

Teaching and Educational Methods

Integrating Mixed Methods and Service-Learning in Undergraduate Education in Applied Research Methods: A Course Preparing Students to Address Complex Social Issues

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Abstract

This paper discusses the methods and outcomes of an undergraduate social science research methods class in the Department of Community Development and Applied Economics (CDAE) at the University of Vermont (UVM). The course is required for all (approximately) 500 majors in this department. The paper reviews literature on experiential, service-learning (S-L) education, co-creation of knowledge, and mixed-methods research, arguing that the approaches prepare students to address wicked (complex social) problems. It then outlines the methods of the class and how these approaches are incorporated into class via a class research project with a community partner (CP). It presents the class's publications, awards, and impacts. The Conclusions section focuses on strengths and limitations.

1 Introduction

Research and education from institutions of higher learning have vital roles to play in addressing the most vexing issues of our day, including the sustainability of food systems, climate resilience, and community development. Almost two decades ago, Batie (2008) called for applied economists to develop the tools and knowledge to address so-called wicked problems (WPs), problems of high social complexity. Another applied economist, Peterson (2009) emphasizes the need for co-created knowledge as an essential tool to attend to WPs. Since then, scholars from across disciplines have documented educational approaches to address WPs. Kłeczek, Hajdas, and Wrona (2020) call for project-based learning to address WPs. Harker Steele and Bergstrom (2018) emphasize the need for a participatory, student-centered approach to tackle WPs. Dekker et al. (2020) note the need for transdisciplinary¹ approaches to solve WPs, a view echoed by Conner (2022).

Service-learning (S-L) has many elements to address WPs: project-based, student-centered, and participatory approaches. S-L is defined as “experiential education in which students engage in activities that address human and community needs together with structured opportunities intentionally designed to promote student learning and development” (Jacoby 1996). For example, Van Meter (2012) discusses the role of S-L in creating sustainable citizens able to confront WPs. McGowan and Branche (2020) discuss the use of S-L to help students develop higher-order thinking skills, synthesize information, and draw conclusions on highly complex topics.

This paper discusses the methods and outcomes of an undergraduate social science research methods class in the Department of Community Development and Applied Economics (CDAE) at the University of Vermont (UVM). The objectives include: (i) highlight the merits of S-L instruction and a mixed-methods course to address WPs; (ii) provide an example of a class with these features in an

¹ In this paper, I operationally define “transdisciplinary” research as having submersed disciplinary frames, adaptive and iterative methods, and the aim to address gaps that exist between disciplines (Baker et al. 2009).

applied economic department; and (iii) contribute to discourse on incorporating these features in future classes.

CDAE was a pioneer in bringing a transdisciplinary approach to applied economics at land-grant universities (Baker et al. 2009). The course, previously CDAE 250, recently renumbered as CDAE 3500, Applied Research Methods, is required for all (approximately) 500 majors in this department. This section is taught every Fall semester by Professor David Conner and has an enrollment of approximately 55 students. The class utilizes a S-L approach. The official goals of the class are to:

1. Develop necessary methodological and analytical abilities to evaluate and critique research arguments, involving both qualitative and quantitative information;
2. Be equipped with skills and techniques needed for successfully completing an independent capstone senior project and lifelong research needs; and
3. Apply class concepts to conduct research to benefit a community partner (CP) in an S-L format.

The unofficial goals are for students to become better consumers and producers of research; by producing research, they become more discerning consumers of it as well. The unofficial goals are stated to emphasize the key intended outcomes in layperson terms. The class has been taught once a year by this instructor since 2011. Other sections have been taught by other instructors in different formats.

Each year, a CP (usually one based at the university) brings to the class a research problem, to understand student awareness, beliefs, experiences, and behaviors germane to the organizations' mission. Past partners (and topics) have included UVM Dining (The Real Food Challenge and demand for sustainably raised livestock products), Office of Sustainability (reducing plastic bottle waste, climate change, and sustainable transportation), Center for Teaching and Learning (CTL; online learning, "belonging" in the classroom, and student use of Artificial Intelligence), and UVM Career Center (overall efficacy).

The class engages CPs in or close to the university, so that the research subjects are university students. The intent of this practice is to make the topics more relatable and research subjects more accessible.

The research topics addressed by the class generally have elements of WPs: complex, ill-structured social problems influenced by social and political factors as well as biophysical complexity (Batie 2008). These topics involve multiple stakeholders and require nuance and understanding of tradeoffs in addressing them.

2 Literature Review

The following section will review literature in S-L, co-creation of knowledge, and mixed-methods research. Following that, the methods of the course will be discussed, along with an overview of outputs and evaluations. It will conclude with a discussion section, featuring reflections and future plans.

