



Learning by Doing: Student & Faculty Reflections on a Collaborative Model for Conducting and Publishing Mixed Methods Research in a Graduate Course

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Abstract

Due to time constraints and faculty resources, one-semester research methods courses, especially mixed methods, often do not result in meaningful student-produced work that contributes to scholarly literature. As publishing increasingly becomes expected for graduate students, instructors may seek ways to incorporate publishing opportunities into course curriculum. This case study presents one instructor's collaborative teaching and publishing model along with graduate student feedback and recommendations for reproducibility of the course model. The model described in the course-based research model vignette was designed to give students practical experience working with raw data, presenting preliminary findings, navigating the IRB process, drafting a manuscript, determining authorship, and identifying and submitting the manuscript to a journal. Acknowledging the importance of and the challenges to graduate student publishing, the instructor in this case study sought to reduce some of the barriers for students. Post-course, the researchers employed a single-case study methodology that includes elements of participatory action research to answer research questions about student participants' learning experiences related to conducting a collaborative mixed methods study and the research and publishing process. The interview protocol included questions about the participants' perceptions about the success of the collaborative teaching methods to teach mixed methods research, their prior experience with research projects, and their interest and engagement with the publishing process during and after the course. The discussion includes practical information for instructors interested in implementing a similar model.

Keywords mixed methods · research methods · case study · collaborative publishing · graduate students · faculty student collaboration

Introduction

Due to constraints of the academic calendar and faculty resources, one-semester research methods courses often entail isolated portions of the research process and use so-called dummy data or contrived exercises to facilitate learning. As a result, these courses may not result in meaningful student-produced work that contributes to scholarly literature. For students interested in developing course assignments into publishable scholarship, a mixed methods research course presents even greater challenges. The interactive teaching and publishing model described in this article was designed to facilitate students' learning about mixed methods research beginning with the cleaning and analysis of data collected by the professor prior to the course and extending through the article draft development and subsequent article publication.

This model of learning about mixed methods by working on an authentic mixed methods research project calls for ongoing engagement and collaboration between the instructor and students rather than a more traditional one-way instructor-to-student knowledge exchange. The study described in this article occurred after the mixed methods course and includes findings and recommendations to better understand the effectiveness of an instructor and graduate student collaboration model for conducting and publishing mixed methods research in a graduate course. The mixed methods course model is described in detail in the course-based research model vignette and may be replicable for other graduate research methods courses. Since this article describes both the case study at hand and the mixed-methods research study during the course, the authors will refer to the course-based study as the “course-based project” and the current case study as the “case study.”

Problem, Purpose, and Course-Based Research Model Vignette

Publishing during graduate school has become increasingly necessary for candidates seeking academic jobs (Hotaling, 2018; Hatch & Skipper, 2016), and involvement in the publication process is a worthwhile investment of time, as it demonstrates an individual's research productivity to potential employers (Bartowski et al., 2015; Lei & Chuang, 2009). Yet, Belcher (2009) noted, “many graduate students outside of the sciences receive little training in performing the most important task of their careers: writing for publication” (p. 190). Students who publish during graduate school also reap other benefits such as the opportunity to network and collaborate with faculty and fellow graduate students on writing projects (Mizzi, 2014; Copenheaver et al., 2016) and forge stronger relationships with faculty and advisors (Lei & Chuang, 2009). In addition, graduate students with publishing records have higher levels of research self-efficacy (Lambie et al., 2014), are better prepared and socialized for careers in academia (Anderson & Hosek, 2022; Austin, 2002), and have an increased chance of completing their degree and becoming a successful career researcher (Castelló et al., 2017; Horta & Santos, 2016).

As a result, graduate students often seek out publishing opportunities during their coursework; however, unless the goal of an assignment is a manuscript, it can be difficult to develop a research project for publication in the semester (Copenheaver

et al., 2016; Hatch & Skipper, 2016). This is true especially for part-time graduate students who may be limited in the amount of time they can spend outside of class on additional academic work. This problem was of particular interest given the positionality of the authors of this manuscript as two graduate students and one early career faculty member, all of whom are acutely aware of the challenges confronting graduate students considering academic careers.

