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Beyond The Numbers: The Impact of Quantitative Teaching on Overall Student Performance

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ABSTRACT

A number of studies demonstrate that quantitative teaching provides social science students with analytical and critical skills. Accordingly, the skills acquired during quantitative teaching are assumed to enhance students' progress in and after their degree. However, previous studies rely on subjective measures of students' evaluations of their skills. So far, no prior studies have examined whether the skills obtained through quantitative teaching can be transferred to an overall better performance at university. In order to address this gap, we use high-quality administrative records to examine the impact of quantitative teaching on undergraduate students' overall marks. The results show that students subject to additional quantitative teaching obtain significantly better marks throughout their studies. The evidence emphasizes the importance of methodological pluralism for social science students.

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KEYWORDS
Higher education; numeracy; quantitative teaching; student performance

Introduction

Social science students need methodological pluralism in their curriculum to be able to grasp and understand the reality of our social world. This means the appreciation of a variety of methods, from qualitative to quantitative in everyday learning practices (Payne, Williams, and Chamberlain 2004). However, particularly the quantitative deficit in higher education in the social science has become a teaching dilemma of wide concern and debate for many years (Payne and Williams 2011; Byrne 2012; Platt 2012). The issue is not merely one of students' anxieties with statistical methods (Bernstein and Allen 2013; Bos and Schneider 2009; Oldmixon 2018; Slootmaeckers, Kerremans, and Adriaensen 2014), but also structural challenges with the curriculum, including the lack of quantitative methods in mandatory modules (Adeney and Carey 2009; Adriaensen, Coremans, and Kerremans 2014; Buckley et al. 2015), how quantitative methods are taught (King and Sen 2013; Wilder 2010), and the shortfall of social scientists with quantitative skills (MacInnes et al. 2016).

In recent years, several initiatives have been set up to address the quantitative deficit within the social sciences. One of the largest such initiatives in the U.K. is 'Q-Step', a £19.5

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million, nationwide project funded by Nuffield, HEFCE, and the ESRC to promote a step-change in quantitative skills amongst social sciences undergraduates. After a competitive tendering process, 17 universities were chosen to become 'Q-Step Centers' . Previous research on quantitative teaching has demonstrated that such teaching improves numeric skills, perceived technical skills, employability, and income for social science students (Andersen and Harsell 2005; Paxton 2006). However, despite recent findings about the impact of quantitative teaching on students' *attitudes* toward quantitative methods in social science (Williams et al. 2008, 2016), there is a lack of studies that examine the impact on broader student *performance*.

This is important because there are good reasons to believe that better quantitative skills may improve social science students' overall performance. Familiarity with statistical thinking, quantitative techniques, and numerical evidence might be beneficial for other modules because quantitative skills can be applied to multiple domains within the social sciences. In particular, we argue that three potential mechanisms explain why this is the case: First, quantitative skills (on top of qualitative skills) provide students with additional research tools to critically question and assess social, political, and economic claims made in their readings, lectures and seminar discussions. Second, quantitative skills allow students to understand better when and why specific methods are used in evaluating particular arguments and theories. Third, quantitative skills boost students' knowledge of the methods used in a broader range of research studies, which means theories and analyses are more accessible for the students. In other words, when students receive additional quantitative teaching, we expect that they will, on average, perform significantly better in their studies compared to students not receiving additional quantitative teaching.

Noteworthy, examining the impact of quantitative teaching on student performance is methodologically challenging for at least three reasons. First, if all students receive more quantitative teaching, then there is no control group to compare them to. Second, if students voluntarily choose more quantitative teaching, then background factors associated with this choice are themselves likely to be associated with student performance. Third, students might be biased in their assessments of their own progress, and as most research on the impacts of quantitative teaching is based on self-reported survey data, there is a lack of information on how well students actually perform.

In this study, we are able to deal with these issues using detailed administrative data within one of the Q-Step Centers (at the University of Kent). Specifically, we acquired administrative data on student performance from the academic year 2017/2018[1], enabling us to examine whether students that took additional quantitative modules perform better in their overall studies than students who lack such modules. Using an exact matching approach, we can test whether students that differ in taking additional quantitative modules perform better in their overall studies. The results offer new insights into the complex relationship between social science, quantitative teaching, and student outcomes.