2.1 Service-Learning

Jacoby (1996) defines S-L as "experiential education in which students engage in activities that address human and community needs together with structured opportunities intentionally designed to promote student learning and development" (Jacoby 1996). S-L brings many student benefits, including increased knowledge retention, civic engagement, and professional skill development (Eyler and Giles 1999; Eyler et al. 2001). CPs gain from improved networks and greater university ties as well as the tangible outputs or deliverables of the class projects (Eyler et al. 2001).

Celio, Durlak, and Dymnicki (2011) identify key practices that improve beneficial outcomes to students. First, the S-L component should be aligned with curricula and include clear goals and articulation of the relationship between learning and service outcomes. Second, the class should allow for student voice in input on design of the project. Third, a strong connection to the CP improves

multiple outcomes. The partner should also have a voice in the service component subject and design. The benefit to both students and partners should be clearly articulated, and opportunities should be made to forge positive relationships between both faculty and students and the partner. Finally, reflections help to link the service project to course learning outcomes, as well as providing students with greater confidence, self-efficacy, and caring relationships.

2.2 Co-Creation of Knowledge

Another pedagogic goal of the class is to foster co-created knowledge, as well as transferring explicit (written or spoken) knowledge and facilitating tacit (how-to) knowledge. Peterson (2009) emphasized the unique role of co-created knowledge in addressing complex issues and its high strategic value when created and used. Conner et al. (2014) argue that explicit, tacit, and co-created knowledge are all needed in food and agricultural entrepreneurship curricula; further work corroborates the role and value of co-created knowledge in food businesses in Vermont (Conner 2020).

2.3 Mixed Methods

Another theme emphasized throughout the class is the value of mixed-methods research; using a combination of idiographic, qualitative, and nomothetic, quantitative data brings depth and breadth of perspective, accuracy, and precision, respectively, with each type of data, shoring up the weakness of the other (Babbie 2010). Mixed-methods approaches are increasingly seen as necessary to address complex social issues (Bigler et al. 2019; Strijker, Bosworth, and Bouter 2020). A goal of social science research is to deeply understand the subjects' experience of a given phenomenon; this class takes a positive approach, rather than the normative (assuming a single correct rational action subjects should take) approach used in many economics studies.

3 Methods

As discussed above, this is a S-L class taught in Fall semester. Over the summer, before the class begins, the CP is finalized. Thus far, the CP has been an on-campus entity. The instructor and CP discuss and delineate the details of the research project the CP would like to undertake. A few key features are: (i) they are able to articulate how the results will be used, and (ii) the target research subjects are mostly or entirely composed of UVM students. The latter provision is intended to reduce time and effort finding subjects, and to make for an emotionally and possibly physically safer process. Generally, the goal of the research is to understand student beliefs, perceptions, knowledge, and behaviors around some issue the CP's organization is facing.

The CP attends class four times. The first meeting is to introduce the partners and the research topic and questions. The CP explains why the results are important and how they will be used; demonstrating that the results will not just sit on a shelf but be put into action engages and motivates students. The second meeting takes place after the literature review and observation assignments are complete (see below for more detail on each assignment). The class discusses key themes and results from these activities and then brainstorms interview questions. In the third meeting, the class discusses results from the interviews and brainstorms survey questions. In the final meeting, near the end of the semester, the class discusses survey results and overall results, implications, and recommendations.

The students engage in four research activities: a literature review, an observation, a series of interviews, and a survey, each with an accompanying homework. They also compose a final report, compiling, refining, and summarizing the previous results. Homework assignments are done both as individuals and in groups of four (with the occasional groups of three or five depending on class size). The literature review has two parts: after a session led by the department's reference librarian liaison, each student finds and cites five relevant articles, and puts them in a wiki so that all other students can