While there is anecdotal evidence about instructors utilizing innovative models to teach research methods, few existing research studies highlight collaborative methods-based instruction that uses authentic data and is designed to lead to publishable results. The course-based mixed methods research project that led to the case study in the present article is detailed in the [course-based research model vignette](#) section for instructors wishing to replicate the model. In order to evaluate the effectiveness of the course-based model, the authors conducted the single case study described in the methodology and subsequent sections.

Course-based Research Model Vignette

The collaborative model in this study began in a graduate level mixed methods course with 10 full- and part-time students in two different PhD programs at a large public research institution in the southeast United States. The goal of the course-based model was to give graduate students hands-on experience when learning about mixed methods research and publishing in a way that also served a local community partner. The instructor was a tenure-track assistant professor teaching both undergraduate- and graduate-level courses. The course took place in fall 2020, and all classes were held via Zoom as a result of the COVID-19 pandemic.

Before the course, the instructor collected data from a community partner organization, a municipal-based prevention, treatment, and outreach center that offers three youth leadership programs to high school juniors and seniors. The goal of the partnership between the instructor and the community partner was to assess the three youth leadership development programs using quantitative and qualitative methodological approaches. The instructor distributed surveys and conducted focus groups during the community partner's 10-month programs, which took place a year before the course. The instructor conceptualized the study and collected the data prior to the mixed methods course, which allowed them to devote course time to data analysis, integrating mixed methods findings, and writing up the qualitative and quantitative results. During the course, graduate students analyzed the data in parallel and employed a convergent parallel mixed methods design (QUAL+QUANT) (Creswell & Plano Clark, 2018). The course materials for the course included Creswell and Plano-Clark's (2018) mixed methods textbook, select chapters from *The Oxford Handbook of Multimethod and Mixed Methods Research Inquiry* (Hesse-Biber & Johnson, 2015), a selection of journal articles, and resources about the community partner.

Students were placed in two groups, one qualitative and one quantitative, according to their preferences. The two groups worked largely independently outside of class to clean the data, devise data analysis techniques, and write up the results. During class time, students also worked together to develop consensus around the

research questions, which included one qualitative question, one quantitative question, and one mixed methods question. Students from both groups saved the documents and the cleaned data in a shared folder. The initial course deliverable included a collaborative paper from each group focusing on one data source and answering either the qualitative-based research question or the quantitative-based research question. Afterward, the instructor assigned five new student pairs, each with one student from the qualitative group and one student from the quantitative group.

The final course deliverable was a paper that integrated the qualitative and quantitative results into a cohesive manuscript and answered the mixed methods research question. The authors of each final paper presented their research in the last class meeting, which allowed students to see different interpretations of the same data and identify similarities across their findings. There was variation in the ways that students approached both the data analysis and synthesis, demonstrating the challenges researchers face when conducting a collaborative research study.

After the course ended, the instructor compiled the research papers that were submitted for a grade and developed a journal article draft about the mixed methods study. To be clear, the mixed methods article is a different publication than this one. When given the option, all ten students elected to keep their names on the article submission and were included as authors in the published article. Prior to submission, the instructor shared the final draft of the article and asked students to fill out a mixed-methods authorship determination scorecard to help determine author order based on contributions. Students were asked to rate themselves on their contributions to aspects of the research project including qualitative data coding, quantitative data analysis, integration of the results, journal submission preparation, and post-journal submission edits.

During the article submission process for the mixed methods research article, half of the students responded to the instructor's solicitation for comments and suggestions. Only five of the ten students completed the mixed methods authorship determination scorecard to determine authorship order. The instructor served as the corresponding author and submitted the journal article in July 2021, roughly seven months after the course ended. After minor revisions were addressed by the five students still active in the project, the article was accepted for publication in October 2021 and was published online in fall 2022.