The note proceeds as follows. First, we introduce the case and empirical strategy in more detail. Second, we provide the key results and demonstrate that students with additional quantitative teaching indeed perform significantly better throughout their studies. Third, we discuss the implications of the findings as well as suggestions for future research.

Data and methods

Data

The University of Kent is one of 17 universities nationwide to establish a Q-Step Center. While the Q-Step Centers across the U.K. vary in focus and design, they have the same broad aim equipping social science undergraduate students, including political science undergraduate students, with more advanced quantitative skills to improve the applied numeracy of the students. In brief, Q-Step provides a unique opportunity to assess how increased quantitative teaching matter for student performance.

The University of Kent's Q-Step Center is hosted within the School of Social Policy, Sociology and Social Research, and the School of Politics and International Relations. The Q-Step Center included three noteworthy goals that are relevant for our analysis: First, setting up new degree pathways across different Schools, namely the School of Social Policy, Sociology and Social Research, the School of Politics and International Relations, Kent Law School, and Kent Business School. This will serve as the context of the current study, thus allowing us to compare students within the same degree.

Second, the Q-Step Center at the University of Kent aimed to integrate quantitative methods into mandatory modules for all students in these four schools to teach the very basics of quantitative methods. This is, in particular, relevant for the baseline of our study, where we can compare students having mandatory modules with a quantitative integration (in the following referred to as mandatory Q-Step modules). In other words, this will provide a reliable baseline indicating how well students are performing in mandatory Q-Step modules prior to the exposure of additional quantitative teaching.

In addition to the mandatory Q-Step modules, students at the four participating schools can choose to take additional quantitative modules (in the following referred to as additional Q-Step modules). The students can also study for a degree with a minor in quantitative methods at Q-Step Kent. In order to complete this minor, the students will have successfully completed three additional Q-Step modules: an introduction to quantitative methods module in the first year as well as two further modules to advance quantitative methods and quantitative communication skills in the second year. Furthermore, in the last year, the students with a minor in quantitative methods choose either a work placement or a quantitative dissertation for 30 credits[2] (see an overview of the curriculum in the Online Appendix).

Third, the Kent Q-Step Center focused on the critical application of quantitative methods in academic and workplace contexts. This means the Q-Step team designed their modules in a way that the skills students are taught are transferable and, thus, not limited to quantitative modules. Accordingly, apart from the quantitative elements, the teaching deals with various applied topics in order for the content to relates to various aspects of the social sciences, such as inequality and voting behavior.

To assess whether Q-Step makes a difference in terms of overall student performance, we look at the average marks of students registered in the academic year 2017/2018. While marks alone are not a comprehensive measure of student performance, this administrative data is reliable as it is not self-reported by the students but by instructors. In addition, the administrative data has the advantage that we do not have to deal with missing data or biases in the reporting (for example, limited to students actively

participating in class). Hence, the marks provide a comparable and quantitative measure of how students are doing in their program.

Methods

We designed our study in three steps to consider differences between students beyond the participation in an additional Q-Step module. First, we only looked at students within the four Q-Step Schools, and thus not students taking Q-Step modules from other Schools. All the students in our sample have mandatory Q-Step modules, meaning that we avoid variation in the exposure to basic quantitative methods teaching in the population of interest. What we are interested in here is whether having additional quantitative methods teaching through at least one Q-Step module is related to the overall performance of the students. Accordingly, for this purpose of our study, we compare students who all had mandatory Q-Step modules, and the primary difference between them is that some students had at least one additional Q-Step module while other students that had no additional Q-Step module in their degree. In terms borrowed from experimental research, the students who had at least one additional Q-Step module are in our treatment group, and students who had no additional Q-Step module are in our control group.

Second, we undertook a placebo test using first-year marks in the mandatory Q-Step module to examine whether students from the treatment group were doing better in their studies prior to the additional Q-Step module than the control group. When we compare marks from the first year in mandatory Q-Step modules, we are able to shed light on potential selection effects into the additional Q-Step module, and whether there is a meaningful difference that could account for a potential bias in our estimation.

