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

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 (Rubaii, 2019). 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 educate and 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 (2013 and 2021) and analyzed results from each period side-by-side. Findings indicate some differences in the content and delivery of these courses. The findings are also considered within the context of the 2009 shift in NASPAA accreditation standards from a focus on required courses and subjects to a focus on required competencies (Goodman, 2020). Finally, we consider the transition to online teaching caused by the COVID-19 pandemic.

Although our inquiry with these surveys is multi-dimensional in scope, the core skills that started our investigation were in the area of numeracy. The initial motivation of this research the

observation of our Senior Author, a co-author of a leading textbook on statistical analysis in public administration and nonprofit management, that the nature of new graduate students in public affairs programs had changed over the course of his career. By the aughts, students were more visual and verbal in their analytical approaches but seemed to be increasingly lacking in basic quantitative skills essential for analyses that are common to public management careers – skills that are most akin to the concept of numeracy. Feedback from employers who hired students highlighted a declining quantitative toolbox that fell short of prior generations of new public managers. Also, students seemed to be more in need of basic instruction related to common mathematical concepts once commonly mastered in secondary education and undergraduate education programs.

This concern is substantiated by an ongoing comparative panel study of the basic work skills of adults, which includes measures of literacy, numeracy, and problem solving. The Program for the International Assessment of Adult Competencies conducted analyses in cooperation with the U.S. Department of Education's National Center for Educational Statistics and documented the performance decline of U.S. adults across numeracy measures as well an inferior position of American adults compared to other industrialized nations in the areas of both numeracy and problem solving between the years 2003 and 2017 (Mamedova and Pawlowski, 2020, 2021; OECD, 2013).

NASPAA accreditation standards also changed in this time period, possibility impacting the coverage of quantitative concepts in public affairs programs. NASPAA accreditation of public affairs programs dates to 1983 with a focus on "inputs" such as specific courses and topics that were required within the curriculum. In 2009, the standards were updated to focus on five "universal competencies" which met through courses that grow out of program's mission and

assessed through student learning outcomes (Guy and Stillman, 2016). Competency Three, "analyze, synthesize, think critically, solve problems, and make decisions" is generally considered to encompass the quantitative topics covered by this study (Goodman, 2020). The current NASPAA accreditation standards have been criticized as being so broad and non-specific that any social science master's program could meet the standards as long as it has a focus on public service (Guy and Stillman, 2016). The degree to which this shift in accreditation standards impacted the content of quantitative and research methods courses has not been explored in the literature and it is therefore unclear how the shift to broad competencies in analysis and problem solving has impacted quantitative and research methods courses.

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, and Brudney, 1994). A primary focus of these surveys was identifying the quantitative techniques covered in different MPA programs, ranging from descriptive statistics to PERT (i.e. Program Evaluation and Review Technique used to predict event timing in project management).

Although most MPA programs 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.

In the 1990s and early 2000s, scholars advanced the argument 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 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).

Recent discussions of what public administration students should learn about quantitative methods incorporates the distinction between producers and consumers of statistical research, with the majority of MPA students firmly in the latter category (Smith & Martinez-Moyano 2012; Gunn 2017). Engbers (2016) posits that in an increasingly data-driven policy environment, it is critical that future public servants learn to apply quantitative research, regardless of whether they personally conduct the analyses. Highlighting the centrality of data to policy making, Overton and Kleinschmit (2021) hold that data science should be integrated across the entire MPA curriculum and propose a "Data Science Literacy Framework" to accomplish this goal. Several small studies of pedagogical innovations in teaching quantitative methods to public affairs students have also been published recently, featuring techniques such as service learning (Lowery, 2007), problem-based and comparative reasoning (Engbers, 2016), and collaborative research partnerships with community organizations (Sarter 2020). Public administration is not alone in this debate over *how* to teach quantitative methods, a famously challenging subject. For example, some within the field of economics argue that teaching narrative economics will lead to greater knowledge retention than the traditional graphs and formulas (Frank, 2007).