The bulk of the work on the mixed methods article occurred during a six-month period after the course ended. There was a core group of students who pursued this publication opportunity with the instructor, but half the students did not actively participate post-course. Instructors wishing to replicate this course-based research study to publication collaboration model, may want to apprise students of the lengthy publication process and gauge their interest in and capacity to participate in post-course activities.

Research Questions

Exact replicability of the course-based research project is neither advisable or possible, however, there are many takeaways for instructors interested in incorporating publishing in a methods course. The purpose of the case study described in the following sections was to explore the phenomenon of a collaborative publishing model for mixed methods research in a graduate course. To achieve this purpose, the research questions guiding this study are as follows:

1. How do graduate students who participated in a research methods course reflect on their learning about the research and publishing process?
2. How do these graduate students reflect on their experiences conducting a collaborative mixed methods research study?
3. How do the instructor and community partner reflect on this collaborative teaching and research model?

Methodology

To answer these questions, this study employed a single-case study methodology, given that the phenomenon of interest was clearly within a “bounded system” i.e., the graduate mixed methods course (Merriam & Tisdell, 2016, p. 37). Case study research methodology is the “study of the particularity and complexity of a single case, coming to understand its activity within important circumstances” (Stake, 1995, p. xi). Additionally, Merriam (1998), who situated case study research in education and primarily relying on qualitative methods, referred to a case as “an intensive, holistic description and analysis of a bounded phenomenon such as a program, an institution, a person, a process, or a social unit” (p. xiii).

According to Stake (1995), a flexible case study design allows for changes based on the research findings since the “course of study cannot be charted in advance” (p. 22). In addition to being widely used in education, case study research is also popular in the related field of training and development (Tkachenko et al., 2022). Since the three authors of this article were also participants in the collaborative model examined in this research (two as students and one as faculty), this study also employs elements of participatory action research (McIntyre, 2008) in that we (i.e., the authors of this article) had a “collective commitment” to engage in “collective reflection” that would lead to actionable knowledge beneficial to all participants (p. 1).

The researchers used purposive sampling (Merriam & Grenier, 2019) with the guiding criterion for selection being participation in the course. This meant potential participants in the case study included the graduate students who took the course, the instructor, and the community partner. The researchers collected data via semi-structured interviews (SSIs) and document review. After receiving Institutional Review Board approval to conduct the case study, SSIs according to an interview protocol were conducted with six graduate students and the community partner. The interviews with the graduate students were conducted by the graduate student authors in alignment with Copenheaver et al.’s (2016) recommendations. In addition, a collab-

orative interview discussion among the three authors took place. Two of the graduate students did not respond to emails, and the authors ultimately did not use the service-learning partner interview for this article.

The interview protocol included questions related to the participants' perceived effectiveness of the collaborative teaching methods, their thoughts about conducting research for a community partner, their experience with research projects, and their interest and engagement with the publishing process during and after the course.

The researchers conducted and recorded the interviews via Zoom and Microsoft Teams in early 2022, and then transcribed the audio files utilizing Otter.ai software, which were subsequently checked for accuracy and completeness. The researchers coded the transcripts using descriptive coding to identify patterns in the data (Saldaña, 2021) and then applied thematic analysis, in particular similarities and differences (Ryan & Bernard, 2003), to determine themes related to the research questions. In addition to the SSIs, the instructor provided the aggregate results of the course evaluation for review and assimilation into the study results.

This case study uses social constructivism as its theoretical framework. Social constructivists maintain that exchanges between learners are central to knowledge construction (Stage et al., 1998). While a teacher may introduce concepts to students, the learning process is not a “one-way transmission of knowledge” (Stage et al., 1998, p. 41). More specifically, learners cultivate understanding when they discuss problems or complete tasks together (Driver et al., 1994). In both in-person and online classes, learners and teachers engage in interactive discussions rather than primarily employing lectures (Picciano, 2017).

