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Enhanced Outcomes, Improved Feedback: Maximizing Success Through Collaborative Final Projects in Quantitative Methods Courses

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ABSTRACT

In political science, teaching quantitative methods can pose challenges due to students' apprehensions and perceptions of the content, the complexity of the material, and the significant time commitment required from instructors. I advocate for adopting collaborative final projects in quantitative methods courses to mitigate these challenges. A comparative case study analysis is implemented to examine quantitative courses with a collaborative final research project to those with an individual project in two countries: Finland and the United States. There was a noticeable decrease in student anxiety and instructor's time commitments and an increase in student success and favorable feedback toward the course and instruction. Overall, adoption of collaborative learning into quantitative methods courses can be mutually beneficial for both students and instructors.

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Quantitative methods; collaborative learning; group projects; course evaluations

In the field of political science, there is a growing perspective that students need to be trained for proficiency in diverse research methodologies. As institutions place greater emphasis on the interconnectedness of university education with career training, attention to quantitative methods skills and proficiency in programming languages may become more prominent. The result of such a focus might entail a scenario where political scientists are tasked with teaching a greater number of quantitative methods courses.

Several studies have delved into the unique aspects of quantitative instruction, aiming to offer the most effective strategies. For example, Bergbower (2017) explored the optimal timing for the offering of a quantitative methods course within an undergraduate curriculum. The study revealed that the most advantageous period to enroll in a quantitative methods course was following the completion of five subject-specific political science courses. Further research delves into various aspects of quantitative methods instruction, including the efficacy of different assignment types (Fisher and Justwan 2018), the importance of question content – recall vs. conceptual – in daily quizzes (Combes 2019), and the implementation of best practices in online quantitative instruction (Bachner and O'Byrne 2021). Overall, recommendations and research related to

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quantitative instruction take into consideration two overarching complementary goals: 1. enhancing student success, and 2. increasing favorable teaching evaluation feedback.

This article explores the implementation of a collaborative final project assignment into quantitative methods courses. The research question asks whether adoption of a collaborative final project can mitigate some of the issues inherent in quantitative methods courses? This article implements a comparative case study analysis to investigate this inquiry in two countries: Finland and the United States (U.S.). When comparing five courses where quantitative methods were taught with the focus being on an individual final project to four courses where the final project was collaborative, several positive specific outcomes were observed, namely: 1. less student anxiety, 2. reduced drop-off of individual performance, 3. less reliance on the instructor to solve minor issues, 4. more students completing the course with a thesis topic, 5. students' increased attention to nuance in research, and 6. improved course feedback. In this article, I discuss in-depth how the adoption of a collaborative final project in quantitative methods courses can be beneficial.

The outline for the article is as follows: First, I discuss the challenges in teaching quantitative methods. Next, a review of the literature on the collaborative teaching approach is presented. Then, there is a discussion of the application of the collaborative teaching approach as a final project for quantitative methods courses. Afterward, through a comparative case study approach, outcomes from courses with an individual final project and a collaborative final project are highlighted. Finally, the article summarizes the main conclusions and discusses potential issues with the approach.

Challenges in teaching quantitative methods

As university administrators and politicians increasingly emphasize the importance of connecting a university degree with career preparation, political science departments have an opportunity to utilize quantitative methods courses to meet this demand. Proficiency in quantitative methods skills is not only valued within the field of political science but are also recognized as beneficial by employers across various sectors. Moreover, research suggests that students who have completed quantitative courses tend to perform better in their other courses (Eick et al. 2021). Therefore, it is crucial for instructors to continue offering and enhancing their teaching in quantitative courses. However, achieving this objective involves addressing several challenges that instructors encounter when teaching quantitative methods.

One major challenge involves students' attitudes toward quantitative training. The relationships between a student's motivation, anxiety, self-confidence, and perceptions of training utility are interconnected. Studies indicate that social science students tend to experience higher levels of anxiety in quantitative methods courses (Bernstein and Allen 2013; Slocum-Schaffer and Bohrer II 2021; Wishkoski et al. 2022). Further, Papanastasiou and Zembylas (2008) discovered a connection between student anxiety and self-confidence. Additionally, Mensah et al. (2023) found that anxiety toward research diminishes students' self-belief and negatively impacts their perceptions of the usefulness of quantitative research. This relationship is concerning because positive attitudes toward the utility of quantitative research methods correlate with greater success

in these courses, as also highlighted by Murtonen et al. (2008). Consequently, the design of quantitative methods courses should include assignments aimed at reducing anxiety and demonstrating the practical value of the training.

