 0.01$) were significantly lower for the respondents who mentioned COVID-19 as a motivating factor for moving online. Average overall time dedicated to numeracy and ethics concepts also declined, but the observed differences were not statistically significant.

>>Insert Table 3 here<<

Discussion

In this research, we sought to better understand trends and developments in the teaching of quantitative and research methods courses in graduate public affairs programs. Findings from our pooled cross-sectional analysis suggest significant differences in the content and modality of these courses over the eight-year period. What we are not able to ascertain from these findings is why these changes emerged and the extent to which they are driven by thoughtful reflection, changes in modality, or disruptions wrought by the COVID-19 pandemic. One would hope instructors are evolving their courses to adapt to changing technologies and workforce needs, but it is unclear from these findings why covering less content would achieve those goals. Future research should explore why instructors are adapting content coverage in these courses.

It is possible that course modality – which is increasingly online – is influencing course content. We know instructors are likely to experience lower student persistence in online classes (McLaren, 2004; Ni, 2013). It is possible that efforts to encourage student persistence is influencing how instructors structure methods courses and forcing them to cover less material. Alternatively, instructors may be responding to the needs of different student populations in online versus in-person courses. If online courses include a higher percentage of in-service students who plan to continue their professional careers after graduation, it is possible that instructors have adapted their course material in line with scholarly recommendations (Caulkins, 1999; Aristigueta & Raffels, 2001; Horne, 2008) to focus more on management science and less on social statistics.

It remains difficult to disentangle the influence of the COVID-19 pandemic on the observed findings. It is possible the statistically significant findings showing less content coverage over time is a temporary bump in the road. Once the disruptive effects of the pandemic are past, perhaps these differences may be less evident. However, one ought to not dismiss too quickly these findings even if they are a consequence of the pandemic. Given path dependence, these practices are entirely likely to persist if not promptly and thoughtfully addressed.

What is clear from the 2021 survey is that instructors who moved their course online in response to the pandemic covered less material and did not achieve the gains in student learning outcomes and interaction seen in previous studies of quantitative and research methods courses in public administration (e.g. Ni, 2003; Harris and Nikitenko 2014). It is possible the disruption and trauma of the pandemic influenced students and instructors alike, and those factors account for the differences we observe.

Undoubtedly, many quantitative and research methods courses will remain online after the pandemic wanes. Therefore, it is important to support instructors who seek to improve student engagement and learning outcomes in the future. Although many universities have resources related to online pedagogy more generally, discipline and subject specific support could also be facilitated by NASPAA. The technological tools that encourage student engagement and learning in a quantitative methods course are quite different from those appropriate to other public affairs courses. Therefore, support specifically aimed at instructors of online quantitative courses at NASPAA member schools may be warranted if the trends of decreased topic coverage, student engagement, and lower learning outcomes persists.

Conclusion

In this article, we explored the impact of new technologies on curriculum delivery; the content of courses related to statistical analysis and research design; and the importance of numeracy, ethics, and data visualization. Findings from surveys sent to quantitative and research methods instructors in graduate public affairs programs eight years apart indicate stark differences in the content and delivery of these courses. It should come as no surprise that significantly more quantitative and research methods courses are taught online in 2021 than in 2013. The unexpected and concerning findings pertain to the significant decline in content coverage in these courses. Our results raise questions that future research might explore, particularly pertaining to why instructors are modifying methods courses to cover less content.

It is vital to know whether this evolution is occurring because instructors are adapting classes based on technological developments and best practices to ensure students are prepared for the workforce, or whether these changes are attributable to other factors. The most optimistic view is that the disruptions of the COVID-19 pandemic forced instructors to quickly prioritize in a difficult environment and content coverage will self-correct when the effects of the pandemic are past. However, it remains possible that the accelerated move to online delivery – hastened and encouraged by university administrators – is influencing course content. According to prior research, student persistence is lower in an online environment. Thus, technical classes – e.g., quantitative methods, financial management – may be more difficult to deliver in that medium.