Social constructivism in a higher education setting emphasizes students pursuing their interests through interactive learning processes. These processes enable students to “experience their education as more than an assortment of classes” and see how their coursework connects to social and emotional experiences (Page et al., 2014, p. 19). Instructors engage in dialogue with students and value their input in all stages of learning. In a constructivist course, students may work in groups to simulate the collaborative research process. A constructivist strategy also allows students to experiment with social and professional researcher roles (Hussain, 2012).

Findings

Throughout the course and beyond, students gained practical experience working with raw data, presenting preliminary findings, navigating the IRB process, drafting a manuscript, determining authorship, and identifying and submitting to a journal. The acceptance of the article for publication in a peer-reviewed journal also gave the students a tangible product from their work in the course. Beyond learning and applying mixed methods analytic strategies, the course had several other takeaways as described by the case study participants in the interviews and in the course evaluations. The following themes emerged from the participants in this case study regarding the collaborative model.

Theme I: Developing Interpersonal Research Skills

Research Backgrounds. At the time of the course, the instructor had six years of previous experience conducting mixed methods research, but for the students, the course was their first foray into mixed methods research. Despite the title and advanced nature of the course, there were no prerequisite courses. Some students had not yet taken introductory qualitative and quantitative courses, while others were in their last semester of coursework prior to taking general exams. One comment on the final course evaluation suggested having a prerequisite of other research courses, especially qualitative research methods and quantitative research methods.

Students interviewed for the case study acknowledged that having the instructor assisting with the project was comforting as they analyzed the data and wrote up the results. A student noted that it was helpful that the instructor, who collected the data and had the most experience with publishing, guided the process of preparing the manuscript for publication. While the students were free to make decisions regarding analysis during the course, and they played a significant role in drafting the report via their final papers, the instructor compiled the final manuscript to submit for publication. One student stated,

If I goof up, he's going to catch it, but at the same time, I felt like he trusted us a lot. I didn't feel like I had to have everything approved, but definitely having a professor there just felt like a safety net, like I'm not the final word on this if I get something really wrong.

Group Selection. Because some students did not know each other or had not worked on research projects together before the course, both groups in the course (qualitative and quantitative) had communications challenges. The course occurred in the fall of 2020 when nearly all learning happened remotely, so there were no opportunities for students to engage in person. Due to varying research backgrounds and perspectives, the students had different ideas about how to approach the data analysis. One member of the quantitative group noted that once they were able to work with another student they knew better, the project went more smoothly.

When selecting whether they would be in the quantitative or qualitative analysis group for the course-based project, most students chose the group they were more comfortable with. A member of the qualitative group described how they were able to contribute more to the project because they selected the area where they felt safe, but they were not challenged to explore the quantitative aspects of the project until the integration phase.

Similarly, some students did not feel that they completed the course project with a firm grasp of the methodology they did not choose, or even mixed methods overall. In the final course evaluation, one student commented, "The project allowed me to become very familiar with half of mixed methods; for us to get a true understanding of mixed methods, I would recommend having students work with both types of data in the future." Others who were more involved with the integration phase commented that the mixed methods project allowed them to refine their own research interests. Recalling the process of integrating the qualitative and quantitative data with their

partner, one case study participant stated, “I discovered I have no interest in quantitative research... though I did really enjoy seeing how we could mix those and play off one another when we analyzed, I much more enjoyed the qualitative approach.” Thus, the model also allowed students to experiment and clarify what their desired roles would be in future research collaborations.

Working as a Team. The collaboration model in the course allowed students to work as a team of consultants for the community partner, and the instructor noted that students “were truly responsible for a product and working with the client.” Despite the instructor’s general dislike of group work, he felt that this class was well-suited to this type of collaborative learning. He further acknowledged that students who were less involved in the group processes during the course might have learned more with a more traditional teaching approach, but people who were involved in the group processes learned about mixed methods research “better than they would have otherwise.” During the case study, the instructor recognized the value of obtaining concrete research experience in a methods course, especially for students seeking positions in academia.

