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Research Article

The Kingmaker: Effective Teaching Approaches to Agricultural Policy

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JEL Codes: A22, Q18, Q19

Keywords: Agricultural Policy, Student Learning, Pedagogy, Phenomenology, Teaching

Abstract

This study examined the teaching methodology used by Dr. Barry Flinchbaugh in his Agricultural Policy course at Kansas State University for nearly 50 years. Dr. Flinchbaugh was known internationally for agricultural policy and teaching. Ten former students were interviewed and asked a series of questions in a semi-structured format. Through qualitative methods, the study aimed to gain a deeper understanding of the instructional practices, engagement strategies, and approaches that contributed to his impactful teaching career. The findings reveal that Flinchbaugh's teaching approach was characterized by a student-centered approach, emphasizing active engagement, critical thinking, and real-world application. Effective student-teacher interactions, including timely feedback and open dialogue, are also highlighted as crucial aspects of Flinchbaugh's pedagogy. Participants attributed their career success and continued engagement in agricultural policy to the knowledge, skills, and inspiration from Flinchbaugh's course. Overall, this study highlights the significance of exceptional educators in shaping students' educational experiences and emphasizes the continuous improvement of teaching methodologies in higher education.

1 Introduction

In higher education, the influence of professors takes on a profound significance, as it may directly shape a student's educational experience, intellectual development, and future opportunities. Teachers can have positive impacts such as academic program and career choices (Lent, Brown, and Hackett 1994; Bettinger and Long 2005; Looney and Akbulut 2007; Carrell and West 2010; Rask 2010). While these influences predominately occur in the classroom, they can also happen after a particular course concludes through engagement before and after the completion of a degree. Effective teaching practices employed by professors have the potential to inspire students, foster a love for learning, and equip them with the knowledge and skills necessary to thrive in their chosen fields.

Teaching effectiveness has been closely linked to optimal learning. Chew and Cerbin (2021) articulate that effective teaching goes beyond the mere transmission of information. It involves creating an environment where every student, regardless of their initial interest, can engage, learn, and transform their perception of the world. Successful teachers change their teaching methods based on the students in their classroom, influencing students' motivations and approaches to learning. Various instructional strategies, such as providing constructive feedback, setting clear learning objectives, and promoting student-teacher interactions, have a significant positive impact on student learning (Hattie 2009).

Effective teaching has long been recognized as a critical factor in student and academic success (Cohen 1981; Umbach and Wawrzynski 2005). As universities and colleges strive to provide high-quality education, it becomes pivotal for teachers to create engaging, inclusive, and effective learning environments. Teaching effectiveness varies as students have different expectations for their instructors by academic discipline (Alhija 2017; Bledsoe, South Richardson, and Kalle 2021). Instructor

characteristics often mentioned when defining teaching effectiveness include enthusiasm, care, and engagement (Hativa 2014; Bledsoe et al. 2021). One way teachers are evaluated for their teaching effectiveness is through the documentation of student evaluations of teaching (Stripling, Estep, and McClanahan 2020). Previous studies have provided evidence to evaluate teaching performance (Centra 1993; Braskamp and Ory 1994; Campbell 2005; Miller and Seldin 2014; Berk 2018). These studies used various methods of data collection, including questionnaires and surveys, student ratings, peer observations, open-ended questions, student interviews, quality control circles, and focus groups (Berk, Nauman, and Appling 2004; Berk 2005; Berk 2006; Berk 2019). Data from these studies show that student data can be used to evaluate effective teaching, especially as students have more frequent interactions with instructors to judge topics related to the relationship between students and an instructor (Braskamp and Ory 1994).

As instructors strive to enhance their teaching practices, valuable insights can be gained by examining the experiences and perspectives of exceptional educators who have had a profound impact on their students. Barry L. Flinchbaugh, PhD, was a professor of agricultural economics and Extension specialist at Kansas State University since 1969. Dr. Flinchbaugh was internationally known for being an influencer of agricultural policy. Through a career in Cooperative Extension, Dr. Flinchbaugh gained experience working on state tax policy and Kansas agricultural issues. His work eventually led to shaping agricultural policy on the national stage. He chaired the committee on 21st Century of Farming. Policy makers across the country often consulted Dr. Flinchbaugh to strategically reach across the aisle and form legislation. Yet, his most impactful effort was teaching nearly 5,000 students. He taught a junior-level agricultural policy course (AGEC 510 and later AGEC 410) for forty-nine years while at Kansas State. His students would go on to become agribusiness professionals, Capitol Hill staffers, college professors and administrators, state governors, state legislators, and school board superintendents, among other professions. Dr. Flinchbaugh won several teaching awards throughout his career due to his effective teaching and student-centered instruction.

2 Purpose and Objectives

This study focused on the teaching methodology used by Dr. Flinchbaugh in his AGEC 410: Agricultural Policy course over nearly fifty years and the effectiveness of his teaching. To provide context of the content within the course, an outline of Dr. Flinchbaugh's AGEC 410 course can be found in Appendix A. Dr. Flinchbaugh was known for teaching using the alternatives-and-consequences approach to public policy issues (House 1993) where different solutions to problems are analyzed through an objective process. We use a phenomenology approach to reach our objectives. Our results will help inform other instructors on how to approach teaching to be student-focused, especially those in agricultural economics and agribusiness programs and/or those teaching agricultural policy courses.