This research relied on insights derived from surveys deployed eight years apart, which offers many advantages over a typical cross-sectional analysis. However, our approach is not without shortcomings. The increased presence of data analytics courses in NASPAA-accredited programs may be influencing what instructors cover in their methods courses. Indeed, one respondent noted that they cover less content in their methods course because they now offer a second statistics and analytics course. In that case, the observed differences are less a function of instructors potentially "watering down" their courses and more about a thoughtful evolution and expansion of what we teach future public and nonprofit professionals. Nonetheless, whereas most programs require a methods course for degree completion, additional statistics and data analytics courses are oftentimes an elective path and not all student may be engaging important content.

A second potential shortcoming of our research may emerge because we neglected to include a relevant item in the survey instrument. We maintained consistency in our instrument and data collection methods to control for potential methodological variations and improve the comparability of findings from the different collection periods. However, much has changed over the eight-year period. For example, one respondent noted that they now incorporate data programming in R, whereas they just used software with dropdowns in 2013. An increased focus on tools such as programming demonstrates a pivot that is responsive to changing workforce needs.

Similar to Horne (2008), we hope this article will stimulate more discussion and thoughtful consideration about what and how we teach quantitative and research methods courses in graduate public affairs programs. Our students are current and future public and nonprofit professionals, and it is our responsibility to give them the skills and knowledge they need to be successful in a changing economy.

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Tables

Table 1. Survey items for each of the four content-specific survey sections

Course Topics	Numeracy	Ethics	Data Visualization
Non-experimental designs	Rates & rates of change	Confidentiality	Advanced table design – e.g., crosstabs, contingency tables
Quasi-experimental designs	Percent & percentage point change	Honesty	Scatter plots
Experimental designs	Numerical relationships – e.g., 5 times larger than x	Objectivity	Box plots
Qualitative methods	Order of operations	Plagiarism	Stem-and-leaf diagrams
Sampling	Basic algebra	Protection of human subjects	Histograms
Measurement	Linear & exponential growth	Institutional review board	Time-series line graphs
Descriptive statistics	Weighted averages	Falsification of data/results	Categorical bar graphs
Probability – introduction	Aggregation of data	Full disclosure of intent of research to study subjects	Choropleth (shaded) maps
Probability distributions – e.g., normal & student's t	Indexes e.g., Dow Jones, CPI, BMI	Full disclosure of any conflicts of interest	Graduated symbol maps
Other probability distributions – e.g., chi-square	Probability, risk, odds	Data bias	Dot density maps
Hypothesis testing	Basic graphical techniques		
Confidence intervals			
Significance testing			
Categorical data analysis			
Correlation			
Linear regression			
Multiple regression			
Nonlinear methods – e.g., probit, logit			
Time-series analysis			

Tables 2a-e. Universal tables for 2013 vs. 2021 crosstabs.

Table 2a: National Survey on Teaching Research and Quantitative Methods--Cross-Tabulations for Numeracy Concepts
(marginal/statistical significance indicated by gray shading)