Students similarly described the process of the course project as an iterative process that included working with other students separate from the instructor, receiving feedback from the instructor on their progress, and then again working in student-led groups on the next steps. The project showed how work could be done effectively in a group, and most students in the case study felt that the instructor’s methods prepared them to do another mixed methods project, although they would prefer to focus on only one methodology. During the case study, a student remarked,

I feel like if I were going to do mixed methods research, it would probably be as part of a team or a partnership at least with one other person, just because I personally don’t feel strong enough on the quantitative side to take it on by myself.

Similarly, case study participants from the quantitative group discussed challenges surrounding the data analysis. During the course, the group was able to clean and enter the data faster with multiple students doing the work, but once they determined the analysis strategy, there was little need for the entire group to run the analysis. One student felt that the analysis might have gone differently if the group had been able to meet in-person. They observed,

We would decide what we were going to do, and then it was really we could all do the same things in SPSS (simultaneously), but there was really not a compelling reason to do that. One person could do it all and then send the results to everyone else if that makes sense. I almost wish we had been able to sit down together and really work through some of it synchronously. That would have, I think, been better for me.

Students in the case study also noted several challenges that are typical of group projects. Although the instructor allocated class time for planning analysis strategies, the qualitative and quantitative teams had to coordinate schedules and find time outside of class to discuss findings and prepare their reports. As the class was fully online,

the students had to determine a strategy for working together without meeting in person. Several case study participants mentioned that having to conduct all class and research team meetings over Zoom complicated the research process. During the case study, members of the quantitative group also described breakdowns in communication over e-mail where it was difficult to discern tone and meaning.

Instructor Role. Another role of the instructor is to familiarize graduate students to research in practice. Especially for courses led by early-career academics, this type of collaboration offers insight into the processes involved with research and publishing for graduate students wishing to pursue academic careers. As one case study participant observed, the model allowed them to see how the instructor structured his research. They added,

Actually working with someone who is at the assistant professor level, [means] research is forefront in what they're working on... Third-year review and promotion and tenure are always looming, and so I think, you get a real perspective and more of a nitty gritty look at what all is involved in doing research and publishing when you're early on in your academic career.

Case study participants also emphasized that it was critical to have a patient and understanding instructor for the course. Several noted the difficulties of the semester and other external factors such as the global pandemic when they reflected on their experiences in the course. One case study participant observed that the instructor was concerned about students' wellbeing and was understanding when students needed extensions on deadlines, remarking,

He just wanted good work, and he wanted it to get done well. And I think that's a really practical way in the real world, it operates as well: you just want to do good work. And so I think he was the right guy for the right time to teach that course.

Although this collaborative model required significant work for the instructor, he felt that all groups benefited from the experience. The instructor explained,

It's a win for the students to get practical experience, it's a win for the university to have their students getting practical experience in publishing and also being involved in the community, it was a win for the community partner to have important work done for them that they don't have the skills to do otherwise or the time or resources to do otherwise, and it's a win for me to work with these great students on projects. I see no downside to it whatsoever.

Theme 2: Working on a "Real" Project

Real Data/Real Project. The instructor designed this collaborative model for teaching mixed methods because he thought doing an applied project with a community partner would be the best way to learn. In the case study interview, he explained,

There's something that clicks in your brain, I think, when you are doing a project that you know you're working with real data, with real people, with a real organization that is going to be actually used in some way. I think it turns you on to learning more, and it makes you more attentive to detail and to the process than if you were just working with dummy data or if I was just giving [the students] coding exercises or some of the more traditional ways that methods are taught.

As the instructor described, students in the case study also expressed that conducting research with authentic data was more effective than just hearing or reading about it.

Comparing this course to previous research methods courses, students in the case study noted that the collaborative model allowed them to work with real data and “get [their] hands dirty,” which was different from other classes where they learned about data analysis from a textbook and practiced using sample data. Case study participants also mentioned the value of contributing to a real project. Although case study participants recognized the practicality and real-world applicability of this research collaboration, they also observed some differences between the course and other research experiences. Some case study participants felt that they did not fully understand the data because they had not helped collect it. Similarly, because the leadership development programs conducted by the community partner had ended, the research team could not easily collect additional data, which limited the scope of the groups' analyses.