By conducting interviews with his former students, this study aims to gain a deeper understanding of the instructional practices, engagement strategies, and approaches that have contributed to his impactful teaching career. The purpose of this study is to identify how students previously enrolled in Agricultural Policy describe Dr. Barry Flinchbaugh's pedagogy and its influence on their success as a student and professional. This study will inform and inspire other educators to enhance their teaching practices and create a supportive learning environment. The determination of pedagogical methods and their impacts will enable educators to adopt similar practices to enhance their own approach to teaching, improving student and professional success outcomes.

RQ1: What do former students perceive to be the methods of effective teaching used by Dr. Barry Flinchbaugh in AGEC 410?

RQ2: How do former students perceive the impact of Dr. Barry Flinchbaugh's teaching methods on their success as a student and a professional?

3 Methods and Data

This study used a qualitative, phenomenological research approach. This approach was chosen in order to explore and empower descriptive stories of interactions between students and Dr. Flinchbaugh (Creswell and Poth 2018). In this case, the phenomenon is the lived experience of the students as they participated in Agricultural Policy class. Similar to the approach of Chuyun Hu (2020), we used interviews to investigate the unique experiences of former AGECE 410 students related to the teaching effectiveness of Dr. Flinchbaugh. Prior to contacting potential participants, we received Human Subjects/Institutional Review Board approval (#IRB-10975).

A phenomenological approach was used because it aligns with our aim to identify common meanings former students share regarding Dr. Flinchbaugh's pedagogy and its influence on them (Creswell and Poth 2018). In brief, "phenomenology is the reflective study of pre-reflective experience, concerned with how people consciously experience phenomena, things, or stuff" (Tracy 2020, p. 65). Whereas the narrative approach is concerned with each individual's story and the grounded theory approach attempts to theoretically explain a shared experience, phenomenology seeks to identify the commonalities across a set of individuals who experienced the same event (Creswell and Poth 2018; Tracy 2020). The phenomenological approach has been used to investigate effective teaching through the eyes of college students (Chuyun Hu 2020), effectiveness of online learning as perceived by college students (Becker and Schad 2022) and faculty (Kabilan and Annamalai 2022), as well as to explore student perspectives of specific teaching approaches (Mangali et al. 2019; McGhee et al. 2019).

Stratified purposive and snowball sampling were used to identify study participants (Creswell and Poth 2018). Stratified purposive sampling was used to identify the initial pool of potential interviewees. We reviewed all available course syllabi for each year Dr. Flinchbaugh taught AGECE 410, looking for the names of former teaching assistants listed on the syllabus, who served as our initial participant pool. Dr. Flinchbaugh had at least one undergraduate teaching assistant per year, and in the recent decades, it averaged to two a year. Thirty-six individuals were identified by archived course syllabi. Three individuals were contacted through the teaching assistant list, and all three agreed to participate. Once we began interviewing, snowball sampling was used to identify additional, information-rich participants (Creswell and Poth 2018) who took the class throughout Dr. Flinchbaugh's forty-nine years of teaching. Eleven individuals were identified through suggestions from other interviewees. Recruitment emails were sent to potential participants using contact information from the lead researcher's personal network as well as the other interviewees. Seven individuals responded and agreed to participate in the study. We were limited to contacting those participants for whom we could secure a phone number or email address.

Data was collected using retrospective, semi-structured interviews to allow for flexibility in question order and follow-up questions based on each interviewee (Flick 2018). Retrospective, semi-structured interviews provide consistency by asking everyone the same questions while allowing them to share their own experiences, memories, and thoughts through open-ended questions. Our procedure for preparing and conducting interviews follows the recommendations of Creswell and Poth (2018) and Tracy (2020). After reviewing the literature on teaching effectiveness, we developed an interview guide containing open-ended questions written to encourage participants to describe their experience as a student and perspective on Dr. Flinchbaugh's teaching effectiveness (Brinkmann and Kvale 2015; Hu 2020). The interview guide was used to ensure consistency in questions asked as well as structure to the interview for data collection. The interview guide can be found in Appendix B. Informed by previous research (Alhija 2017; Hu 2020; Bledsoe et al. 2021; Chew and Cerbin 2021), the questions asked interviewees to describe themselves as students, their experiences in AGECE 410, how they perceived Dr.

Flinchbaugh's teaching effectiveness, and the role their experience in AGEC 410 had in shaping their academic and professional careers. Vagle (2014) and Tracy (2020) recommend experience questions, such as these, for studies with a phenomenological approach because they elicit stories from participants as they reflect on specific situations.

To enhance credibility, the guide was reviewed by an associate professor of agricultural education with expertise in teaching methods and effectiveness as well as an associate professor librarian with expertise in qualitative methodologies and education. The feedback from these reviews was incorporated to finalize the interview guide, which consisted of four demographic, close-ended questions, and seven focus questions with accompanying follow-up questions (Brinkmann and Kvale 2015). The demographic questions allowed participants to provide context of their perspective on their educational and career aspirations when taking Dr. Flinchbaugh's course. An additional focus question and follow-up questions were asked of participants who also indicated they were also former teaching assistants for Dr. Flinchbaugh. This type of questioning allows questions to be asked in a conversational manner that solicits greater detail when needed (Flick 2018). The interview consisted of open-ended questions to gather participant perceptions of the teaching effectiveness of Dr. Flinchbaugh in terms of how they experienced his teaching methods and their impact on their academic and professional success.