Although some disagreement exists regarding the which quantitative coursework is appropriate in public affairs curricula, scholars generally concur that the ability to reason with quantitative information is critical to a career in public service. Underlying all of the approaches to teaching quantitative and research methods in public affairs courses is numeracy, the mathematical parallel to literacy. Despite the importance of numeracy as a foundation to more advanced quantitative concepts, scholars have long noted that MPA and MPP students enter – and in some cases leave – graduate school with low levels of numeracy. Concerns about MPA students' preparation for quantitative coursework have existed since Hy et al. (1987) conducted their first

survey on quantitative methods in MPA programs in 1984. Today, "there is continuing concern about the paucity of social science graduates who have the quantitative skills required by academia and industry" (Clark & Foster, 2017, p. 260). Many MPA students suffer from "arithmophobia," which can in turn lead to "quantitative paralysis" (Kasdan 2015). For these students, an initial focus on numeracy can ease students' pathways into statistics by reducing anxiety and scaffolding learning, ensuring that more students graduate with the ability to use quantitative reasoning to make public decisions.

Online learning in quantitative methods courses

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, mostly voluntary, and driven by university preferences, student need, and instructor preference. 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 second and more abrupt transition framing this study is the shift to increased online teaching imposed by the COVID-19 pandemic as universities moved courses online starting in Spring 2020. As McDonald (2021, p. 4) notes, "in many ways, the transition provided a referendum about online education [in public administration]. 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." Broadly, we know that the impact of the rapid and complete shift to online teaching created issues for both instructors and students in higher education globally (Chang & Fang, 2020; Selvanathan et. al. 2020) and in public affairs specifically (McDonald 2021).

The scholarly reckoning with the impacts and implications of the pandemic on public affairs education is ongoing. Guy (2020) and Vogel (2021) consider how the experience of public servants during the pandemic should shape public affairs education wholistically. Guy (2020) argues that the field should emphasize emotion and "interpersonal competence" along with the traditional value of rationality to better prepare future professionals who will provide public service in "the worst of times." Vogel (2021) contends that a renewed emphasis on public service vocation will better equip students to persevere professionally in the face of disruptive and politically polarizing events like the COVID-19 pandemic. Focusing more tightly on one aspect of the typical public affairs curriculum, Wheeler and Waite (2021) discuss the impacts of the shift to

online courses on internships within MPA programs and provide recommendations for how to continue internships when on site work is not possible. Finally, Yaghi (2021) studied the mental health of over 6,000 undergraduate public administration students in Jordan before and during the pandemic. This study found a persistent increase in anxiety and stress related to concerns about decreased course quality, rapport with instructors, and professional training.

To date, there are no published studies that discuss the impact of COVID-19 on quantitative or research methods courses specifically. The abrupt shift online for many instructors and students during COVID-19 likely impacted 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 new contributions.

Survey participants 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. 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.

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		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			

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. In these cases, program directors were asked to forward the survey to instructors of graduate-level quantitative and research methods courses. 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. In both survey waves, respondents were sent a recruitment email in April and May, with approximately six-weeks separating the first and second email. Data collection yielded 167 and 122 usable responses from the first and second survey waves, respectively.

Given the sample size, we assume that the distribution of accredited programs and degree types mirrors that of NASPAA member schools. NASPAA membership includes both accredited and nonaccredited programs and programs that offer an MPA, MPP, and a range of other master's degrees that focus on public service such as a MS in Public Service Management, and MA in Public Policy and Management. Some NASPAA member schools offer more than one public service-focused master's degree but have only pursued accreditation for one program. Additionally, a given course may service two master's degree programs simultaneously at the same NASPAA member school. Due to this complexity, we did not analyze the impact of accreditation or degree program on the courses included in the study.

The demographic characteristics of survey respondents are presented in table 2 below alongside NASPAA member program faculty demographics. The figures are remarkably consistent across our two surveys and very closely align with NASPAA's statistics. We see a slight overrepresentation among respondents who identify as Asian, but otherwise the demographics present no evidence of potential bias. We discuss the implications of who teaches quantitative methods courses in MPA and MPP programs in greater detail in a separate, forthcoming article.