A second challenge in teaching quantitative methods arises from students' struggle with the content, largely because of its unfamiliarity to them. Indeed, research indicates that students perceive the content of quantitative methods courses to be more challenging compared to other subjects (Fletcher and Painter-Main 2014; Best and Mallinson 2023). Oldmixon (2018) emphasized that many students approach quantitative methods courses with apprehension and concern, often due to "math-phobia" (250). It is conceivable that some students may have chosen political science as their major under the assumption that it would not involve mathematics and they become intimidated when they realize that statistics is required in the curriculum. Consequently, quantitative methods courses should carefully address math anxiety in their design, a concern that is less prominent in topical political science courses.

A third challenge that is frequently underdiscussed is that instructors are often tasked with simultaneously teaching two topics: statistics and a programing software. Indeed, many quantitative methods courses are physically separated into two types of sessions. The course might have sessions that involve classroom lecture on statistics and then distinct sessions in a lab involving activities to learn a computer software. If a single class session is split into lecture and lab components the instructor might even realize that they have double the preparation material when compared to a single class meeting for other courses. For students, learning how to utilize software for quantitative methods, especially software that utilizes a command line, may feel equivalent to learning a foreign language while at the same time learning statistics. Quantitative methods courses may therefore require instructors to incorporate more outlets for student assistance and demand more than the average student/instructor time commitment.[1]

The combination of these three challenges results in decreased student satisfaction with quantitative methods courses, leading to more critical teaching evaluations. Given that many institutions heavily weigh student feedback in instructor performance evaluations, instructors of quantitative courses must pay particular attention to course design. In fact, research by Uttl and Smibert (2017) indicates that professors teaching quantitative courses are less likely to receive tenure, promotion, and/or merit pay, even after controlling for various factors, compared to instructors of other courses. Fletcher and Painter-Main (2014) propose that quantitative methods courses could address these issues by using different teaching evaluation questions. However, many institutions prefer uniformity in evaluations to mitigate potential legal issues that may arise from using different assessment criteria for the same metric for performance reviews. Therefore, it is important that instructors approach quantitative teaching with knowledge of how to be successful. In the next section, I discuss the usefulness of incorporating the collaborative teaching approach into course design.

Collaborative teaching approach

In addition to traditional facilitated learning lectures, I utilize three supplementary teaching approaches during the laboratory sessions of my quantitative courses. These

methods come into play after my instruction on a specific statistical technique covered in the lecture. First, I employ an inquiry-based approach, which entails structured activities with explicit instructions and research guidelines for applying the statistical method. Second, a constructive teaching strategy is utilized, wherein students individually determine the parameters for applying the technique in their own analyses. Third, I occasionally adopt a collaborative teaching method, encouraging students to collaborate in establishing research parameters for their analyses. Integrating the collaborative approach from minor lab assignments into the final project has proven beneficial, leading to enhanced student success and more favorable course evaluations.

Collaborative learning is a broad encompassing concept that indicates a situation where two or more students (or researchers) combine their efforts to learn or produce knowledge. The teaching approach could lead to the production of knowledge that transcends the classroom. For example, Cattapan (2023) shows how feedback in courses led to a collaboratively built textbook on Canadian politics. In the classroom, Sweet and Michaelsen (2023) demonstrate the existence of various assignments that align with the collaborative teaching method, highlighting its efficacy in fostering learning within the social sciences and humanities. For political science, Wolfe (2012) contends that when executed thoughtfully, collaborative learning proves to be particularly advantageous. For instance, Broscheid (2015) demonstrates how team-based learning can be successfully implemented to break down complex political science concepts in large-enrollment U.S. government courses.

The advantages of collaborative-based learning extend beyond specific benefits and encompass broader advantages. Research by van der Linden et al. (2012) reveals that collaborative work significantly enhances students' attitudes, knowledge, and research skills. The result would be particularly pertinent in quantitative methods courses where attitudes strongly influence success. According to Pollock, Hamann, and Wilson (2011), small group discussions foster greater participation compared to larger groups, promoting active learning over passive absorption. Kaufman (2021) underscores the importance of group discussions in providing a comfortable environment for students to address challenges. The finding is crucial given students' initial aversion to quantitative material. In smaller group settings, students are more inclined to seek assistance compared to large lectures. Notably, Burke (2011) highlights that students engaged in collaborative learning tend to achieve higher grades, express greater satisfaction with their educational experience, and exhibit an increased likelihood of remaining enrolled in college. In the next section, I discuss my incorporation of the collaborative approach into my quantitative methods courses.