One of the authors interviewed all participants to provide consistency in data collection. Before each interview, participants provided their consent to participate. The participants were provided with a consent form approved by the Kansas State University Institutional Review Board. Interviews were conducted either via Zoom or in person. Participants returned signed consent forms before their respective interviews. The interviews were conducted between January 2022 and July 2022, each lasting for about thirty minutes. At the beginning of each meeting, participants were verbally told the purpose of the study and asked if their interview could be recorded. The interviews were audio recorded, and handwritten notes were taken down. Participants are identified by pseudonyms throughout this paper to protect the identity of the panel. Rev, a professional transcription service, was used to transcribe the interview data verbatim.

Phenomenological data analysis requires researchers to "generate themes from the analysis of significant statements" (Creswell and Poth 2018). Significant statements are those that establish how the participant experienced the AGEC 410 course related to the research questions (Creswell and Poth 2018). Similar to the phenomenological approach followed by Chuyun Hu (2020), inspired by Van Manen (2016), a thematic analysis of the transcripts was conducted to identify themes (Sechelski and Onwuegbuzie 2019). This process involves closely reading the text several times to identify significant statements related to the research questions, allowing meaning and larger themes to emerge from participants' own language.

Credibility and dependability were enhanced by referential adequacy, using the exact words of the participants to determine the themes. All interpretations of the text always referred to the material (Ary et al. 2010). In addition, a draft of this paper was given to two interview participants to review the accuracy of the analysis prior to submission for publication (Fraenkel et al. 2023). The verbatim transcripts were compared to the audio recordings and notes from each interview to confirm consistency.

Methods of reflexivity were used throughout data collection and analysis to manage the bias, values, and experiences we bring to this study (Creswell and Poth 2018). Notes were written throughout the data collection and analysis processes. These records serve as a means of triangulation, to reflect on the interview, and identify how we may affect the interactions with participants and the data. As members of the higher education community, we recognized our position as faculty members in agricultural communications and agricultural economics frames our perspectives. In addition, we are both former students of Dr. Flinchbaugh's AGEC 410 class.

A total of ten interviews were conducted. Data collection was concluded after the tenth interview because data saturation had been reached, that is responses were reinforcing, rather than diverging, themes emerging in the data (Guest, Bunce, and Johnson 2006; Tracy 2020). The respondents represented a cross-section of former students able to answer our questions because of the diversity in when their student experience happened, the type of student they described themselves as, and their current occupation. At least one student from every decade of Dr. Flinchbaugh's career was interviewed. Interview participants included six males and four females. Participants were asked to describe themselves as Kansas State students. Four interviewees described themselves primarily as "a very involved student" who did not necessarily put academics first. Three interviewees described themselves as "pretty serious about my studies." Two others described themselves as a "fairly typical college of ag student" who was "not even close to a straight A student." The professions of the interview participants included academia, nonprofit organization, production agriculture, government, and commodity organizations.

4 Results

RQ1: What do former students perceive to be the methods of effective teaching used by Dr. Barry Flinchbaugh in AGE 410?

Participating interviewees perceived Dr. Flinchbaugh's methods of effective teaching to be genuine interest in students and subject, engaging storytelling, and challenging students intellectually. These factors were commonly mentioned by participants as the adaptive teaching methods that enhanced their motivation, perseverance, and learning in the course (Chew and Cerbin 2021).

4.1 Genuine Interest in Student and Subject

Nearly all of the former students interviewed described Dr. Flinchbaugh's authentic care for each student's success in the classroom and their careers, held in tandem with his love for teaching the subject of agricultural policy. For instance, Betty shared how Dr. Flinchbaugh consistently exuded delight in teaching students, an attribute she appreciated even more after working professionally in education.

"Just fundamentally, it was just his passion and his obvious joy that he got from teaching and from the topic. It was, again, now that I've approached teaching from the other side, I know that sometimes it can take a little effort to be enthused and excited every day in the classroom. He seemed to just always naturally be happy to be standing up there in front of us."

Dr. Flinchbaugh's curiosity and "all-in" attitude for students was acknowledged by former students as evidence of care that led to effective teaching. How he conveyed that care evolved and grew over his nearly half-century teaching career, but was always present, as described by Carolyn when she stated:

"At some point he moved from the gruff guy at the front of the room who chose to use intimidation with students, to someone who was really willing to stand at the front of the room and make sure everybody knew how much he cared about them. [...] By the time he was done teaching, I think even the gruffest students who sit in the back row, knew he cared about them, and I don't think he would've stayed as effective if that piece hadn't been the case."

Dr. Flinchbaugh not only desired to see students succeed in the classroom, but also in their careers. He taught agricultural policy as a mechanism to prepare the next generation of effective leaders across industry segments, as Daniel described.

“He was very passionate about making sure that there was a next generation that knew the knowledge that he had. You could tell that the passion of him as a teacher came from a sense of needing to pass along what he learned to the next generation.”

During the COVID-19 pandemic, Dr. Flinchbaugh taught virtually. Despite distance and technology challenges, his care for the student, investment in their success, and passion for agricultural policy persisted. Elizabeth described her experience as a student in AGEC 410 during one of the virtually delivered semesters:

“I felt like I was always so valued as a student, more so in his class than any other, because he was taking that extra time to make sure that his teaching was effective, even though it was through a medium that he wasn’t comfortable with.”