Table 2. Respondent Demographics vs Averages in NASPAA accredited programs

	2013 survey respondent demographics	2021 survey respondent demographics	NASPAA member program faculty demographics*
White	78%	74%	72%
African American	8%	8%	9%
Asian	12%	16%	8%
Hispanic or Latino	2%	7%	5%

Native Hawaiian or Pacific Islander	<1%	0%	-
American Indian or Alaska Native	<1%	<1%	<1%
Male	65%	62%	64%
Female	35%	37%	36%

Notes: * NASPAA percentages are an average of the data found in the following reports: 2013 Diversity Report (Primo, 2013), 2018-2019 Self-Study Diversity Insights report (Ledezma, n.d), and the 2019-2020 NASPAA Annual Data Report (Maples, n.d.). Percentages do not sum to 100 due to rounding and because respondents in our surveys could select multiple options.

Analysis

Our analytic approach involved comparing survey data from the two periods. We created a normalized index variable by summing survey responses to the 11 numeracy questions, 19 quantitative topic questions, 9 ethics questions, and 10 data visualization questions and converting these raw scores to z-scores. These index variables allowed us to compare the amount of change across the four major content areas, as well as across the two surveys. We then compared means via independent-sample t-tests to determine whether the coverage of numeracy, topics, ethics, and data visualization decreased between 2013 and 2021. Responding to concerns in the literature on the impact of competency-based accreditation standards on public affairs curricula, we hypothesized that coverage in each area would be lower in 2021 than in 2013.

To explore changes in the topics covered by individual survey questions, we conducted a chi-square analysis. Responses to individual questions were recoded and reduced from five to three categories given the low number of counts and unequal variances for some items. In the ethics section, “none” was recoded as 1, “a little” and “a moderate amount” were recoded as 2, and “a lot” and “a great deal” were recoded as 3. In the numeracy, and data visualization sections respondents were asked how much time they spent on specific topics. “No time” was recoded as 1, “up to 10 minutes” and “10 to 20 minutes” was recoded as 2, and “21 to 30 minutes” and “more

than 30 minutes was recoded as 3. Similarly, in the quantitative topics section of the survey “no coverage” was recoded as 1, "less than one hour” and “one to two hours” was recoded as two, and “more than two hours” was recoded as 3. We generated frequencies for each 2013 and 2021 variable, 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 to these concepts over time.

Finally, we focused on the results from the second survey and analyzed whether COVID-19 influenced the coverage of course content. 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. For example, one survey participant wrote “COVID-19 required all our courses to be delivered fully online between fall 2020 and fall 2021.” Others simply stated “COVID-19” or “the pandemic.” In order to explore the extent to which COVID-19 may have influenced course delivery and content, 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. In the 2021 sample, 37% of respondents reported that they moved their course online as a result of COVID-19.

Results

Our analysis of the index scores in 2013 and 2021 showed that quantitative methods and research methods course coverage did change between these two survey years, but not consistently. There was a statistically significant decrease in the coverage of quantitative topics in 2021 but there was no statistically significant difference in the coverage of numeracy, ethics or data visualization. In this section, we discuss these findings and present a finer grained analysis of

which individual topics were covered in greater detail through the results of our chi-square analysis. In the subsequent section, we consider the impact of COVID-19 on course content.

Table 3. T-Tests for Coverage in Each Section Between Periods

	Mean	Standard deviation	t	df	Significance (2-tailed)
Numeracy concepts index					
2013 z scores	0.10	1.02	1.86	226	.065[m]
2021 z scores	-0.14	0.95			
Course topics index					
2013 z scores	0.12	0.94	2.03	219	0.043*
2021 z scores	-0.15	1.06			
Ethics average index					
2013 z scores	0.01	1.01	0.23	249	.816
2021 z scores	-0.02	0.99			
Data visualization index					
2013 z scores	0.03	1.02	0.58	231	.562
2021 z scores	-0.04	.981			

Notes: [m]=p<0.10, *=p<0.05, **=p<0.01

In 2021, course coverage of numeracy was not significantly different than in 2013 t(226)=1.9, p=.065. Among the numeracy concepts, the chi-square analysis indicates that faculty dedicated significantly less time to weighted averages and indexes in 2021 (see table 4a). 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. We present the frequencies and Pearson chi-square statistics for each of the statistically significant items across the two periods in tables 4a-c below (full output for all surveyed items can be found in supplemental tables 1a-1d in the following repository: https://github.com/prenticecr/methods).