Application of collaborative approach in quantitative courses

Papanastasiou and Zembylas (2008) recommend that instructors in research courses proactively tackle anxiety early on, establish a supportive classroom environment, and consider rethinking and redesigning their courses. The authors' three recommendations have led me to regularly evaluate and reevaluate the design of my quantitative methods courses. Prior, there existed an apprehension to adopt a collaborative final project into my quantitative methods for two reasons. First, there was a need to guarantee that

students could independently create a thesis to obtain their degree. The fear is that by having a collaborative final project there would be the possibility that some students would not be able to complete the individual thesis later. The second reason for apprehension was that some students might pay less attention to the complex material and put less effort into individual assignments if they know the major assignment for the course is collaborative. Nevertheless, I adopted the collaborative approach with the goal of reducing the number of students that either fail to submit the assignments or drop the course.

Across nine courses taught at two different institutions spanning two countries, I have diversified the final projects while maintaining a consistent general course design. The only exception was when one course was impacted by COVID-19 and some class sessions were held online. Each class session followed a similar format, with the class divided into two segments. The first segment comprised a lecture focusing on a quantitative concept, followed by the second segment, which involved hands-on exercises using R statistical software. During the lab sessions, I facilitated example demonstrations and engaged students in activities that required them to actively apply the techniques learned. Then, students would have individual homework assignments that they would need to complete prior to the next week's first class session.

The bachelor's level courses addressed a comprehensive range of topics including descriptive statistics, measures of central tendency, measures of dispersion, probabilities and sampling, inference, sampling and estimation, one-sample and two-sample hypothesis testing, measures of association, control variables, bivariate and multiple regression, and logistic regression. The bachelor's courses are positioned at the same point in the curriculum across both countries/programs. The master's level courses covered the same topics and included advanced subjects such as factor analysis, ordinal logistic regression, and multinomial logistic regression. Given students' prior familiarity with the foundational topics upon entering the master's level course, the topics prior to regression analysis were reviewed swiftly, allowing more time for the additional advanced material.

In Table 1, an overview of the courses is provided. I had taught a general quantitative methods course for political science majors three times with an individual final project and twice with a collaborative final project at a comprehensive state university in the Midwest, U.S. This teaching university, part of a state university system, offers both undergraduate and master's degree programs, has an overall enrollment of fewer than 4,000 students, and maintains a high acceptance rate close to 90%. Any student can declare a political science major and enroll in the quantitative method's course after completing two introductory political science courses. Thus, the program is not very selective. Additionally, approximately half of the students are pursuing the political

Table 1. Descriptive information for quantitative methods courses.

Country	Degree level	Years	# of Courses	Final project
United States	BA	2016 and 2018–2019	3	Individual
United States	BA	2020–2021	2	Collaborative
Finland	BA and MA	2022	2	Individual
Finland	BA and MA	2023	2	Collaborative

science degree with the intention of attending law school, which may suggest a lesser focus on political science as a social science discipline.

In Finland, I had taught two bachelor's level and two master's level quantitative courses each where the final project was either individual or collaborative. The quantitative master's courses were not mandatory but were strongly encouraged. The Finnish university is one of the three largest universities in the country, is research-focused, and has an overall enrollment of around 20,000 students. The university's overall acceptance rate fluctuations anywhere between 10–20%. The political science program is highly selective with around 1,000 applications each year and only 44 individuals entering the program. Entry to the program is determined by a mixed admissions process: half of the students are accepted based on their "high school" grades (22), and the other half based on an entrance examination (22). Last year, the program was the most sought-after of its kind in the country.

The program at the Finnish institution is more selective and places greater emphasis on the thesis for degree attainment. This focus suggests that students may be better equipped to complete a research assignment independently. I initially opted for the individualized final project in Finland based on this assumption and the greater significance of the thesis for degree completion compared to the U.S. university. However, the challenges encountered with individualized project courses remained consistent, regardless of the program's selectivity.