Third, apart from the marks, we also rely on administrative data of relevant sociodemographic student characteristics. In particular, these covariates help us to compare the marks across the two student groups when adjusting for a series of characteristics often used in the literature for explaining educational outcomes across societal groups, namely gender, age, parents' education level, and nationality (see, for example, Blanden and Machin 2004). The size and composition of our sample allow us to use the method of exact matching to avoid dimensionality and assign every student from the treatment group with a student that has the exact the same socioeconomic characteristics from the control group. In other words, for every Jane (female, age 20, parent without a higher education degree, not British) from the treatment group, we find an equivalent student in the control group. This makes the exposure to an additional Q-Step module the main observable difference between our treatment and our control group.

Table 1 shows the summary statistics of the variables in our analysis. As we can see, around 10% of the students in our sample had an additional Q-Step module. The descriptive statistics further show that the average age is 20.4, and there is an overrepresentation of females, students whose parents had a higher education degree, and students with British nationality. This reflects the typical composition of student bodies in the U.K. (Universities U.K 2017).

Figure 1 shows a histogram with the distribution of average marks of the students. Noteworthy, the distribution is left-skewed and shows that most marks are distributed within 50 and 70 (the 25th percentile is 56.2, and the 75th percentile is 65).

Table 1. Summary statistics.

Variable	Range	Mean (S.D.) / %	*N*
Average marks	0–76.2	60.2 (7.2)	897
Additional Q-Step module	0–1	10%	898
Male	0–1	40%	898
Age	18–30	20.4 (1.8)	898
Parent, higher education	0–1	60%	804
British nationality	0–1	80%	898

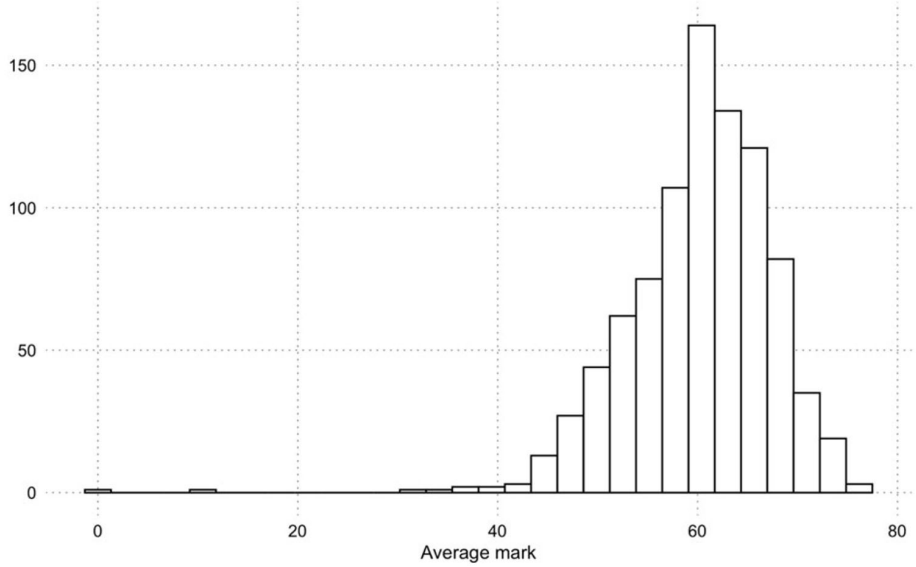

Figure 1. Distribution of average marks.

Before turning to the results, we look into the marks obtained by the students in their mandatory first-year module with quantitative elements and whether this differs between students selecting additional Q-Step modules. Figure 2 shows that the marks of students in their first-year mandatory Q-Step module are not systematically different between the students that did select additional Q-Step modules and the students that did not select additional Q-Step modules. On the contrary, the data suggests that students that ended up selecting additional Q-Step modules performed slightly worse in their mandatory first-year module. This suggests that the results cannot be explained by a selection bias in students performing better, being more likely to sign up for additional Q-Step modules[3].