By conveying these interests genuinely to the students, initial connections were formed between Dr. Flinchbaugh and the student, creating a bridge that fostered the students’ desire for learning. His *genuine interest in the student and subject* was demonstrated by curiosity, enthusiasm, and devotion to teaching and learning.

4.2 Engaging Storytelling

Dr. Flinchbaugh’s affinity for and mastery of storytelling was a significant theme throughout the data. Former students described his stories as engaging because they were based on real events and personal experiences. The stories were a part of Dr. Flinchbaugh’s teaching methods, woven throughout lectures to make abstract concepts concrete and timely. When asked about what AGEC 410 class sessions and assessments were like, Francis described:

“I think that he probably tailored it to the classes and what was happening in the news. The bulk of the structure was that there were certain chapters we were going to cover every week in the book, in the textbook, and there was going to be a quiz that covered that material every other Friday-ish. But that was probably the vast majority of the structure. I feel like the rest of it was relatively free-flowing, filling in with stories and talking about things that were happening.”

The stories improved information recall for George, *“He made his point through stories, and you can remember the stories. He was able to tie it in with things that you could remember, and if you could remember the story, you could remember the point.”*

The stories Dr. Flinchbaugh told in the classroom engaged students by taking global and national agricultural policy issues relevant at the local level. This approach invited students to relate to the story and think of someone they knew who might be affected by the issue. Betty verbalized this point, echoed by several former students, when she stated:

“When he would talk about policymaking at the national level, he would give examples to bring it back to small-town Kansas and think about people that play different roles, because most of the students in the class were from small-town Kansas. He’d say “Think about the role your local banker plays or your local school board president or...” He’d sort of use small-town Kansas as a microcosm for larger policymaking decision arenas.”

Dr. Flinchbaugh gleaned his stories from real experiences he had working in agricultural policy development and Extension at the national, state, and local levels. For most of the interviewed former students, being a practitioner of the topic is what made Dr. Flinchbaugh an effective teacher. Carolyn describes that shared sentiment, stating the following:

“Hands down, I think that was the most important piece for me as an effective teacher, that he knew his information, but he knew it outside of the classroom. He didn’t talk about things he never had his hands in. He was really active in it.”

4.3 Challenging Intellectually

Dr. Flinchbaugh challenged students intellectually to encourage them to learn. By creating an environment of two-way discussion, he fostered students’ motivation and critical thinking. Several interviewees mentioned how intent Dr. Flinchbaugh was on students’ learning, including Henry, who said, *“Even though the class was very dynamic, a lot of discussion and everything, he required that you learn something, and he was very, very conscious of the fact that he wanted you to learn.”*

Dynamic discussion is unpredictable and dependent on the participating members. This created a classroom in which, *“there was a little edge of the unexpected all the time. There was always something new you’re going to be challenged on intellectually or just general life stuff, too,”* said James. Dr. Flinchbaugh would not let students loaf in class. Rather, he knew how to motivate students to participate. James went on to say, *“He’d call you out when you needed to be called out, and he’d encourage you when you needed to be encouraged.”*

Dr. Flinchbaugh enjoyed the give and take of a discussion, so he was willing to be challenged by students as a method of effective teaching. By encouraging students to explain and argue their point of view on a topic, they had to think critically to build their case. Elizabeth explained how she experienced Dr. Flinchbaugh’s approach to challenging students intellectually:

“A willingness to be challenged. He was always willing to discuss. He’s been teaching this class for however long. His answers on tests are his answers on tests, but he was always willing to discuss if you had a reason for thinking that another answer was appropriate, which I think really encouraged students’ critical thinking.”

RQ2: How do former students perceive the impact of Dr. Barry Flinchbaugh’s teaching methods on their success as a student and a professional?

Former students were asked about the impact Dr. Flinchbaugh’s methods of effective teaching had on them as students and as professionals. Many participants echoed Betty’s sentiment, *“He had a very fundamental and significant role in my professional trajectory.”* Dr. Flinchbaugh also encouraged students to double-down on their passions, as Carolyn describes, *“When I think about the impact he had on me as a student, he helped me drill into an interest.”*

Three themes emerged as the mechanisms for Dr. Flinchbaugh’s impact on former students’ academic and professional success: exposure to new possibilities, facilitated connections, and longevity of lessons. Participants commonly mentioned these factors as influential to their paths as a student and professional beyond AGEC 410 (Chew and Cerbin 2021).

4.4 Exposure to New Possibilities

The choice to enroll in Dr. Flinchbaugh’s AGEC 410 class had lasting effects on interviewed former students. Many participants attributed a shift in their academic trajectories, and later their careers. The shift was influenced by Dr. Flinchbaugh’s teaching methods, which exposed students to new experiences and opportunities in a way that was accessible and sparked interest in students. For instance, Francis described how Dr. Flinchbaugh made working in agricultural policy attainable:

“To a certain extent, when you grow up in rural Kansas, you don’t get a lot of those kinds of experiences. [...] So, I think to a certain extent, he put the world of policy work and ag policy work ... He created this idea that it was within the reach of work that we could do.”