The courses enrolled between 12 and 34 students, with the lowest enrollment observed in the two master's courses. The bachelor's courses had a comparable number of students across programs. Thus, any differences in outcomes are not attributable to enrollment size. The primary objective of all courses was to equip students with the skills necessary for effectively completing a quantitative research thesis, with the ideal outcome being a strong foundation for their thesis upon course completion.

The individualized version of the final project involved the students writing a condensed research paper. The projects would include shortened introductions, literature reviews, theory sections, and conclusions. In contrast, the projects would contain robust methodological and results sections akin to those in journal articles. For the individual projects, there were due dates included throughout the semester for each component of the paper, as well as stages of the quantitative analysis (e.g., variable recoding). Students were provided two survey datasets to utilize for their final project: 1. A country-specific election dataset based on the country of instruction (American National Election Study or Finnish National Election Study), and 2. a comparative survey dataset (European Social Survey). Both datasets were used for the lab activities and homework assignments so that students were familiar with them. Students were also provided numerous open lab sessions to work on their projects and ask questions during the regularly scheduled class meetings' time.

The collaborative project was similar in most aspects with only a few exceptions. First, the shortened sections of the research project were no longer mandatory in written form. However, the robust methodological and results sections in written form were still required. Second, the groups were required to present their results, which was not an aspect of the individual project. The individualized project did not have a

presentation element. The choice to have presentations was to reduce the potential for free ridership. The presentations were formatted to be 15 mins and include all the components required in the individualized project. Although there was no explicit requirement for all students to speak during the presentation, the groups organized their presentations to ensure that each participant contributed, except for a couple students who were absent due to illness. The students who were absent sent me an email detailing their contributions to the group activities, which I confirmed with other group members. Students fielded questions about their research project after their presentations from myself and other students.

The students collaborated on the projects in groups of 2–3. The groups were formed at the beginning of the course, following two weeks of class sessions, for two reasons. First, delaying group formation until after the initial sessions helped address the issue of having groups with students who might drop the course. Second, this early formation aimed to alleviate anxiety and provide an opportunity for the groups to establish rapport, particularly if the participants were previously unfamiliar with one another. At both institutions, students had some experience with group work; however, it was not the predominant pedagogical approach. Therefore, students across the programs were likely to have a similar level of familiarity with group work. The groups collaborated mostly in person, except for some portions of the writing aspect of the assignment, which were completed outside the classroom. Significant time was allocated during class sessions for group work, as other modes of collaboration might be more challenging. I did not provide a detailed breakdown of the division of labor among the groups. Instead, I emphasized that all participants should actively engage in each task, ideally working together during class sessions. The work conducted during class sessions enabled me to provide feedback to the groups on their progress, helping them stay on track. The areas where it was easiest to verify this type of collaboration included observing the groups as they explored data, estimated models, created tables and figures, and crafted their presentation slides. The collaboration was more challenging to discern when evaluating the written material. However, no disagreements or issues related to an unfair division of labor were reported, likely because the bulk of the work was conducted during class sessions and under the instructor's observation. A group assignment that requires substantial time outside the classroom might lead to issues related to the division of labor, particularly when members have external commitments.

Everyone in the group received the same grade on the collaborative projects for three interrelated reasons. First, to alleviate student anxiety by ensuring that no individual would be singled out for their performance. Second, to foster a sense of group solidarity, as individual performance might fluctuate throughout the semester, and a sense of solidarity would encourage mutual support. Third, to emphasize the importance of mutual reliance for overall performance, thereby holding group members accountable to one another. It is worth noting that no complaints were reported regarding the grading.

Below, when discussing the outcomes, I provide quotes and feedback from course evaluations to demonstrate that the students found the collaborative approach to be beneficial for their success.[2] The next section implements a comparative case study analysis to examine the courses with contrasting final projects.

Outcomes

Throughout this section I will be comparing all the courses with an individual final project to all the courses with a collaborative project. A switch to the inclusion of a collaborative final project led to several positive outcomes. It is important to emphasize from the outset that these positive outcomes were consistent across both institutions. This finding indicates that the outcomes are not influenced by the selectivity of the institution or program.