How much time do you devote to the following numeracy concepts?		SurveyWave 2013	SurveyWave 2021	How much time do you devote to the following numeracy concepts?		SurveyWave 2013	SurveyWave 2021
Rates and rates of change	No time	39	36	**Weighted averages**	No time	33	41
		26.9%	34.3%			23.2%	39.4%
	Some time	52	42		Some time	50	37
		35.9%	40.0%			35.2%	35.6%
	Significant time	54	27		Significant time	59	26
		37.2%	25.7%			41.5%	25.0%
	Total	**145**	**105**		**Total**	**142**	**104**
Percent and percentage point change	No time	28	27	**Aggregation of data**	No time	17	14
		19.6%	25.7%			12.1%	13.7%
	Some time	54	43		Some time	34	32
		37.8%	41.0%			24.1%	31.4%
	Significant time	61	35		Significant time	90	56
		42.7%	33.3%			63.8%	54.9%
	Total	**143**	**105**		**Total**	**141**	**102**
Numerical relationships (e.g., "five times larger than x")	No time	61	38	**Indexes (e.g., Dow Jones, CPI, BMI)**	No time	44	53
		42.7%	36.9%			30.8%	52.0%
	Some time	37	29		Some time	47	31
		25.9%	28.2%			32.9%	30.4%
	Significant time	45	36		Significant time	52	18
		31.5%	35.0%			36.4%	17.6%
	Total	**143**	**103**		**Total**	**143**	**102**
Order of operations	No time	76	56	**Probability, risk, odds**	No time	10	14
		53.1%	54.4%			6.9%	13.6%
	Some time	43	26		Some time	25	24
		30.1%	25.2%			17.4%	23.3%
	Significant time	24	21		Significant time	109	65
		16.8%	20.4%			75.7%	63.1%
	Total	**143**	**103**		**Total**	**144**	**103**
Basic algebra	No time	67	46	**Basic graphical techniques**	No time	9	8
		47.2%	45.1%			6.2%	7.6%
	Some time	35	34		Some time	24	17
		24.6%	33.3%			16.6%	16.2%
	Significant time	40	22		Significant time	112	80
		28.2%	21.6%			77.2%	76.2%
	Total	**142**	**102**		**Total**	**145**	**105**
Linear and exponential growth	No time	49	37				
		34.8%	35.9%				
	Some time	31	29				
		22.0%	28.2%				
	Significant time	61	37				
		43.3%	35.9%				
	Total	**141**	**103**				

Table 2b: National Survey on Teaching Research and Quantitative Methods--Cross-Tabulations for Course Delivery Differences

(marginal/statistical significance indicated by gray shading)

How has the course offered through an alternate delivery differed from when it was offered via traditional course delivery?		SurveyWave 2013	SurveyWave 2021
Student interaction	Less	11	52
		31.4%	57.1%
	Same	13	32
		37.1%	35.2%
	More	11	7
		31.4%	7.7%
	Total	**35**	**91**
Computational exercises	Less	0	12
		0.0%	13.6%
	Same	29	64
		82.9%	72.7%
	More	6	12
		17.1%	13.6%
	Total	**35**	**88**
Instructor feedback on student progress	Less	0	7
		0.0%	7.7%
	Same	19	58
		54.3%	63.7%
	More	16	26
		45.7%	28.6%
	Total	**35**	**91**
Instructor time spent in preparation	Less	2	4
		5.6%	4.4%
	Same	12	29
		33.3%	31.9%
	More	22	58
		61.1%	63.7%
	Total	**36**	**91**
Instructor time spent grading	Less	0	5
		0.0%	5.5%
	Same	18	55
		51.4%	60.4%
	More	17	31
		48.6%	34.1%
	Total	**35**	**91**
Overall class attainment of learning objectives	Less	2	17
		5.9%	*18.7%*
	Same	24	58
		70.6%	63.7%
	More	8	16
		23.5%	17.6%
	Total	**34**	**91**

Table 2c: National Survey on Teaching Research and Quantitative Methods--Cross-Tabulations for Course Topical Coverage

(marginal/statistical significance indicated by gray shading)