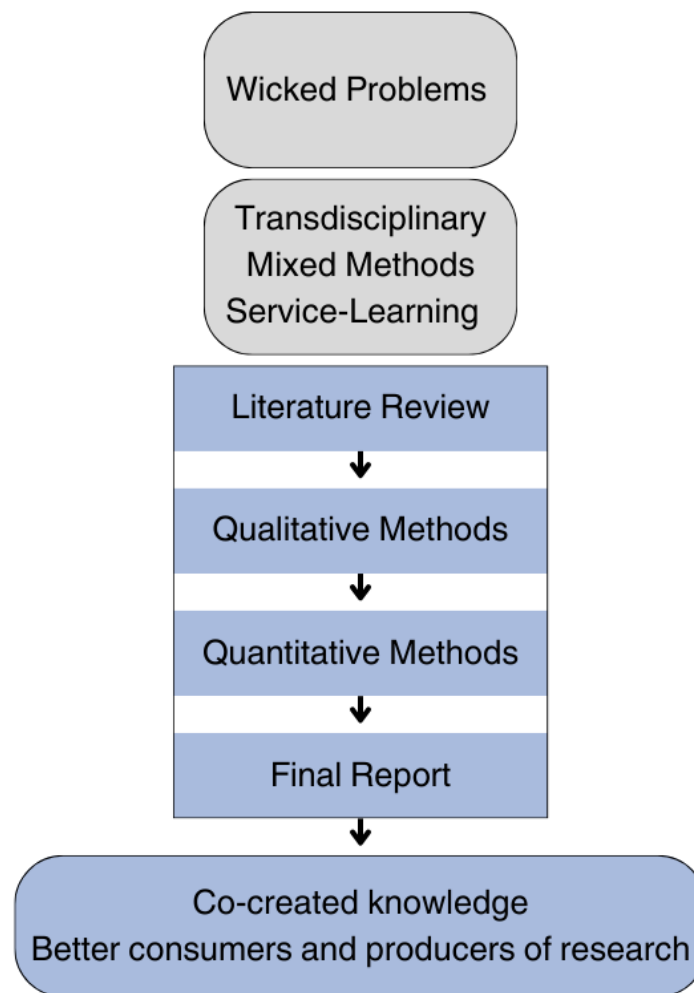


Figure 1. Overview of Course Activities

see and use them. In part two, each group writes a (approximately) ten-page literature review, ending with an identified gap in the literature. Students are presented with a number of options on how to organize a literature review (chronological, pro and con, by dimension and by stakeholder type). The instructor holds a workshop about a week before the due date of the literature review, reviewing outlines and drafts of progress so far. The instructor also provides examples of assignments from previous years that earned all or nearly all possible points.

Next, each individual conducts a participant observation. This has been the assignment most varied and challenging to design. The goal is for the students to experience a phenomenon first-hand—to get a sense of the “vibe”—before collecting data from others. This assignment is designed in conjunction with the CP. Part examples include: visiting online class pages; visiting a dining hall to see how food is presented and marketed; attending a climate justice rally; and using a type of sustainable transportation (e.g., bus, bike) they do not normally use. Students fill out a document with a number of prompts (date and time; expectations before beginning; reflections on their experience—emotions and impressions, descriptions of other people, and their behaviors; and sensory prompts—sights, smells, and sounds). It concludes with reflections on what they learned (what was new, unexpected) and ideas for questions on interviews.

For the third homework, students conduct and analyze data from five interviews. Ideas for questions are brainstormed in the second CP meeting (and a fast-typing student records the various ideas on the classroom computer and displays on the screen). Students are reminded that interview questions should be ordered by three principles: general to specific, most to least important, and least to most risky. The instructor takes the list of brainstormed questions, identifies common and important themes, and composes a draft interview guide, which is shared with and edited as needed by the CP until all agree on a final version. When the interview homework is assigned, the class brainstorms dimensions of variability in the subject population (major, year of study, on- or off-campus; as well as gender, race, ethnicity, age, and place of origin). The class discusses strategies and the importance of a diverse sample, and outlines strategies on how to gain one. Each student interviews five subjects.

In addition to a class session on qualitative data collection (key informant interviews and focus groups), there are two sessions on qualitative data analysis. Students are taught the basics of coding in one class; then in the next class, they are given part of a transcript from a previous unrelated study and asked to list open, axial, and selective codes. They code the data in these three steps alone, then compare them with a partner, and then the whole class attempts to reach consensus. For the homework assignments, the groups of four write a report on the methods, results, and implications of the interviews. In the results section, they present the (approximately five to eight) axial codes and (one or two) selective codes (Babbie 2010) that emerged from the interviews, creating a heading and description of that theme, describing the range and relative frequencies, and giving at least one quotation that captures each. Implications focus on key findings to date, how they may be used, and ideas for survey questions.