In Table 2, these outcomes are displayed with the corresponding challenges they help to partially mitigate. The most readily apparent was a reduction in students' anxiety toward the course when they learned at the first meeting that the final project would be collaborative. At the conclusion of the first class meeting, I always ask how many students are worried about the course. While the course with the individual final project witnessed nearly all students raise their hand expressing worry, only about half the students in the collaborative courses expressed worry. The students that expressed worry in the collaborative project course would often follow up the raising of their hand with the verbal expression "just a little bit." When the final project was individual, students often requested meetings during the first two weeks to discuss whether they should drop the course. In these instances, I would often lose between 2 and 5 students during the first week of courses regardless of my attempts to reassure students of their abilities. The requests to discuss whether students should drop the course did not occur in the courses where the final project was collaborative. I would regularly continue the informal "poll of worry" among students at the start of each new section of topics (every 2–3 weeks). Students' reduced anxiety levels persisted throughout the duration of the course, extending until its conclusion. While students in all courses expressed reservations about the course content, the courses with the collaborative final project experienced no expressions of effort futility. Thus, the collaborative project helped lessen the issue of student anxiety and math-phobia.

A second positive outcome is related to content difficulty, which is a reduced drop-off of individual performance. For example, students demonstrated improved performance on the weekly individual assignments when the final project was collaborative. One potential explanation for this phenomenon is that students had a predetermined support network established through their participation in the collaborative final project. Consequently, they had access to a group of peers whom they were implicitly encouraged to seek assistance from at the outset of the course. Additionally, students who were part of the collaborative final project were not only responsible for their own progress but also held accountable by their peers. This heightened sense of accountability might have motivated them to put forth greater effort into mastering the course

Table 2. Challenges of quantitative courses and outcomes of the collaborative approach.

Challenges	Outcomes
Student anxiety	Less student anxiety
Content difficulty	Reduced drop-off of individual performance
Simultaneously teaching two topics	Less reliance on the instructor for solving minor issues
Additional outcomes	More students completing the course with a thesis topic
	Students' increased attention to nuance
	Improved course feedback

material for the individual assignments. Conversely, in courses where the final project was individual, a subset of students frequently submitted incomplete assignments, often missing significant portions of the required tasks. Between 15% and 25% of students in the courses with an individual final project would regularly submit incomplete assignments. In some instances, these assignments were completely blank or only containing any work we might have done in class together. In comparison, there we only a couple of instances where a student from the courses with a collaborative final project submitted an incomplete weekly assignment (across the four courses).

Furthermore, the courses with the individual final project experienced a dropout rate of approximately 1 in 7 students across the five courses after the first assignment due date. In contrast, all students enrolled in courses featuring a collaborative final project successfully completed the course. Finally, all students in the courses with the collaborative project submitted the final project, while around 18% of students on average in the individualized courses either, 1. did not submit the final project, or 2. submitted the final project sometime during subsequent semesters. Interestingly, nine students that had failed the course with the individual final project later took the course with the collaborative final project. These students did not experience issues in the collaborative course. The result could partially be caused by their increased awareness of the material, having encountered it before to some extent. However, when asked for feedback these students did indicate that they found the course with the collaborative project "a much better course" despite the only difference being the structure of the final project.

A third positive outcome was that a greater number of students would indicate seeking help from other students prior to asking me for help when issues arise. The outcome slightly eased the challenge of simultaneously teaching two types of content for both the students and the instructor. The collaborative project prompted students to a culture of collaboration where students could help each other solve issues. In the courses with the collaborative final project, at the outset of the course almost every group created a Whatsapp or message group thread with their colleagues. When asked at the end of the semester the usefulness of these group threads the students indicated that they would regularly use the threads to ask for help regarding coding issues in R or share helpful websites for coding errors. This result demonstrates an excellent learning outcome. Students' reliance on colleagues for support and help transcends the classroom and mirrors activities they will need to engage in at their future workplaces. The collaborative approach empowers students to become problem solvers instead of relying on the instructor to solve all their problems.

The outcome also reduced the amount of time that I spent with each student. The number of students seeking help during office hours decreased dramatically, with zero students ever attending office hours in the four collaborative project courses. For context, I would regularly assist between 4 and 10 students weekly depending on the class size when I had the individual final project. Beyond office hours, I also found myself spending much less time assisting students during class sessions. In the courses with individual final projects, I would routinely have a long queue of students idly waiting for individualized help during class sessions. Frequently, students would queue up at the front of the room, each holding their laptops, while I attempted to address each student's issue individually, one at a time. In contrast, in the courses with the collaborative

projects there was rarely a queue for help. When students did need assistance, they were more likely to attempt to resolve issues prior to asking me for help. In fact, almost all instances where students needed assistance in the courses with the collaborative projects were due to anomalies and peculiarities with their personal computer software, rather than issues with the techniques they were taught in the lecture or lab sessions. Since one challenge of teaching quantitative methods is that the instructor is essentially teaching twice the content, this form of relief is welcomed.