Bringing agricultural policymaking within reach in AGECE 410 influenced students’ decision-making outside of the classroom, as Kit described, *“I would not have been probably very likely to take that internship or even apply for it before having taken Ag Policy.”*

Many participants recounted how Dr. Flinchbaugh’s teaching initiated a decision to switch their major or pivot their disciplinary focus between their bachelor’s and master’s degrees. Daniel illustrated this shift when he stated, *“After taking his class and learning that I could serve in public service and also work in agriculture, I completely changed what my courses were, started making those look more like something that I could use in public service.”*

Dr. Flinchbaugh’s influence on students’ success in school and their career builds on the foundation of his genuine care for the student. Betty reflected, *“I think sometimes he would see potential in undergraduate students that maybe they hadn’t yet seen in themselves, or he would help encourage people to think about opportunities and options that they hadn’t yet identified in themselves.”*

4.5 Facilitated Connections

Former students fondly remembered each semester in AGECE 410 beginning with every student completing a notecard of personal information, followed by Dr. Flinchbaugh meeting each student and spending a few seconds visiting with them. This exchange built on Dr. Flinchbaugh’s network of relationships he called on to facilitate connections for students. Brian described how Dr. Flinchbaugh’s work and his appreciation for relationships created a vast network. *“Flinchbaugh was just so connected with everybody, and knew so much about people’s families, and where you came from and what you were doing,”* Larry stated.

Dr. Flinchbaugh facilitated connections internal and external to his classroom. He encouraged students to get to know each other and connect by studying for exams together. Elizabeth stated Dr. Flinchbaugh’s teaching methods created “camaraderie” among students that spanned academic, professional, and political boundaries to establish a “common respect” between former students of Dr. Flinchbaugh. That camaraderie opened doors for former students, including Carolyn, who described how being a student of Dr. Flinchbaugh facilitated connections:

“All because I got myself in rooms even when I was an intern, because I was Dr. Flinchbaugh’s student. So, I got to go to meetings when it wasn’t even my Senator on the Ag Committee. I was in Senate Ag Committee staff meetings, working on components of the Farm Bill because they trusted me because I was a Flinchbaugh student.”

Dr. Flinchbaugh’s teaching methods were effective in building excitement among students about the material, making them eager to discuss the content and the class with others who had shared the experience, creating “instant connection,” said Elizabeth.

4.6 Longevity of Lessons

The lessons Dr. Flinchbaugh delivered through AGECE 410 had lasting impacts on the interviewed former students. Reported effects included an impact on how former students learn, problem solve, and navigate relationships in their current professional careers. For example, James stated:

“I think as a professional, some of the phrases and some of the things, the ideas that he seated about politics and kingmakers and how the sausage gets ground and how to be a good human

and how to ride to the middle of the problem, I think are things that I always remember as I'm navigating the D.C. stuff right now."

The effective teaching method of Dr. Flinchbaugh's pedagogy encouraged interviewed former students to become continuous learners. In AGEC 410, it was acceptable not to know every answer, but finding it was expected. Kit described this expectation when they stated, "If you don't know, go find out and report back and learn about it."

Dr. Flinchbaugh's approach to agricultural policymaking informed how former students seek to carry themselves as professionals. As Elizabeth described:

"I look forward to what my career looks like; I hope that I can emulate a lot of the things that he did of focusing on issues around politics, of being able to find commonality and create bridges between the two aisles, and to have, I keep saying audacity, but I really think of that word, because of him."

While agricultural policy content stayed with students, so did the lessons within the lessons—those nuggets of wisdom about how to approach life's grander challenges. The longevity of Dr. Flinchbaugh's lessons means former students carry them into their roles as students and professionals well beyond the boundaries of a classroom and a semester.

5 Recommendations

RQ1: What do former students perceive to be the methods of effective teaching used by Dr. Barry Flinchbaugh in AGEC 410?

Participants shared Dr. Flinchbaugh's genuine care for students as well as the agriculture industry were exuded through his lectures and interactions with others. Teaching principles centered around students, such as authenticity and caring, are important for creating positive learning environments (Saucier et al. 2022) and creating a high-quality relationship between teacher and students (Hagenauer and Volet 2014). Dr. Flinchbaugh started each semester of his course off the same way. He would have each of his students write their name, hometown information, and other relevant information down on a notecard. For the first week of lecture, he would go one by one and visit with each student and have a short conversation. Later in his career, he discovered his students spanned multiple generations. Additionally, teaching assistant participants noted his approaches to exam and quiz writing. After writing his questions, he would have his teaching assistants review them to ensure clarity and understanding of each student in his classroom. If a significant number of students missed a question, he would reflect on what he did wrong in his teaching or question writing as opposed to what the student did not understand. From these instances, he would revise the question and incorporate it into an upcoming exam to reassess student learning.

Participants from this study said his stories were memorable and allowed students to make connections with course content to their everyday lives. Storytelling has been noted as an effective teaching tool to engage with students, help students remember course concepts, and create a relationship between students and teachers (Green 2004; Sharda 2007). Participants mentioned Dr. Flinchbaugh challenged them to think critically through classroom discussions about topics within agricultural policy and American politics. Discussions have been noted as an important pedagogy as it helps students to prepare for public discourse and citizenship post college (Howard 2002).

RQ2: How do former students perceive the impact of Dr. Barry Flinchbaugh's teaching methods on their success as a student and a professional?