Given the context of the project within a course of people in two different graduate programs, the students in the course worked in groups with individuals they did not know well and might not have preferred to work with. The case study participants felt that if they were faculty members as opposed to students in a class, they would be able to pick research partners based on similar interests and work styles, which might have better facilitated the data analysis and reporting.

Subjectivity of Research. Case study participants in both the qualitative and quantitative groups reflected on how the project introduced them to the subjectivity of research. One participant mentioned that because the students did not collect the data, they did not fully understand the nature of the data when they made analysis decisions. Another case study participant observed,

It's always interesting to learn something in classes because when you learn about it in a textbook and a class, it all sounds like it's going to be very structured and easy, and it's going to be like “This, then this, then this.” And then when you actually get data and see how it actually works in the real world... you see that it's a lot messier than what you might expect, and so then you have to make decisions about how to handle that messiness without compromising the research.

During the case study interview, a member of the qualitative group commented specifically on how subjective determining analysis and coding strategies could be. Similarly, a member of the quantitative group shared that their team struggled to settle on a direction for their analysis. They explained,

That was super hard, but at the same time, it made you realize that there's more than one way to do everything. Like even in quantitative [research] where it's math, you know, what math are you picking? You have so many things to pick from, and you have to figure out your approach based on what data you have, what's best for the project, what you're trying to do.

Mixed Methods Takeaways. After the course, the students interviewed in the case study acknowledged that the project demonstrated that mixed methods research is more than analyzing and writing up quantitative and qualitative research in one manuscript. For example, case study participants mentioned learning the importance of including a research question specific to mixed methods. They also emphasized the value of learning to integrate the quantitative and qualitative data to represent the analytical power of mixed methods research. One case study participant noted, “to actually be able to meld those two methodologies in an applied example, I think was really beneficial for me as a learner.”

Authorship Determination. The final course deliverable was a mixed-methods article draft that could include data analysis and findings information from the other student groups. Everyone's work for the class was fair game for the final paper. There were many opportunities for students to work together to analyze the data, although at least one student chose to work alone. With 11 individuals contributing to the research, authorship determination was an essential but complicated component. Due to the multiple course deliverables and the rotating groups, ascertaining the level of contribution of each person presented challenges. Authorship determination discussions occurred post-course, first with a group of students who responded to a call extended by the professor to determine an equitable process. The smaller group worked with the professor to identify authorship determination resources, especially those that address mixed methods projects. They subsequently developed a mixed methods authorship determination scorecard based loosely off the American Psychological Association (n.d.) Authorship Determination Scorecard which was utilized first to help determine author order on the journal article.

Responding to a question about their comfort level with the authorship determination process, one case study participant stated, “I feel like the order that the rest of us went in after [the scorecard] matches the workload of what we put into the class.” Another participant noted that the scorecard helped those who perhaps were not the dominant ones in the group get credit where it was due. Acknowledging the difficulty of ranking oneself, a case study participant stated, “there's big egos and little egos... I feel like I might have been more generous than [other student] was with her own stuff, because [they] put a lot into that as well.” While the scorecard was helpful, it was also subjective and based on the perceptions of the individuals.

Some students from the course did not fill out the scorecard, with one case study participant noting that authorship determination “really wasn't a priority to me, and I didn't really care if I'm not first or whatever. It's still going to be in the CV no matter what.” A few case study participants acknowledged that since they are not planning to go into academia or pursue a career in research, they were not concerned about their position in the authorship order. There were disparities within the scores, as one student thought they had scored themselves higher than others who they considered

an equal contributor to the project. Another case study participant commented on factors such as gender and personality affecting how a person ranks themselves on the scorecard.

It is of note that the scorecard was created post-course, which meant students in the course were not aware of the aspects of which they would be evaluating themselves for authorship determination. One case study participant spoke to the unfamiliarity most of the students had with authorship determination, noting

I thought maybe we were all so new to that piece of [the research process] that it was really very subjective. We didn't start out knowing, 'well, this is kind of what you need to be looking at, and this is what you're going to evaluate yourself on after the work is finished.'