For the fourth homework, students help design an online survey, solicit responses, and analyze the data. Similar to the interview, the survey questions are brainstormed by the class (during the third CP meeting). Key demographic variables to the study are also discussed (“do we believe different demographic groups’ views should be recorded? Would different demographic groups answer questions differently and why?”). The question ideas are recorded, then the instructor creates a draft and shares it with the CP, who edits it. When complete, the instructor uploads it into the Qualtrics platform. Students are directed to obtain ten responses (and get one homework point for each response up to ten): the first question of the survey asks the name of the student to be credited by the response. Questions generally focus on attitudes, beliefs, awareness, and behaviors around the research topic (often using Likert-type scales) along with demographic variables. The instructor converts the data in an SPSS file. In groups, the students compose a report on the survey portion; they outline the methods and choose eight to ten variables of interest to provide descriptive statistics or frequencies. They also conduct two bivariate analyses, and test and report on statistically significant differences in response among various groups (e.g., testing a null hypothesis that different genders or majors had no difference in responses to a question of perception or behavior). Prior to the survey design and data collection and analysis, class sessions cover survey strategies (length, sections, and question order) and variable types (nominal, ordinal, interval, and ratio). Subsequent sessions cover statistical inference, and the appropriate bivariate and regression analyses for different variable types. Throughout the semester, the students have a weekly computer lab taught by a graduate assistant, where they learn to use SPSS.

Finally, each group composes and submits a final report. They integrate and adapt the prior four assignments (literature review, observation, interviews, and surveys) and develop implications and recommendations for the CP based on the results. It is emphasized that simply cutting and pasting is insufficient; research is an iterative process where new results should cause you to reflect upon and re-evaluate prior framing, assumptions, and results, and revise accordingly. The students must revise the literature review and curate results to make a cogent argument in order to earn full points on this report. The intentions of the final report are to: (i) give experience and test the ability to form an argument based on data; (ii) provide results and recommendations for the CP; and (iii) provide a tangible output, evidence of having completed a research project, for the student’ portfolios.

In addition to the homework assignments, the class also has a midterm and final exam (which tests the students' ability to conduct research on topics other than the S-L project and use methods such as experiments and different sampling techniques), a lab grade, and participation points. The class uses a flipped classroom where the students watch pre-recorded video lectures on each topic prior to class, then use class time to answer questions and discuss why, when, and how the method is used. Each video lecture has a small assessment, due before class, to motivate the student to watch the video. There are two class sessions on how to evaluate the veracity of research claims and outputs, one each near the beginning and end of the class, to enable the goal of being better research consumers. Finally, the qualitative research component includes a discussion on how to demonstrate rigor in qualitative work.

The class also has frequent informal check-ins and two (mid and end of semester) exercises where the professor makes columns titled start, stop, and keep, and invites the students to write what the professor should start doing, stop doing because they do not work, and keep doing because they are effective. The professor leaves the room and asks students to fill the column and put check marks next to things they agree with. When complete, the professor returns and discusses them with the class.

4 Results

Students gained experience and skill in research ethics, conceptualization, research design, literature review, and qualitative and quantitative data collection and analysis. Other topics covered in class, but not directly used in the research project, include experiments and epistemological social and economic paradigms.

4.1 Publications

In two cases, the instructor selected a group of outstanding students and composed and published peer-reviewed articles on the data from the class project; the topics were campus sustainability perceptions, working with UVM's Office of Sustainability (Conner et al. 2018), and demand for humanely raised animal products, working with UVM Dining (Robinson et al. 2021). A Food Systems MS student used the data in her thesis and published an article on students' experiences of UVM Dining's Real Food Challenge program (Porter et al. 2017). A Natural Resources MS student used class data on students' emotional responses to climate change in her final project paper (McCamp 2020).

4.2 Awards

This class has led to a number of teaching awards. The instructor won the North American Colleges and Teachers of Agriculture's Excellence in Teaching Award in 2014 and the UVM College of Agriculture and Life Science's Carrigan Award for Excellence in Teaching and Undergraduate Education in 2021. The CP for the Fall 2021 class, Sarah Heath of the UVM Career Center, was recognized by UVM's Office of Community-Engaged Learning in April 2022.²

4.3 Impacts

A few policy and practice changes were guided by the class's research. In an effort to decrease single use water bottle use, a number of water fountains were fitted with bottle fillers; the locations were based on suggestions from the interviews and surveys. The UVM Dining changed labelling practices to promote the Real Food Challenge and started serving more items made entirely to qualify as "real" foods (sustainable, local, humane, and fair).³

² <https://site.uvm.edu/cals-news/cdae-community-partners-recognized-for-commitment-to-students/>

³ <https://www.uvm.edu/sites/default/files/RFWGMinutes2013.05.21.pdf>

4.4 Testimonials

Testimonial 1

Working with Professor Conner's CDAE class in Fall 2021 was of real benefit to the UVM Career Center. Though the audience surveyed was not necessarily representative of the whole student body (given the CDAE slant), it was nevertheless a treasure-trove of information from nearly 500 students. Not only did it confirm our suspicions (that we already offer most of what students want, they just don't know it)—which was tremendously helpful in informing our marketing and outreach efforts—but it also allowed us to point to a data set backing our new strategies when sharing them with university leadership. The attached card—given out to academic advisors—is an example of a direct result from this research, and so was the creation of our BuzzFeed-esque quizzes that guide students' career preparation. Of course, we still have to get students to use the quizzes, but that is a question of culture shift that will take time. It was great working with David and his students, and the research has proven so useful, we still reference it regularly.