Table 4a. Crosstabulations for Numeracy Concept Coverage

Time Spent on Numeracy Concepts	Weighted Averages 2013	Weighted Averages 2021	Indexes 2013	Indexes 2021	Probability, Risk, Odds 2013	Probability, Risk, Odds 2021
No time	23%	39%	31%	52%	7%	14%
Some time	35%	36%	33%	30%	17%	23%
Significant time	42%	25%	36%	18%	76%	63%
Pearson Chi-Square	9.99		14.17		5.15	
Significant (2-sided)	0.01**		0.00**		0.08[m]	

Notes: Percentages sum by column and may not sum to 100 due to rounding. Only statistically significant findings presented. [m]=p<0.10, *=p<0.05, **=p<0.01. For full output, please see supplemental table 1a.

Table 4b. Crosstabulations for Course Topical Coverage

Time Spent on Course Topics	Quasi-Experimental Designs 2013	Quasi-Experimental Designs 2021	Probability Distributions 2013	Probability Distributions 2021	Non-Experimental Designs 2013	Non-Experimental Designs 2021
No time	31%	44%	28%	36%	24%	39%
Some time	31%	30%	20%	29%	30%	27%
Significant time	38%	26%	52%	35%	45%	34%
Pearson Chi-Square	5.28		7.40		6.20	
Significant (2-sided)	0.07 [m]		0.03*		0.05*	

Notes: Percentages sum by column and may not sum to 100 due to rounding. Only statistically significant findings presented. [m]=p<0.10, *=p<0.05, **=p<0.01. For full output, please see supplemental table 1b.

Table 4c. Crosstabulations for Data Visualization Coverage

Time Spent on Data Visualization	Advanced Table Design 2013	Advanced Table Design 2021	Stem-and-Leaf Diagrams 2013	Stem-and-Leaf Diagrams 2021	Histograms 2013	Histograms 2021	Graduated Symbol Maps 2021	Graduated Symbol Maps 2021	Dot Density Maps 2013	Dot Density Maps 2021
No time	14%	16%	44%	67%	4%	15%	80%	90%	75%	83%
Some time	24%	13%	39%	22%	39%	35%	15%	8%	19%	8%
Significant time	62%	71%	17%	11%	57%	50%	5%	2%	5%	8%
Pearson Chi-Square	5.09		12.76		8.02		4.73		5.94	
Significant (2-sided)	0.08 [m]		0.00		0.02		0.09 [m]		0.05	

Notes: Percentages sum by column and may not sum to 100 due to rounding. Only statistically significant findings presented. [m]=p<0.10, *=p<0.05, **=p<0.01. For full output, please see supplemental table 1c.

In contrast, coverage of quantitative topics was significantly lower in 2021 in comparison to 2013, $t(219)=2.03$, $p=.043$. Faculty spent significantly less time covering quasi-experimental designs, probability distributions, and non-experimental designs in 2021 (table 4b). 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.

Similar to the coverage of numeracy, there was no statistically significant difference in the coverage of ethics when 2013 was compared to 2021, $t(249)=0.233$, $p=.816$. There was also no major change in the number of faculty reporting that they cover ethics in their course. In 2013, 82% of survey respondents reported that ethical concepts and principles are covered in their course while in 2021, 84% answered "yes" to this question. The individual ethical concepts under consideration also showed no statistically significant differences between periods in the chi-square analysis (e.g. confidentiality, falsification of data, etc.). These results are reported in supplemental table 1d.

The difference in coverage of data visualization was also not statically significant when the index scores were compared, $t(213)=0.58$, $p=.562$ but respondents did report spending significantly less time on several data visualization concepts in 2021 (table 4c). 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.

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 were taught online in 2021 when 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. Of the survey participants who taught online courses in 2021, 46% reported that they moved their course online due to COVID 19. Given the speed at which instructors were forced to move their courses online in response to COIVD 19, it is likely that getting up to speed in online teaching overnight impacted the breadth of topics covered in these courses. To explore this impact, we ran the analysis report above again without the survey participants who moved their courses online in response to COVID 19. When these courses were excluded, the differences in coverage of quantitative topics disappeared. There was no statistically significant difference in the mean index score in numeracy, quantitative topics, ethics or data visualization when the courses that moved online due to COVID 19 were excluded from the analysis (table 5). We interpret this as an indication that the implementation of the competency-based NASPAA standards has not impacted the content of quantitative methods and research methods courses.