Results

We estimate a series of OLS regression models with student performance in terms of average marks as the outcome. Table 2 shows the effect of having at least one additional Q-Step module in the form of unstandardized regression coefficients. The first two models show the results for all students who, prior to 2017, had a mandatory Q-Step

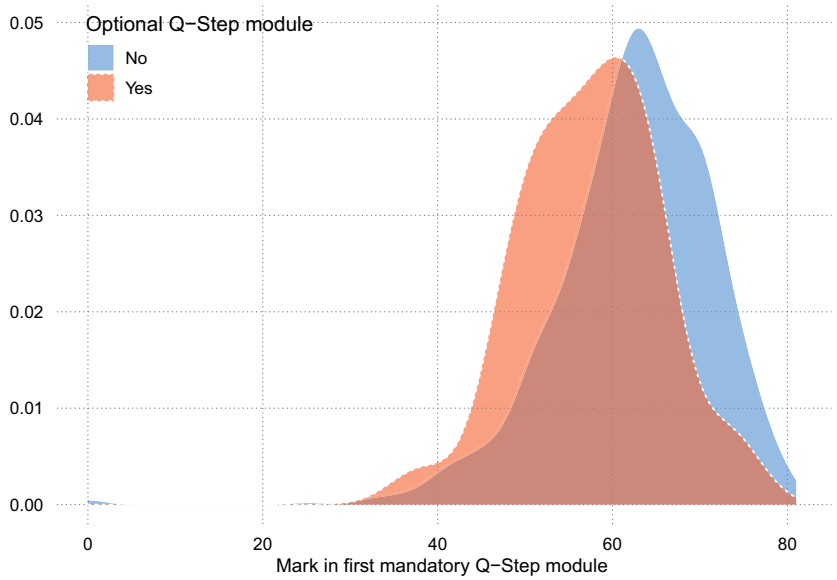

Figure 2. Marks in first mandatory Q-Step module.

module within one of the Q-Step affiliated Schools. Model 3 and 4 show the same estimations but on the smaller sample where each student with an additional Q-Step module is matched to a similar student without an additional Q-Step module.

Model 1 in Table 2 shows that students who took additional Q-Step modules performed significantly better than students who did not have additional Q-Step modules. On average, the students with an additional Q-Step module got a 2.6% points better average result. Model 2 includes the relevant covariates. While gender, parents' educational background, and nationality do not have a significant effect on average marks in our analysis, younger students appear to perform statistically better. However, the effect is relatively small and given that most students are teenagers or in their early twenties, we are cautious with making too strong inferences based on this covariate. Most importantly, the inclusion of the covariates in our model did not change the main finding.

Model 3 is similar to Model 1 but for the matched sample. Here we find an effect remarkedly similar to the effect obtained with the unmatched sample. Specifically, we find an average effect size of 2.7% points better marks for students who undertook additional Q-Step modules. Lastly, Model 4 adds the covariates to the matched sample model and confirms the main finding again. In the Online Appendix, we demonstrate that the results are robust when adding additional restrictions to the sample composition.

As always, when there is no randomization involved in the assignment to quantitative teaching, we should be cautious regarding our inferences. We are not able to conclude that the additional quantitative teaching provided via the Q-Step program is an

Table 2. Effect of optional Q-Step module on average results, OLS regressions.

	Model 1	Model 2	Model 3	Model 4
Additional Q-Step module	2.6*** (1.0)	2.9*** (1.0)	2.7*** (1.0)	3.0*** (1.0)
Male		−0.1 (0.5)		−0.3 (0.6)
Age		−0.5*** (0.1)		−0.7** (0.3)
Parent, higher education		−0.2 (0.5)		0.3 (0.6)
British nationality		−0.3 (0.6)		−0.6 (0.8)
Constant	60.0*** (0.2)	70.1*** (2.9)	60.3*** (0.3)	75.4*** (6.1)
Observations	897	803	556	556
R^2	0.01	0.02	0.01	0.03

Notes. The dependent variable is average mark in 2017. Unstandardized regression coefficients with standard errors in parentheses. $^*p < 0.1$, $^*p < 0.05$, $^*p < 0.01$.

incontestable success for all social science students, but the administrative data we have used and statistical approaches point toward a positive impact of the additional Q-Step modules on average student performance.

Discussion and concluding remarks

The quantitative deficit in social science has become a matter of wide concern and debate for many years (Bos and Schneider 2009; Payne and Williams 2011; Slootmaeckers, Kerremans, and Adriaensen 2014). While there are still significant issues to be addressed in order to make quantitative teaching work, the findings from the Q-Step setting at the University of Kent presented in this analysis suggests that quantitative teaching with a social science focus has implications beyond undergraduate students' ability to perform well in quantitative modules. Using an exact matching approach, we find those social science students who took additional Q-Step modules on top of a course with very basic quantitative methods performed significantly better than their peers who did not choose those more advanced quantitative methods modules. In addition, these results are robust when controlling for a range of socioeconomic characteristics. We conclude that additional quantitative teaching provides students with transferable skills that can be applied to a variety of domains in the social science.