A surprising fourth positive outcome is that a greater number of students identified a topic they would like to explore in their thesis. Previously, I had apprehensions about implementing the collaborative approach, fearing that students might not develop a solid groundwork for their theses upon course completion. There was a concern that some students may not utilize the activity as an opportunity to explore and think about topics for their future theses. However, the outcome was quite the opposite. Around twice as many students (2/3^{rds} compared to 1/3rd) in the collaborate approach course indicated having a tentative idea for their thesis, including a 10% increase in students having an idea that reported they would not utilize quantitative methods in the thesis. The collaborative project facilitated discussions on thesis ideas in a way that was not present in the other courses. Conversely, many students in the individual project courses mentioned choosing a final project topic merely to fulfill the course requirements, rather than initially exploring a thesis topic. In fact, many students in the courses with the individual final project requested that I choose a topic for them – e.g. "can you just tell me what to look at/do?" Students in the courses with the collaborative final project more often indicated a preference for exploring phenomena that they were interested to explain, which resulted in lively debates regarding topic choice among the groups. None of the groups across the courses with the collaborative final project asked me to provide a topic for them or tell them what to look at/do.

A fifth positive outcome was that students appeared to have a firmer grasp on the research methods, as well a greater ability to go beyond the basic course material. For example, when students were discussing their collaborative projects, it was commonplace to hear them critiquing the wording of survey questions or the details of data collection. While some students in the classes with the individual final project might touch on survey question wording, the occurrence was quite rare. In the collaborative groups, a majority of the groups had estimated multiple models to assess whether the survey instruments they chose to focus on provided robust results. In addition, across five courses and over 80 students where the individual project was assigned not one student ever asked about the language the surveys were conducted in or the format of the surveys (e.g., online vs. mail). In comparison, over 70% of the collaborative groups provided discussions of this information without being prompted in their paper and presentations. By collaborating, students were able to recognize and discuss a larger amount of information that could have implications for their analysis and findings. The result shows that by tackling the project collaboratively the students were able to anticipate a greater number of potential issues and criticisms with their analyses. These four outcomes of adopting a collaborative approach directly address the challenges of teaching quantitative methods regarding students' anxiety, students' attitudes, and the difficulty of the material.

The final notable outcome is that course feedback was significantly more positive in the courses that implemented the collaborative final project. Students reported much higher satisfaction with the course and instruction. A quote from one evaluation stated, "I thought I would hate this course but this course has been the most helpful one I have taken," which was a sentiment expressed by numerous students in the collaborative final project courses. Students in these courses were also more likely to provide qualitative evaluation feedback with quotes like "I feel like I actually learned something usable," "this course felt more like science," and "I have learned more in this course than any other." Quantitative evaluations regarding the overall quality of instruction, instructor assistance, and instructor availability were higher in the courses with the collaborative final project. The higher evaluation regarding availability in the courses with the collaborative final project was remarkable, considering that I spent less than half the time assisting these students compared to those in the individual final project courses. Additionally, as mentioned earlier, I did not devote any office hours to helping those students. Since they required less assistance, likely due to relying on their groups, it seems that the assessment of my support was inflated. In comparison, the most common evaluation comments in the courses with the individual final project was that the course was "too much" and "should be optional." A handful of students even suggested in these courses that "the course should be two separate courses worth double the credits." All this critical feedback was absent from evaluations for the courses with the collaborative final project. Since teaching evaluations are weighted so heavily in performance evaluations, junior scholars would find adopting a collaborative approach in quantitative instruction to be especially beneficial. This suggestion is further underscored by the observation that junior scholars are more frequently assigned to teach quantitative methods courses.