Table 5. T-Tests for Coverage in Each Section When the Pandemic is not a Motivation for Moving Course Online

	Mean	Standard deviation	t	df	Significance (2-tailed)
Numeracy concepts index					
2013 z scores	0.10	1.02	-1.43	114	.155
2021 z scores	-0.04	0.95			
Course topics index					
2013 z scores	0.12	0.94	-0.04	106	.971

2021 z scores	-0.06	0.86			
Ethics average index					
2013 z scores	0.01	1.01	0.10	210	.918
2021 z scores	0.03	0.97			
Data visualization index					
2013 z scores	-0.02	1.00	0.40	116	.689
2021 z scores	0.08	0.95			

Notes: ^{m}=p<0.10, *=p<0.05, **=p<0.01

We also explored whether individuals who noted COVID-19 as a motivation for teaching online spent less time than their counterparts in 2021 on the individual topics covered in the survey (table 1) through a chi-square analysis. As expected, some differences emerged and those who noted COVID-19 as a motivation for teaching online reported covering significantly less material (table 6). 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 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.

Table 6. Crosstabulations for Numeracy, Course Topic, Ethics, and Data Visualization Coverage when Pandemic is Motivation for Moving Course Online

	Aggregation of Data		Indexes		Qualitative Methods		Sampling		Descriptive Statistics	
Time spent	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor
No time	9%	21%	44%	66%	43%	64%	17%	39%	9%	28%
Some time	28%	37%	34%	24%	20%	8%	38%	21%	24%	13%
Significant time	63%	42%	22%	11%	37%	28%	46%	41%	67%	59%
Pearson Chi-Square	4.75		4.87		5.07		7.16		7.48	
Significant (2-sided)	0.09[m]		0.09[m]		0.08[m]		0.03*		0.02	

	Probability Distributions		Hypothesis Testing		Correlation		Linear Regression		Multiple Regression	
Time spent	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor
No time	28%	49%	13%	28%	15%	39%	13%	33%	13%	39%
Some time	34%	21%	21%	28%	42%	28%	24%	10%	27%	13%
Significant time	37%	31%	66%	44%	43%	33%	63%	56%	60%	49%
Pearson Chi-Square	4.76		5.50		7.64		7.29		9.60	
Significant (2-sided)	0.09[m]		0.06[m]		0.02*		0.03*		0.01	

	Honesty		Plagiarism		Time-Series Line Graphs	
Time spent	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor
No time	2%	13%	7%	16%	27%	46%
Some time	47%	44%	48%	66%	40%	22%
Significant time	52%	44%	45%	19%	34%	32%
Pearson Chi-Square	4.61		6.66		5.09	
Significant (2-sided)	0.10[m]		0.04*		0.08[m]	

Notes: Percentages sum by column and may not sum to 100 due to rounding. Only statistically significant findings presented. [m]=p<0.10, *=p<0.05, **=p<0.01

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), and less overall class attainment of learning objectives (X^2 (2, N = 91) = 10.38, p = 0.01) (table 7). The largest differences were in student interaction and learning attainment. Twenty-six percent more faculty who moved their course online due to COVID 19 reported that student engagement and learning attainment were lower online than in their comparable face-to-face class. These faculty also reported more instructor time spent grading (X^2 (2, N = 91) = 5.22, p = 0.07), but this difference was smaller with only 9% of faculty reporting that grading in their online courses took more time in their online course and an approximately equal number reporting grading took the same amount of time in their online and face-to-face courses.

Table 7. Crosstabulations for Teaching Online and Influence on Content and Engagement when Pandemic was Motivation for Moving Course Online

	Student Interaction		Computational Exercises		Instructor Prep Time		Instructor Grading Time		Learning Attainment	
Teaching Online Instead of Face-to-Face	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor	No mention of pandemic	Pandemic was factor
Less	45%	71%	6%	22%	9%	0%	11%	0%	6%	32%
Same	49%	21%	77%	68%	36%	27%	60%	61%	70%	57%
More	6%	9%	17%	10%	55%	73%	30%	39%	23%	11%
Pearson Chi-Square	8.10		4.95		5.39		5.22		10.38	
Significant (2-sided)	0.02*		0.08[m]		0.07[m]		0.07[m]		0.01**	