As a result of this, our research can add to the literature that demonstrates the importance of quantitative teaching that relates to social reality on how students perform throughout their studies. In particular, the findings emphasize the importance of methodological pluralism for the social science curriculum, where not only qualitative but also quantitative methods matter for a well-rounded education of social science students (Payne, Williams, and Chamberlain 2004). The results also have implications for our understanding of the importance of quantitative teaching after graduation, as the acquisition of transferable skills could also account for why students with quantitative skills face better technical skills, employability and income prospects (Andersen and Harsell 2005; Paxton 2006). Thus, integrating more advanced quantitative methods with a social science focus in the curriculum could be essential for social science students to critically think and succeed in higher education and beyond. While we are not able to make any specific suggestions based upon the results, future research should shed light on how quantitative teaching best can facilitate the performance in modules across the board, and also in the working life after university.

Using the unique Q-Step setting at the University of Kent with administrative data, this study can address limitations of previous studies in the field. Nonetheless, some limitations remain with this method: First, it is essential to reiterate that the methodological approach is not a randomized controlled trial where students are unable to opt-in (or out) of specific modules. While we have taken several measures to address the most apparent challenges that can bias the results, we believe that additional work is needed in order to substantiate the causal nature of these findings. Second, we have focused upon one specific measure in this paper, namely marks. We are aware that this is not a perfect measure of performance, and future research should include a multitude of measures to show whether these results matter beyond the quantitative, unidimensional marks. Third, there are specific limitations in the current study regarding the external validity. This is because the estimates provided here could be different in other settings, and they might be greater or smaller conditional upon the interactions between the modules that constitute the overall study experience for each student. Therefore, we highly encourage that additional tests are performed in other settings to replicate these results. Those limitations aside, we find convincing evidence that quantitative teaching matters in systematic ways for how students perform throughout their studies. When arranged successfully, quantitative teaching can consolidate effective learning and progression for students with direct implications for their skills and overall performance.

Notes

1. The research is in compliance with the ethics guidelines of the University of Kent, including adequate human subject protections consistent with the University of Kent's standards and in compliance with the American Political Studies Association Ethical Guidelines.
2. For reference, a typical Undergraduate Degree in the U.K. is worth 360 credits.
3. We also tested the average marks of the additional Q-Step modules, and we do not find any systematic differences from other modules. Hence, this reaffirms that any difference between the treatment and the control group in our study can be explained by the marks given in the additional Q-Step modules.

Notes on contributors

Dr Gianna Maria Eick is a Post-doc researcher and lecturer in Comparative Political Economy at the University of Konstanz. She previously finished her PhD at the University of Kent where she managed the Self-Study of the Q-Step Center at Kent. Her research interests include the relationship between migration and the welfare state, in particular welfare chauvinism, micro-meso-macro links to individual political attitudes and comparative social policy in general.

Dr Erik Gahner Larsen is Senior Scientific Adviser at the Conflict Analysis Research Center, University of Kent. His most recent research has been published in outlets such as British Journal of Political Science, European Journal of Political Research, Political Science Research and Methods, and Party Politics.

Dr Ben Geiger was a founding co-Director of the University of Kent's Q-Step Center, and is currently a Senior Lecturer in the School of Social Policy, Sociology and Social Research at the University of Kent. His work focuses on the benefits system, disability and inequality, and more broadly, on the role of social science – including the need for mixed methods research, and the responsibilities of social scientists. Further details can be found at www.benbgeiger.co.uk

Dr Trude Sundberg is a Senior Lecturer in Social Policy at the School of Social Policy, Sociology and Social Research and Director of the University of Kent's Q-Step Center. Trude's work focuses on the lived experiences of marginalized groups in society across different regions, nations and parts of the world by looking at both emotional and physical effects of discrimination, stereotyping, values, attitudes and inequalities. The second dimension of their work focuses on building stronger collective and community focused social research methods.

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References

Adeney, K., and S. Carey. 2009. "Contextualising the Teaching of Statistics in Political Science." *Politics* 29 (3):193–200. doi:10.1111/j.1467-9256.2009.01355.x.