A final observation was that around three times as many students reported confidence in their ability to produce a quantitative thesis. In fact, the number of students utilizing quantitative methods in their thesis pursued for the degree increased drastically. The increase was so notable that faculty members in the department commented on the outcome across universities. In addition, the department in Finland has recently started creating a template and guidelines to produce quantitative theses to assist students. There were so few students that utilized quantitative methods in their theses prior that there had not been a need for such a blueprint. Although this observation mainly stems from my recent quantitative courses transitioning to collaborative final projects, it will be valuable to evaluate in the future whether the quality of quantitative theses also shows improvement.

Discussion

This article explored the usefulness of adopting collaborative final projects into political science quantitative methods courses in two countries: Finland and the United States (U.S.). To summarize, students in the courses with collaborative projects, across both countries, reported lower anxiety, achieved greater success, and evaluated the courses more positively. The outcomes demonstrate the importance of adopting collaborative teaching approaches into courses that have traditionally contained mostly individual

assessments, such as a final research project or final exams. Additionally, the collaborative course created an environment where students relied on each other for problem-solving, an outcome that directly translates to how issues will be solved in many instances in future workplace scenarios.

It is worth reiterating one general result from implementing the collaborative teaching approach. The general feedback for the courses was overwhelmingly positive. For junior scholars reliant on positive teaching feedback, this approach might be especially useful. In semesters with an individual final project, more students would express dissatisfaction with having to take the course. Regardless of the practical examples I would provide, these students would internalize the mindset that they will never actually use the skills they are being taught. In comparison, in the courses with the collaborative final project students were more likely to reinforce the usefulness of the course to each other. In addition, students were more likely to take ownership over any mistakes rather than providing general statements of non-understanding, such as "I just do not get it." By working collaboratively students perceived a well-defined role and set of expectations from their peers. Thus, the introduction of a nonhierarchical accountability mechanism led students to internalize the importance of learning the material. Of course, it is important to recognize that this is a case study analysis. Therefore, it would be useful for future research to confirm these conclusions by empirically testing these outcomes on a larger set of data.

To conclude, it is worth mentioning two potential issues an instructor might encounter when implementing the collaborative approach into their quantitative methods courses. The first is that students in a group might disagree about which topics or dataset to explore. Thus, the data options need to be plentiful, but not too expansive. By providing students only two datasets with numerous, diverse survey questions I was able to avoid disagreements that might be caused by having too many options if the students could choose or create their own datasets. At the same time, there were enough options so that the groups were not conducting the same analyses.

A second potential issue is that of free riders (Shimazoe and Aldrich 2010). A concern I had was that by having the students complete the project in groups there would be free riders that did little to no work. I mitigated this issue in three ways. First, I maintained the weekly individual homework assignments so that students still had to do a substantial quantity of work on their own. Second, a written version of the project was due even with the inclusion of the presentations. Third, by allocating substantial time for collaborative work during class sessions, my in-class oversight helped to reduce instances of free riding. In addition, the issue was naturally mitigated by the fact that the students were majors, and the courses were offered later in their pursuit for a degree. Therefore, students would be less inclined to free ride. However, it is hard to eliminate the issue, especially in the U.S. context where students work a greater number of hours outside of the university and are enrolled in a larger number of courses. Therefore, instructors should always reevaluate and adjust their collaborative approach to account for the issue when it arises.

Overall, instructors teaching quantitative methods would benefit from the adoption of collaborative research projects in their courses. The positive outcomes from inclusion of a collaborative project existed in both countries where the comparison between

approaches occurred. The result shows that more diverse teaching methods could be beneficial across contexts to improve quantitative methods training. The inclusion of collaborative projects also provides students a useful opportunity to gain experience with group work as a tool for investigating knowledge.

Notes

1. While I found research that makes similar statements, I did not find research that empirically demonstrates this point. However, at institutions where I have taught and teaching obligations were based on credit hours, quantitative courses counted for a greater number of credit hours compared to topical courses. In fact, at the last U.S. institution where I taught, three quantitative courses were weighted equal to four topical courses in credit hours. Thus, there appears to be at least a general expectation that these courses require a greater time commitment.
2. Data collection methods complied with the European Union's (EU) General Data Protection Regulation (GDPR) and the guidelines of the Finnish National Board on research Integrity (TENK). The use of course evaluation data is in accordance with APSA Ethical Guidelines for protecting human subjects. The course evaluation data was collected anonymously, and consent was provided for the use of data. In addition, no identifying information is provided for non-anonymous quotes provided by students and consent was obtained for use of any quotes.

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Disclosure statement

The author reports there are no competing interests to declare.

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