The themes associated with this research question were that Dr. Flinchbaugh exposed his students to new opportunities, integrated students into a network of contacts, and provided a framework of thinking about policy issues. Participants said he provided them with the chance to think about the world differently, including careers, academics, and ideas. Faculty interactions have positive influences on motivation and career development (Komarraju, Musulkin, and Bhattacharya 2010). Participants shared Dr. Flinchbaugh connected his students to contacts within industry and government as well as created a classroom environment that encouraged peer study groups. It was observed that students noticed his approachability, and his proximity changed in the most recent decades. Dr. Flinchbaugh's retirement from Extension in 2004 may have provided more time to interact and engage with students outside of the classroom. Knowing his students on a more personal level allowed him to learn more about their career aspirations and integrate them into his extensive network of contacts. Student networking has been shown to have a positive influence on grade performance (Hwang, Kessler, and Francesco 2004) and persistence (Zwolak, Zwolak, and Brewe 2018). In addition, faculty can provide external validity to degree outcomes by connecting students with alumni and industry connections, and increasing students' professional networks (Vieregger and Bryant 2020; English et al. 2021). Participants noted Dr. Flinchbaugh's ability to build lifelong learning skills as they approach situations along their career path. Teaching methods used by instructors in courses develop various competencies not only desired by employers but general and soft skills (Lavi, Tal, and Dori 2021).

A limitation of this study may be students were primed by questions to provide responses related to effective teaching practices and positive memories of their time in Dr. Flinchbaugh's course. Interviewees may have been willing to speak with us because of their positive experiences in Dr. Flinchbaugh's class. Those with negative experiences may not have taken the opportunity to be interviewed because of a desire to respect the late professor. In addition, Dr. Flinchbaugh had almost 5,000 students take his course throughout his career. This study focused on a much smaller sample of students to provide richer content than traditional survey methods. Although we interviewed a variety of types of students from across the timeline of Dr. Flinchbaugh's career, we do not believe the interviewees represent all types of former students. Generalizability is not a characteristic of qualitative research, but transferability to other classroom environments is enhanced by the descriptions of our interviewees' characteristics and experiences (Tracy 2020).

6 Conclusions

Teachers can have a significant impact on their students. This study sheds light on teaching practices and instructional qualities of Dr. Barry Flinchbaugh, a renowned agricultural policy professor. The findings of this research revealed the importance of a student-centered approach that emphasizes active engagement, critical thinking, and real-world application. Furthermore, the study revealed that Dr. Flinchbaugh's instructional methods promoted effective student-teacher interactions, creating a supportive and collaborative environment. The provision of timely and constructive feedback, as well as the cultivation of open dialogue, allowed for individualized guidance and mentorship, which positively influenced students' intellectual growth and professional development. This study serves as a tribute to the exemplary teaching career of Dr. Flinchbaugh and underscores the profound impact that passionate and student-centered instruction can have on student learning outcomes. It is hoped that this research will inspire further investigations into effective teaching practices and contribute to the ongoing efforts to enhance the quality of education in agricultural economics and other disciplines.

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Appendix A: Agricultural Policy Outline

- A. The Policy Setting
 - 1. Public Decision-Making – Who and How
 - 2. Methods of Analysis
 - 3. Economic Principles
 - 4. Macroeconomics
 - 5. Effect of Pandemic

- B. The Politics of Agriculture
 - 1. Governmental Institutions
 - 2. Farm Organizations
 - 3. Other Special Interest Groups
 - 4. Policy Decision Process

- C. The Foreign Dimension
 - 1. Economic Principles
 - 2. WTO
 - 3. Trade Policy/Trade Wars
 - 4. Development Policy

- D. Macroeconomic Policy – Monetary and Fiscal

- E. Domestic Farm Policy
 - 1. The Historical Farm Problem
 - 2. Free Market to Mandatory Controls
 - 3. Farm Bills – Past, Present, and Future
 - 4. Crop Insurance
 - 5. Emergency Payments
 - 6. Food and Nutrition Programs

- F. The Structure of Agriculture
 - 1. Alternative Structures
 - 2. Concentration, Integration, Contracting
 - 3. Future of the Family Farm/Rural Communities
 - 4. Agri-Business

- G. Biofuels Policy
 - 1. National Security
 - 2. All Sources
 - 3. Food vs. Fuel

- H. Resource Policy
 - 1. Living with Limited Resources
 - 2. Land and Water
 - 3. Environmental Issues
 - 4. Endangered Species
 - 5. Animal Welfare/Rights
 - 6. Climate Change
 - 7. Deregulation
 - 8. Immigration

- I. Food Policy
 - 1. Food Safety and Security
 - 2. Food Assistance and Nutrition
 - 3. GMO, Organic, and Local Foods

- J. Role of Government in 21st Century Agriculture

Appendix B: Interview Guide

Thank you for meeting with me today. As we discussed, we are interviewing a few of Dr. Barry Flinchbaugh's former teaching assistants and students. We hope to learn your perspective on what made Dr. Flinchbaugh an effective teacher in AGEC 410, Ag Policy, and how your experience in the class influenced your academic and professional trajectory.

I am going to record our discussion. Is that okay?

Your name will not be associated with any information reported from this research, or future research. We will assign you a pseudonym, so all of your responses will remain confidential. If there is a question you prefer not to answer, please just say so.