What are the main topics covered by your quantitative and research methods course?		SurveyWave 2013	2021
Non-experimental designs	Less than one hour (lecture and exercise)	53	29
		38.4%	28.2%
	One to two hours	33	27
		23.9%	26.2%
	Two or more hours (lecture and exercise)	52	47
		37.7%	45.6%
	Total	**138**	**103**
Quasi-experimental designs	Less than one hour (lecture and exercise)	44	46
		31.2%	44.2%
	One to two hours	44	31
		31.2%	29.8%
	Two or more hours	53	27
		37.6%	26.0%
	Total	**141**	**104**
Experimental designs	Less than one hour (lecture and exercise)	49	39
		35.0%	37.5%
	One to two hours	40	37
		28.6%	35.6%
	Two or more hours	51	28
		36.4%	26.9%
	Total	**140**	**104**
Qualitative methods	Less than one hour (lecture and exercise)	57	53
		40.7%	51.0%
	One to two hours	22	16
		15.7%	15.4%
	Two or more hours	61	35
		43.6%	33.7%
	Total	**140**	**104**
Sampling	Less than one hour (lecture and exercise)	32	26
		22.5%	24.8%
	One to two hours	50	33
		35.2%	31.4%
	Two or more hours	60	46
		42.3%	43.8%
	Total	**142**	**105**
Measurement	Less than one hour (lecture and exercise)	17	20
		12.1%	18.9%
	One to two hours	49	28
		34.8%	26.4%
	Two or more hours	75	58
		53.2%	54.7%
	Total	**141**	**106**
Descriptive statistics	Less than one hour (lecture and exercise)	17	17
		12.1%	16.0%
	One to two hours	26	21
		18.4%	19.8%
	Two or more hours	98	68
		69.5%	64.2%
	Total	**141**	**106**

What are the main topics covered by your quantitative and research methods course?		SurveyWave 2013	2021
Probability-Intro	Less than one hour (lecture and exercise)	54	49
		38.6%	46.2%
	One to two hours	32	22
		22.9%	20.8%
	Two or more hours	54	35
		38.6%	33.0%
	Total	**140**	**106**
Probability distributions (normal and student's t)	Less than one hour (lecture and exercise)	39	38
		27.9%	35.8%
	One to two hours	28	31
		20.0%	29.2%
	Two or more hours	73	37
		52.1%	34.9%
	Total	**140**	**106**
Other probability distributions (chi-square, etc.)	Less than one hour (lecture and exercise)	47	40
		34.1%	38.1%
	One to two hours	30	31
		21.7%	29.5%
	Two or more hours	61	34
		44.2%	32.4%
	Total	**138**	**105**
Hypothesis testing	Less than one hour (lecture and exercise)	21	20
		14.9%	18.9%
	One to two hours	26	25
		18.4%	23.6%
	Two or more hours	94	61
		66.7%	57.5%
	Total	**141**	**106**
Confidence intervals	Less than one hour (lecture and exercise)	34	41
		24.5%	39.0%
	One to two hours	42	28
		30.2%	26.7%
	Two or more hours	63	36
		45.3%	34.3%
	Total	**139**	**105**
Significance testing	Less than one hour (lecture and exercise)	24	25
		17.0%	23.6%
	One to two hours	28	25
		19.9%	23.6%
	Two or more hours	89	56
		63.1%	52.8%
	Total	**141**	**106**
Categorical data analysis	Less than one hour (lecture and exercise)	35	29
		25.2%	27.6%
	One to two hours	40	28
		28.8%	26.7%
	Two or more hours	64	48
		46.0%	45.7%
	Total	**139**	**105**

What are the main topics covered by your quantitative and research methods course?		SurveyWave 2013	2021
Correlation	Less than one hour (lecture and exercise)	31	25
		22.0%	23.6%
	One to two hours	40	39
		28.4%	36.8%
	Two or more hours	70	42
		49.6%	39.6%
	Total	**141**	**106**
Linear regression	Less than one hour (lecture and exercise)	12	11
		8.5%	10.4%
	One to two hours	17	11
		12.1%	10.4%
	Two or more hours	22	20
		15.6%	18.9%
	Total	**141**	**106**
Multiple regression	Less than one hour (lecture and exercise)	29	22
		20.6%	20.8%
	One to two hours	22	20
		15.6%	18.9%
	Two or more hours	90	64
		63.8%	60.4%
	Total	**138**	**106**
Nonlinear methods (Probit, Logit, etc.)	Less than one hour (lecture and exercise)	101	75
		74.3%	71.4%
	One to two hours	15	13
		11.0%	12.4%
	Two or more hours	20	17
		14.7%	16.2%
	Total	**136**	**105**
Time series analysis	Less than one hour (lecture and exercise)	109	89
		79.0%	84.8%
	One to two hours	14	10
		10.1%	9.5%
	Two or more hours	15	6
		10.9%	5.7%
	Total	**138**	**105**