Notes: Percentages sum by column and may not sum to 100 due to rounding. [m]=p<0.10, *=p<0.05, **=p<0.01

To explore changes to these course characteristics over time, we ran this analysis again comparing 2013 to 2021 but excluded the courses that moved online in response to the pandemic (table 8). One notable finding of this comparison is that in both years, nearly one-quarter of the online instructors felt that student learning attainment is higher in their online course in comparison to their equivalent face-to-face course and in both years, only 6% felt that student learning attainment is lower in their online methods course. There proportion of faculty who rated learning attainment as lower, the same, or higher than in their face-to-face classes was consistent across the survey years (X^2 (2, N = 81) = 0.001, p = 0.99). The number of computational exercises and the instructor prep time was similarly stable between survey years. Finally, instructors made strides in reducing their grading time between 2013 and 2021, with nearly half of instructors reporting that grading in their online course took more time than in their equivalent face-to-face course but only 30% reporting the same in 2021 (X^2 (2, N = 83) = 5.83, p = 0.05).

The most disappointing finding in the comparison between online courses in 2013 and 2021 is in relation to student interaction. The literature suggests that online courses have the potential to foster more student interaction (Ni, 2013) and in 2013 this was the case with 31% of instructors reporting more student interaction in their online quantitative and research methods course in comparison to their equivalent face-to-face course (table 8). In 2021, this percentage fell dramatically, with only 6% of instructors reporting that their online course had more student interaction (X^2 (2, N = 82) = 8.91, p = 0.01). Although courses that moved online due to COVID 19 were excluded from this analysis, this change may still indirectly reflect the pandemic. Post-pandemic research is needed to determine if this drop in online student interaction is a trend or a pandemic-related anomaly.

Table 8. Crosstabulations for Teaching Online and Influence on Content and Engagement when Pandemic was not a Motivation for Moving Course Online

Teaching Online Instead of Face-to-Face	Student Interaction		Computational Exercises		Instructor Prep Time		Instructor Grading Time		Learning Attainment	
	2013	2021	2013	2021	2013	2021	2013	2021	2013	2021
Less	31%	45%	0%	6%	6%	9%	0%	11%	6%	6%
Same	37%	49%	83%	77%	33%	36%	51%	60%	71%	70%
More	31%	6 %	17%	17%	61%	55%	49%	30%	24%	23%
Pearson Chi-Square	8.91		2.33		0.41		5.83		0.01	
Significant (2-sided)	0.01**		0.31		0.81		0.05*		0.99	

Notes: Percentages sum by column and may not sum to 100 due to rounding. ^{m}=p<0.10, *=p<0.05, **=p<0.01

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 some differences in the content and modality of these courses over the eight-year period but we did not see a decrease in coverage of numeracy, quantitate topics, ethics, or data visualization broadly. By extension, we did not see evidence of a negative impact on the topics covered in quantitative and research methods courses following the shift from required topics to required competencies in the NASPAA accreditation standards. We conclude that Competency Three, "analyze, synthesize, think critically, solve problems, and make decisions" has not negatively impacted quantitative and research methods course content.

A survey is by design a snapshot in time and it is therefore not possible to predict the degree to which the influence of the COVID-19 pandemic on the observed findings will remain if some of the courses that moved online during the pandemic remain online. 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 indeed 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. This support could take the form of conference sessions or workshops, resources on the NASPAA website, or journal articles. Smith and Martinez-Moyanos' 2012 article in this journal provides an example of developing best practice recommendations for teaching quantitative methods in bricks-and-mortar classes and their study could be replicated with instructors of online courses. Relevant examples providing recommendations by applying pedagogical theory can be found in other academic fields, such as Snow Andrade's article on student success in online English courses (2015).

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 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 quantitative topic coverage in the courses that moved online in response to COVID 19, as well as lower student learning attainment, student interaction, and fewer computational exercises. The lower student interaction in online courses overall in 2021 is also concerning. Our results raise questions that future research might explore, particularly pertaining to why instructors modified methods courses to cover less content and how instructors can increase opportunities for student engagement.

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 content in a difficult environment and 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 the content coverage. According to prior research, student persistence is lower in an online environment (McLaren, 2004; Ni, 2013). 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 students 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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