Testimonial 2

The Office of Sustainability has worked with David's class multiple times since 2011, and we have benefitted from the qualitative and quantitative data collection and analysis provided. We often use the surveying the class does as a pilot for future surveying efforts, and methodological support from David has helped us answer meaningful questions (about everything from food/beverage systems and campus sustainability efforts to transportation and climate anxiety) with confidence. The interviews students conduct are especially valuable in giving us insight into the beliefs, values, and attitudes of the student body that our staff would not have the capacity to conduct at such scale. The peer-to-peer nature of these interviews creates a uniquely relaxed, trusting, and open environment that results in more honest and candid responses than our staff could facilitate. Working with the class also gives us an opportunity to engage with the students and tell them more about the work of our office. We appreciate David's commitment to providing the student with real-world projects that benefit the campus and community.

Testimonial 3

In Fall 2020, the CTL partnered with Dr. Conner and students enrolled in CDAE 250, Applied Research Methods, to explore the relationship between teaching practices grounded in pedagogy of care, inclusivity, and belongingness and student engagement. At a time when both students and faculty were feeling disconnected, this collaboration was timely and valuable. During the COVID-19 pandemic, students and faculty needed to quickly adapt to online learning, video conferencing, and socially distanced classrooms. Dr. Conner and his students designed a study to help CTL better understand what teaching behaviors were helpful, supported student learning, and caused students to feel more connected in uncertain times. The results helped to inform CTL's programming for faculty. The data provided validation for the center's continued emphasis on creating a supportive social presence, course design that was both flexible and structured, and adjusting expectations given the state of the world. The opportunity to "ground-truth" our programmatic themes using UVM faculty and students data strengthened our resolve to move forward with our work.

5 Conclusion

This paper highlights the objectives, methods, and outcomes of an applied social science research methods class at UVM. The intent of the class is to instruct the use of mixed-methods research in a S-L format, creating better producers and consumers of research to be able to confront WPs, the most important and complex issues of today. The class instructs in mixed methods because this approach is

well-suited to holistically address complex problems (Bigler et al. 2019; Strijker et al. 2020). Especially, this class uses qualitative (observation, interviews, and inductive coding) and quantitative (surveys and statistics) methods to provide both breadth and depth to the topic as well as give students more research tools for future use (Babbie 2010).

The class intends to incorporate S-L best practices as posited by Celio et al. (2011), succeeding in certain ways better than others. The research project explicitly uses methods learned in class to address the CP's research objectives. Student input is incorporated throughout, especially in the interview and survey instrument design, although the topic is set before the course begins. Four CP meetings permit some relationship building between students and the CP, although large class size and short class time (50 minutes) limits this. Students mainly reflect via the start-stop-keep exercise and anonymous course evaluations. Common critiques include a wish for each student to pick an individual research project (which would be logistically difficult if not impossible in a class this size) and the occasional grumble that students are doing unpaid work for the university.

As discussed above, the stated goals of the class are to make the students better consumers and producers of research. Students generate co-created knowledge (Peterson 2009; Conner et al. 2014) alongside the professor and the CP, developing recommendations for the specific context of the project. Finally, student final reports contribute to their portfolios, providing tangible evidence of their research ability and experience for future education and employment opportunities.

The research topics covered in the classes have elements of WPs. By tackling complex topics such as artificial intelligence, climate change, and food systems sustainability, students use results to make recommendations for multiple stakeholders with different viewpoints and which must balance biophysical, social, and political factors with inherent tradeoffs.

The major challenges of this class have been finding and selecting CPs and addressing student feedback that they are being used as unpaid labor, doing research the university should pay for itself. The first challenge is addressed by being proactive, developing a course outline and partner expectations, and beginning inquiries in April for the following Fall semester.

The strengths of this class are its experiential, hands-on nature, producing benefit to both students and CPs, and its emphasis on mixed-methods research, all of which prepare students to confront complex problems. The major weakness is the lack of time devoted to each method, necessitating further education to gain depth in one or more of the methods covered. One limitation is the exclusive use thus far of internal partners; external partners may bring different perspectives and objectives. Pre- and post-tests could be used to measure course impacts more precisely, as would student testimonials.

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Note: According to the policy defining activities, which constitute research at the University of Vermont/University of Vermont Health Network, this work met criteria for a project that does not require IRB review.

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