Adriaensen, J., E. Coremans, and B. Kerremans. 2014. "Overcoming Statistics Anxiety: Towards the Incorporation of Quantitative Methods in Non-Methodological Courses." *European Political Science* 13 (3):251–265. doi:10.1057/eps.2014.8.

Andersen, K., and DM. Harsell. 2005. "Assessing the Impact of a Quantitative Skills Course for Undergraduates." *Journal of Political Science Education* 1 (1):17–27. doi:10.1080/15512160490921824.

Bernstein, JL., and BT. Allen. 2013. "Overcoming Methods Anxiety: Qualitative First, Quantitative Next, Frequent Feedback along the Way." *Journal of Political Science Education* 9 (1):1–15. doi:10.1080/15512169.2013.747830.

Blanden, J., and S. Machin. 2004. "Educational Inequality and the Expansion of U.K. Higher Education."*Scottish Journal of Political Economy* 51 (2):230–249. doi:10.1111/j.0036-9292.2004.00304.x.

Bos, AL., and MC. Schneider. 2009. "Stepping around the Brick Wall: Overcoming Student Obstacles in Methods Courses." *PS: Political Science & Politics* 42 (02):375–383. doi:10.1017/S1049096509090519.

Buckley, J., M. Brown, S. Thomson, W. Olsen, and J. Carter. 2015. "Embedding Quantitative Skills into the Social Science Curriculum: Case Studies from Manchester." *International Journal of Social Research Methodology* 18 (5):495–510. doi:10.1080/13645579.2015.1062624.

Byrne, D. 2012. "U.K. Sociology and Quantitative Methods: Are We as Weak as They Think? Or Are They Barking Up the Wrong Tree?"*Sociology* 46 (1):13–24. doi:10.1177/0038038511419178.

King, G., and M. Sen. 2013. "How Social Science Research Can Improve Teaching." *PS: Political Science & Politics* 46 (03):621–629. doi:10.1017/S1049096513000619.

MacInnes, J., M. Breeze, M. de Haro, M. Kandlik, and M. Karels. 2016. *Measuring Up - International Case Studies on the Teaching of Quantitative Methods in the Social Sciences*. London: British Academy for Humanities and Social Science. https://www.thebritishacademy.ac.uk/documents/218/measuring-up.pdf

Oldmixon, EA. 2018. "It Was My Understanding That There Would Be No Math": Using Thematic Cases to Teach Undergraduate Research Methods." *Journal of Political Science Education* 14 (2):249–259. doi:10.1080/15512169.2017.1405356.

Paxton, P. 2006. "Dollars and Sense: Convincing Students That They Can Learn and Want to Learn Statistics." *Teaching Sociology* 34 (1):65–70. doi:10.1177/0092055X0603400106.

Payne, G., and MD. Williams. 2011. *Teaching quantitative methods: getting the basics right*. London: Sage.

Payne, G., M. Williams, and S. Chamberlain. 2004. "Methodological Pluralism in British Sociology." *Sociology* 38 (1):153–164. doi:10.1177/0038038504039372.

Platt, J. 2012. "Making Them Count: How Effective Has Official Encouragement of Quantitative Methods Been in British Sociology?" *Current Sociology* 60 (5):690–704. doi:10.1177/0011392112440438.

Slootmaeckers, K., B. Kerremans, and J. Adriaensen. 2014. "Too Afraid to Learn: Attitudes towards Statistics as a Barrier to Learning Statistics and to Acquiring Quantitative Skills." *Politics* 34 (2):191–200. doi:10.1111/1467-9256.12042.

Universities U.K. 2017. "Patterns and Trends in U.K. Higher Education 2017." https://www.universitiesuk.ac.uk/facts-and-stats/data-and-analysis/Documents/patterns-and-trends-2017.pdf (February 17, 2020).

Wilder, EI. 2010. "A Qualitative Assessment of Efforts to Integrate Data Analysis throughout the Sociology Curriculum: Feedback from Students, Faculty, and Alumni." *Teaching Sociology* 38 (3):226–246. doi:10.1177/0092055X10370118.