Table 2d: National Survey on Teaching Research and Quantitative Methods--Cross-Tabulations for Ethical Concepts and Principles

(marginal/statistical significance indicated by gray shading)

Are ethical concepts and principles covered in your course?		SurveyWave 2013	SurveyWave 2021
	Yes	118	89
		81.4%	84.0%
	No	27	17
		18.6%	16.0%
	Total	**145**	**106**

If yes, how much class time are devoted to the following principles?		SurveyWave 2013	SurveyWave 2021	**If yes, how much class time are devoted to the following principles?**		SurveyWave 2013	SurveyWave 2021
Confidentiality	No time	5	6	**Institutional review boards**	No time	11	12
		4.3%	6.7%			9.4%	13.3%
	Some time	57	49		Some time	52	46
		48.7%	54.4%			44.4%	51.1%
	Significant time	55	35		Significant time	54	32
		47.0%	38.9%			46.2%	35.6%
	Total	**117**	**90**		**Total**	**117**	**90**
Honesty	No time	2	5	**Falsification of data/results**	No time	7	8
		1.7%	5.6%			6.0%	8.9%
	Some time	61	41		Some time	63	52
		52.1%	45.6%			53.8%	57.8%
	Significant time	54	44		Significant time	47	30
		46.2%	48.9%			40.2%	33.3%
	Total	**117**	**90**		**Total**	**117**	**90**
Objectivity	No time	0	1	**Full disclosure of intent of research to study subjects**	No time	10	11
		0.0%	1.1%			8.5%	12.2%
	Some time	46	43		Some time	57	47
		39.3%	47.8%			48.7%	52.2%
	Significant time	71	46		Significant time	50	32
		60.7%	51.1%			42.7%	35.6%
	Total	**117**	**90**		**Total**	**117**	**90**
Plagiarism	No time	15	9	**Full disclosure of any conflicts of interests**	No time	16	14
		12.7%	10.0%			13.7%	15.6%
	Some time	67	49		Some time	60	52
		56.8%	54.4%			51.3%	57.8%
	Significant time	36	32		Significant time	41	24
		30.5%	35.6%			35.0%	26.7%
	Total	**118**	**90**		**Total**	**117**	**90**
Protection of human subjects	No time	8	6	**Data bias**	No time	0	2
		6.8%	6.7%			0.0%	2.2%
	Some time	41	34		Some time	0	37
		35.0%	37.8%			0.0%	41.1%
	Significant time	68	50		Significant time	0	51
		58.1%	55.6%			0.0%	56.7%
	Total	**117**	**90**		**Total**		**90**

Table 2e: National Survey on Teaching Research and Quantitative Methods--Cross-Tabulations for Data Visualization Techniques

(marginal/statistical significance indicated by gray shading)

How much time to you devote to the following data visualization techniques?		SurveyWave 2013	2021	How much time to you devote to the following data visualization techniques?		SurveyWave 2013	2021
Advanced table design (cross-tabs, contingency tables)	No time	18	17	**Time-series line graphs**	No time	34	35
		13.5%	16.3%			25.4%	33.3%
	Some time	32	13		Some time	55	35
		24.1%	12.5%			41.0%	33.3%
	Significant time	83	74		Significant time	45	35
		62.4%	71.2%			33.6%	33.3%
	Total	**133**	**104**		**Total**	**134**	**105**
Scatter plots	No time	15	14	**Categorical bar graphs**	No time	16	21
		11.3%	13.2%			12.0%	20.0%
	Some time	41	31		Some time	54	33
		30.8%	29.2%			40.6%	31.4%
	Significant time	77	61		Significant time	63	51
		57.9%	57.5%			47.4%	48.6%
	Total	**133**	**106**		**Total**	**133**	**105**
Box plots	No time	43	47	**Choropleth (shaded) maps**	No time	102	88
		32.8%	44.8%			78.5%	83.8%
	Some time	45	30		Some time	23	12
		34.4%	28.6%			17.7%	11.4%
	Significant time	43	28		Significant time	5	5
		32.8%	26.7%			3.8%	4.8%
	Total	**131**	**105**		**Total**	**130**	**105**
Stem-and-leaf diagrams	No time	57	71	**Graduated symbol maps**	No time	106	95
		43.8%	67.0%			80.3%	90.5%
	Some time	51	23		Some time	20	8
		39.2%	21.7%			15.2%	7.6%
	Significant time	22	12		Significant time	6	2
		16.9%	11.3%			4.5%	1.9%
	Total	**130**	**106**		**Total**	**132**	**105**
Histograms	No time	6	16	**Dot density maps**	No time	98	88
		4.5%	15.1%			75.4%	83.0%
	Some time	52	37		Some time	25	9
		38.8%	34.9%			19.2%	8.5%
	Significant time	76	53		Significant time	7	9
		56.7%	50.0%			5.4%	8.5%
	Total	**134**	**106**		**Total**	**130**	**106**