We'll start out with a few demographic questions, then get into your experience with Dr. Flinchbaugh in AGEC 410.

What is your current occupation?

What was your undergraduate major at Kansas State?

What year did you graduate with your undergraduate degree at Kansas State?

Do you have any higher degrees? If so, from what are they?

How would you describe yourself as a KSU student?

What was it like being a student in Dr. Flinchbaugh's AGEC 410, Ag Policy class?

What were class sessions like?

How were you assessed – assignments, exams?

From your perspective as a student in Dr. Flinchbaugh's class, what made him an effective teacher?

What specific memories of the class stand out to you now? Please describe them.

What behaviors did Dr. Flinchbaugh exhibit that exemplified effective teaching?

Can you recall any specific actions where he demonstrated these behaviors?

If a TA – **Would you please describe your experience as a TA for AGEC 410?**

How did it differ from your experience as a student in the class?

While a TA, what additional perspective did you gain on his approach to teaching?

How do you describe the impact Dr. Flinchbaugh had on you as a student?

How do you describe the impact Dr. Flinchbaugh had on you as a professional?

Is there anything else you would like to add?

Who else should we talk to as a part of this research?

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Research Article

Students' Attitudes Toward Cooperative Learning in Online Classes

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JEL Codes: A2

Keywords: Active learning, cooperative learning, group projects, online teaching, and research-based teaching

Abstract

Active learning approaches allow students to excel at course material at higher cognitive levels. One of these strategies is cooperative learning, where students learn in small groups. This approach fosters retention, motivation, and critical thinking. In addition, using research-based teaching strategies where students can work hands-on on real-world problems improves learning outcomes. A fair amount of learning takes place online, which leads to the question of how research-based group projects can be included successfully in an online environment. This research aims to answer this question by studying undergraduate online students. The main objective is to shed light on students' attitudes toward cooperative learning in online education. The main contribution is to highlight how a research-based group project can be incorporated in a fully online delivered course and how it is received by students. Key findings are that the majority of students agree that such an activity is a good opportunity to practice working in teams for future jobs. In particular women and those who hold a positive attitude toward group projects were most likely to view the research-based group project as good preparation.

1 Introduction

Active learning is an approach to instruction where students “do things” and think about what they have done, engaging in material in different ways than just lecture (Felder and Brent 1994). When instructors use strategies in the classroom that enable students to create learning outcomes themselves, they foster active learning. Looking at Bloom's taxonomy, when students master important class material being actively engaged, they are achieving higher cognitive levels of learning; interactive learning strategies are key for this (Salemi 2012). When employing active learning strategies, students talk and listen to each other, and get to read, write, and reflect on what they have studied (Paul and Elder 2019). The strategies encourage student engagement with the concepts being taught, leading to positive outcomes (Salemi 2012). Active learning fosters increased retention, enables transfer of new knowledge, increases motivation, and improves critical thinking and interpersonal skills (Espey 2007). It caters to students with different learning styles, enabling them to learn successfully due to the diverse set of teaching strategies employed during active learning (Salemi 2012).

As put by Chickering and Ehrmann (1996, p. 3), “*Learning is not a spectator sport. Students do not learn much sitting in class listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives.*” This is one of the main focal points of interactive learning strategies (Salemi 2012). There are many different active learning techniques, such as class discussion, role-playing, case studies, simulations, problem-based learning, and cooperative learning exercises. Cooperative learning exercises are defined as using small groups in instruction, enabling students to work together so that they can maximize learning for themselves and others (Smith 1996). Incorporating group projects in classes allows for positive interdependence, individual accountability,

equal participation, and simultaneous interaction. When implemented, cooperative learning leads to academic achievement; students learn significantly more, remember what they studied longer, and develop better critical thinking skills. Furthermore, students are more motivated, and their retention is improved. Students have also been found to make more connections with others, develop more self-esteem, and build life skills with cooperative learning (McGoldrick 2012).

Given that a considerable percentage of instruction takes place online (Welding 2022),¹ the question arises how can group projects be successfully implemented in an online learning environment. Hence, this research aims to investigate students' attitudes toward cooperative learning when it is included in a class that is offered online. Specifically, students' attitudes toward a group project that requires collaborating with others online throughout the semester is studied.

The research objective is to gain a better understanding of how students perceive research-based group projects in an online setting. To achieve this objective, I study undergraduate student attitudes toward conducting research projects in groups when the facilitation of the course is online. The following main research question is addressed: *What are students' attitudes toward cooperative learning in an online course?* The remainder of the paper discusses previous literature and provides an overview of the course and group projects in the course. Next, the methodological background is described before empirical results are presented. The final section provides concluding remarks.

While interactive teaching methods are key for student learning, research-based teaching strategies better engage students, and maximize their learning and successful course completion (Boyer Commission on Educating Undergraduates in the Research University 1998; Amaratunga and Senaratne 2009). Hence, this research focuses on a course where a research-based group project was offered, namely AGB 456 – Food Product Innovation and Development. In this course students go through the process of coming up with a new product idea and then testing it for feasibility in the market by means of a consumer survey. Afterward, they analyze the data and present their findings. Such hands-on learning offers a way to apply theoretical concepts, so student learning is enhanced through active inclusion in research (Bransford, Brown, and Cocking 2004). There is general agreement that interactive, research-based approaches enhance students' learning of theoretical foundations (Boyer Commission on Educating Undergraduates in the Research University 1998). This research contributes to knowledge related to teaching and learning by considering students' perspective of cooperative learning as it relates to research-based teaching, and sheds light on cooperative, research-based learning in an online environment. More specifically, the contribution of this research is to investigate students' attitudes toward the inclusion of a group project in a 400-level online class in an agribusiness program over the course of multiple semesters.