Williams, M., G. Payne, L. Hodgkinson, and D. Poade. 2008. "Does Sociology Count: Student Attitudes to the Teaching of Quantitative Methods." *Sociology* 42 (5):1003–1021. doi:10.1177/0038038508094576.

Williams, M., L. Sloan, SY. Cheung, C. Sutton, S. Stevens, and L. Runham. 2016. " Can't Count or Won't Count? Embedding Quantitative Methods in Substantive Sociology Curricula: A Quasi-Experiment."*Sociology* 50 (3):435–452. doi:10.1177/0038038515587652.

Online Appendix

A. The Q-Step Centre at the University of Kent

Programs:	BA Sociology with Quantitative Research BA Social Policy with Quantitative Research BA Criminology with Quantitative Research BA Politics and International Relations with Quantitative Research LLB Law with Quantitative Research	BBA Business Administration with Business Analytics
Year 1:	Doing Social Research with Numbers (15 credits) OR An Introduction to Quantitative Social Research/Quant GROUP Summer School (15 credits)	
Year 2:	How to Win Arguments with Numbers (15 credits) AND The Power and Limits of Causal Analysis (15 credits)	How to Win Arguments with Numbers (15 credits) AND: The Power and Limits of Causal Analysis (15 credits) OR Introduction to Big Data (15 credits)
Year 3:	Advanced Quantitative Dissertation (30 credits) OR Quantitative Work Placement Module (30 credits)	

Table A 1. Required modules for a Quantitative Minor from the Q-Step Centre at the University of Kent.
Notes: These requirements apply to the academic year 2017/2018.
More info available at https://www.kent.ac.uk/qstep/programmes/converting.html

B. Robustness test: Results without zero average marks

Table A 2 shows the results when excluding the observations that have an average mark of zero. Model 1 and Model 2 are for the unmatched data (without and with covariates), and Model 3 and Model 4 are for the matched data (also without and with covariates). The coefficients show that the removal of these observations does not alter the results or interpretations presented in the main text.

	Model 1	Model 2	Model 3	Model 4
Additional Q-Step module	4.3*** (1.3)	4.6*** (1.7)	4.0** (2.0)	5.3*** (1.9)
Male		-1.3* (0.7)		-1.3 (1.2)
Age		-0.3 (0.2)		-1.5** (0.7)
Parent, higher education		0.3 (0.7)		0.7 (1.2)
British nationality		0.1 (0.9)		0.6 (2.3)
Mandatory Q-Step module mark		0.4*** (0.04)		0.4*** (0.1)
Constant	61.1*** (0.3)	34.7*** (2.6)	60.2*** (0.6)	35.9*** (4.4)
Observations	824	594	258	258
R^2	0.01	0.2	0.02	0.1

Table A 2. Effect of additional Q-Step module on average results, OLS regressions.
Notes: The dependent variable is average mark in 2017. Unstandardized regression coefficients with standard errors in parentheses. * p < 0.1, * p < 0.05, * p < 0.01.

Table A 3 shows the results when using the mandatory Q-step module mark as the outcome of interest. Model 1 and Model 2 show the results for the unmatched data. Here, we see that students subject to an additional Q-Step module does not perform significantly better in their mandatory Q-Step module and, actually, perform significantly worse. Model 3 and Model 4 show the results for the matched data. Here we see no significant effect, indicating that the matching procedure has created balance on the mandatory Q-Step module mark between the two groups.

	Model 1	Model 2	Model 3	Model 4
Additional Q-Step module	-4.9*** (1.6)	-4.6*** (1.7)	-1.1 (1.6)	-1.3 (1.6)
Male		0.6 (0.7)		0.6 (1.1)
Age		-0.4 (0.2)		-1.0 (0.6)
Parent, higher education		-0.8 (0.8)		-0.01 (1.0)
British nationality		-0.3 (0.9)		-5.3*** (2.0)
Constant	62.4*** (0.4)	62.5*** (0.7)	59.3*** (0.5)	57.9*** (1.1)
Observations	655	594	258	258
R^2	0.01	0.02	0.002	0.04

Table A 3. Effect of additional Q-Step module on mandatory Q-Step module mark, placebo test, OLS regressions.
Notes: The dependent variable is module mark in mandatory [anonymized program] module. Unstandardized regression coefficients with standard errors in parentheses. * p < 0.1, * p < 0.05, * p < 0.01.