Table 3: Effects of COVID-19 on Course Content--Cross-Tabulations
(only statistically significant findings presented)

How much time do you devote to the following concepts?		Mention COVID-19 No	Mention COVID-19 Yes	How much time do you devote to the following concepts?		Mention COVID-19 No	Mention COVID-19 Yes
Aggregation of Data	No time	6	8	**Correlations**	No time	10	15
		9.4%	21.1%			14.9%	38.5%
	Some time	18	14		Some time	28	11
		28.1%	36.8%			41.8%	28.2%
	Significant time	40	16		Significant time	29	13
		62.5%	42.1%			43.3%	33.3%
	Total	**64**	**38**		**Total**	**67**	**39**
Indexes (e.g., Dow Jones, CPI, BMI)	No time	28	25	**Linear Regression**	No time	9	13
		43.8%	65.8%			13.4%	33.3%
	Some time	22	9		Some time	16	4
		34.4%	23.7%			23.9%	10.3%
	Significant time	14	4		Significant time	42	22
		21.9%	10.5%			62.7%	56.4%
	Total	**64**	**38**		**Total**	**67**	**39**
Qualitative Methods	No time	28	25	**Multiple Regression**	No time	9	15
		43.1%	64.1%			13.4%	38.5%
	Some time	13	3		Some time	18	5
		20.0%	7.7%			26.9%	12.8%
	Significant time	24	11		Significant time	40	19
		36.9%	28.2%			59.7%	48.7%
	Total	**65**	**39**		**Total**	**67**	**39**
Sampling	No time	11	15	**Honesty**	No time	1	4
		16.7%	38.5%			1.7%	12.5%
	Some time	25	8		Some time	27	14
		37.9%	20.5%			46.6%	43.8%
	Significant time	30	16		Significant time	30	14
		45.5%	41.0%			51.7%	43.8%
	Total	**66**	**39**		**Total**	**58**	**32**
Descriptive Statistics	No time	6	11	**Plagiarism**	No time	4	5
		9.0%	28.2%			6.9%	15.6%
	Some time	16	5		Some time	28	21
		23.9%	12.8%			48.3%	65.6%
	Significant time	45	23		Significant time	26	6
		67.2%	59.0%			44.8%	18.8%
	Total	**67**	**39**		**Total**	**58**	**32**
Probability Distributions	No time	19	19	**Time-Series Line Graphs**	No time	18	17
		28.4%	48.7%			26.5%	45.9%
	Some time	23	8		Some time	27	8
		34.3%	20.5%			39.7%	21.6%
	Significant time	25	12		Significant time	23	12
		37.3%	30.8%			33.8%	32.4%
	Total	**67**	**39**		**Total**	**68**	**37**
Hypothesis Testing	No time	9	11				
		13.4%	28.2%				
	Some time	14	11				
		20.9%	28.2%				
	Significant time	44	17				
		65.7%	43.6%				
	Total	**67**	**39**				