The final author order of the submitted article was an imperfect estimate of the contributions of each of the 11 authors, demonstrating the complexity of authorship determination, especially in mixed methods projects. After employing the scorecard for this research project, the smaller group of students and the instructor began refining it for a future publication, in particular re-evaluating the categories and associated weights to ensure that the qualitative data contributions were counted fairly.

Publication Process. Students in the course were from two disciplines that do not share many presentation or publication venues; however, the research spanned both disciplines and provided opportunities for the students to craft discipline-related research projects. Following the social constructivism framework, the representation of the two PhD programs proved to be beneficial, as students in the course learned from each other and gained a broader understanding of how mixed methods research is conducted in practice. Integration of the disciplines is evident in the published journal article where studies from both fields appear in the references.

In spring 2021, the semester after the course, five students collaborated to identify journals and conferences where they could present their research. Five students did wish to be involved with the publication process, although their names would still appear on the author list. The publication process allowed the student researchers to explore the steps after manuscript preparation, submission, and subsequent review. The instructor created a table for revisions, and four of the students divided the reviewer comments and made the appropriate changes. Because the instructor and students shared the tasks involved with developing the journal manuscript, the workload was lighter for everyone than it would have been working alone. However, this collaboration model is not a shortcut to publication. In total, 2.5 years elapsed from the instructor receiving IRB approval for the study to the group receiving notification that the revised manuscript was accepted for publication. The article was published one year after acceptance.

Theme 3: Practical Applications

Case study participants described several applications of the knowledge gained from the course experience and collaborative model. One participant felt that working with a faculty member on a research project was a preview of the exchanges that

occur while writing their dissertation. Another case study participant remarked that the course experience boosted their confidence to do research independently and in a group setting, which led them to consider using mixed methods for their dissertation study. Case study participants also felt more comfortable with and had a better understanding of the publishing process after the course.

Case study participants who do not aspire to pursue faculty work at the completion of their degree still noted benefits of the course for their professional roles. One participant plans to use their employer's data clearinghouse to explore outcomes of their organization's programs:

Since that...was a community program and nonprofit program that really was geared towards the high school students, that actually is influencing what I want to do research-wise for my current position.... I've already spoken with our executive director and am looking at the data.

Another case study participant described gathering, integrating, and presenting qualitative and quantitative data in their job to determine their department's core values, stating, "I'm still using the skills that I learned in that class. It's been really beneficial for me, I think, because I bring that perspective to my workplace where other people don't have that research background."

As an outgrowth of the course, five of the students and the instructor have continued to collaborate on projects surrounding authorship determination in mixed methods research. The instructor spoke to the value of collaboration in the course by noting,

We kind of got this community of people who want to do research and who were willing to spend some time and who recognize if we do it as a group it's not as much time as it is if only one of us does it. It's useful... It's a meaningful line of inquiry, and we're doing it in a competent way, so that feels good.

One case study participant commented, "I don't think there's a better ringing endorsement of the class other than the fact that five of us and [the instructor] are still working on a paper together."

Discussion and Implications

For the mixed methods course described in the vignette, the instructor utilized a pragmatic practice-based approach which included course-based activities to develop student skills within their disciplines. According to a Delphi study of competencies for doctoral leadership faculty, key advising role competencies include, "1) knowledgeable about research methods, tools, and technologies; 2) guide quality written work; 3) be available to students; 4) engage students as co-researchers; 5) coaching skills; 6) responsible for dissertation advisement; and 7) teach research ethics" all but one of which (dissertation advisement) were utilized in this collaborative model (Hyatt & Williams, 2011, p. 60). This likely aided in the project success for the students.

Most of the students approached the project with foundational knowledge of research methods from other courses, and they connected new ideas with their previous knowledge as they collaborated (Stage et al., 1998). The students who had taken both qualitative and quantitative methods courses prior to the mixed methods course indicated that they felt prepared to apply their knowledge in a mixed methods research project. Lambie et al. (2014) found a positive correlation between research self-efficacy and the number of prior research courses completed. Within social constructivism, however, more advanced students can also assist with their peers' progress and understanding of new concepts in a classroom setting (Stage et al., 1998). For faculty considering employing a similar model in their methods courses, having other research methods courses as prerequisites would be of benefit to everyone involved.

How should scholars and practitioners collaborating on a project such as this measure their success? According to MacGregor (1990) "a successful collaborative project includes positive interdependence among the students, a product to which everyone contributes, and a sense of commitment and responsibility to the group's preparation, process, and product" (p. 24). In this case of this model, students not only had a sense of commitment, which was enhanced via the collaborative components, but the manuscript's acceptance for publication in a peer-reviewed journal also demonstrated the project's success in terms of making a unique contribution to scholarship. The culmination in publication also lends credence to the effectiveness of the constructivist learning strategy at the graduate level.

Faculty-student mentorship in research is "one of the richest opportunities for weaving students into the social fabric of the discipline and practicing skills that they will apply in later years" (Page et al., 2014, p. 20). In a collaborative publishing model, however, the faculty member takes on additional responsibilities that would not be required in less collaborative courses (Copenheaver et al., 2016). As noted previously, the model detailed in this study is not a shortcut to a quick publication. All aspects of the research process still take place, and in fact may take more time to complete depending on the size of the class and the length of time needed to collect the data prior to beginning the course.

The success of this model relies heavily on the instructor's willingness to assume a prominent role in conceptualizing the study and collecting the data, and then subsequently preparing the manuscript for publication. At the same time, the instructor must relinquish some autonomy and allow students to be responsible for much of their own learning (Sherman & MacDonald, 2009). The instructor should also be committed to mentoring and guiding students through the research process and giving them credit in the final product (Copenheaver et al., 2016). Whereas mentoring graduate students can be perceived as invisible labor when there is not a tangible product, having an article published in a peer-reviewed journal is an added value for the instructor (O'Hara et al., 2019).

This type of investment in student's research training is an additional gain for the university and its students, particularly if the university is a public and land-grant institution. As a land-grant university, there is an expectation of research, and service relating to or benefiting community or external partners (Gavazzi & Gee, 2018). The more investment is made in graduate students to navigate the research and publish-

ing process, as was done through this collaboration model, the more instructors may be willing to serve as mentors to undergraduates through programs such as the one outlined by Horowitz and Christopher (2013).

The success of this collaborative model for educating students in two different disciplines demonstrates the transferability of this model across multiple fields of study. Instructors seeking to implement this collaborative model should consider the specific takeaways that are most critical for developing scholars in their fields and ensure that graduate students are learning these skills in practical ways. However, instructors should ensure that their adaptation of this model also encompasses more general research skills that are necessary for graduate students and interdisciplinary researchers.

Conclusion

From start to finish, the research process typically lasts longer than a single academic term. In many graduate research courses, students learn the steps of the research process and propose a study design, however, they do not have sufficient time to collect or analyze data. The hands-on approach to mixed methods research in this model allowed graduate students to participate in the later stages of the research process, and turned classroom experiences into an opportunity for publication for both instructor and students. Instructors interested in replicating this model will need to plan the course as they plan a research project, including allocating time prior to the course to devise a study, seek IRB approval when necessary, and collect the data.

The publication process can be overwhelming for students new to the process, but working alongside an instructor and other graduate students makes it less daunting. While contributing to the publishing process was not required for the students in this course, instructors applying this collaborative model should encourage participation in the publication process as it provides a valuable learning experience. Acknowledging the importance of and the challenges to graduate student publishing, the instructor in this case study sought to reduce some of the barriers for students while integrating a collaborative teaching model. The collaborations forged in the class continue to provide opportunities for the students and instructor to work together on research projects. The model success is attributable to the instructor's commitment to mentorship and a core group of students' desire to continue identifying research collaborations beyond the semester-long PhD-level research methods course.

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Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

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