2 Background Information

2.1 Relevant Literature

The literature provides support for different types of active learning (see Prince 2004 for a review). Among others, benefits include student engagement, remembering more content, promoting achievement, developing enhanced problem-solving skills, and critical thinking. Cooperative learning in particular increases academic achievement and self-esteem, enhances social support, and improves interpersonal relationships (Prince 2004). Specifically, group projects have been shown to be beneficial to students. For example, Tanner (2013) pointed out that small groups in the classroom can enhance the feeling of collaboration, inclusion, and community, and reduce negative feelings toward whole-group conversations. Espey (2018a) found in a study with 650 students from five courses that students felt greater improvement with regards to their critical thinking skills when in a course with team-based

¹ In 2020, 74 percent of college students took at least one online class, 15 percent primarily attended online colleges, and almost three million attended college completely online according to data from the National Center for Education Statistics (Welding 2022).

learning. In their courses, team-based learning was used to increase engagement and interaction. The findings were particularly strong in comparison to lecture-based courses. Espey (2018b) investigated which team characteristics affect outcomes for the team and the individual when using team-based learning. Among others, grade point average and the amount of female team members positively affected team performance. Furthermore, individual performance of female team members was positively related to the level of team cooperation. Individual success was significantly related to gender diversity and individual effect of team activities.

When it comes to the relationship between engagement in a group activity and academic performance, Espey (2022) found that those students who are more actively involved in the group work (as reflected in their peer evaluations) scored higher by 2–3 percentage points more on their final exam, taking into account class level, gender, and grade point average.

Brown et al. (2019a) analyzed students' attitudes toward group work by comparing an authentic, business-oriented approach to a traditional approach when building teams. They found that the business-oriented approach was preferred by students who thought that the forming of the groups, as well as grading and scheduling of meetings, was improved in this approach. However, the authors did not use an online class. In fact, Picault (2021) pointed out that an online format is challenging for having students form their own groups as compared to establishing groups randomly. Hence, in this research, groups were formed randomly.

Despite all the benefits that group work has in courses, students are often opposed to group projects (Felder and Brent 1994; Caspersz, Wu, and Skene 2003), and may have negative attitudes about their use as evidenced by Gottschall and Garcia-Bayonas (2008). The negative connotation toward the method of instruction is concerning because research has demonstrated that a positive attitude toward the instructional method makes students more receptive and successful in the class (Brown et al. 2019b). It is therefore of interest to investigate students' attitudes toward group projects in online courses. Since research on students' attitudes toward group work in online agribusiness classes is still limited, this article contributes to the literature by surveying students in an online class over the course of four semesters with regards to their attitudes on working in groups.

2.2 The Course: AGB 456 – Food Product Innovation and Development

This research is implemented in AGB 456 – Food Product Innovation and Development, a course that explores food product development and innovation with special emphasis on primary data collection to test market success when developing new products. Each week, the group project ties into the theory covered in the lecture material. This setup is similar to Picault (2021) who designed a course where a team project covered real-life examples related to theory.

Specifically, this course stresses that market research essentials need to be understood and implemented by actors in the food industry for successful product development and innovation. To address this, relevant theoretical constructs in consumer behavior research, background on methods of data collection, basics of multivariate statistical analysis, and business ratios to measure success of product innovations are introduced in the course. At the end of the course, students should be able to recall the essentials of market research and discuss the importance of consumer behavior with regard to product development and innovation in the food industry. They should be able to collect their own data to make successful decisions on product development and innovation. This means that, they learn to design and conduct market research with their own project to analyze whether a new product could be successful in the food and agribusiness sector. They are taught to evaluate and judge the suitability of data collection and analytical methods for making market-driven managerial decisions on product development and innovation in the food industry.

Table 1: Grading Criteria.

Grading Criteria	Participation	Points Possible
Discussion Posts (Yellowdig)	8 @ 10 points	80
Weekly Assignments (1–7)	7 @ 45 points	315
Assignment 8/Final Report (Voice Thread) Group Assignment	1 @ 250 points	250
Team Contract Assignment	1 @ 35 points	35
Peer Evaluation	6 @ 10 points	60
Project Evaluation	1 @ 40 points	40
Midterm Exam	1 @ 110 points	110
Final Exam	1 @ 110 points	110
	Total Points Possible	1,000

The primary student learning outcomes are critical thinking, communication, and discipline specific knowledge. The course includes Discussion Posts (Yellowdig, 8 percent of grade), Weekly Assignments (1–7, 31.5 percent of grade), Group Project: Assignment 8/Final Report (Voice Thread, 25 percent of grade), Team Contract Assignment (3.5 percent of grade), Peer Evaluations (6 percent of grade), Project Evaluation (4 percent of grade), Midterm Exam (11 percent of grade), and Final Exam (11 percent of grade; see Table 1 for an overview of the grading criteria). The group project assignment comprises 25 percent of the overall course grade, which compares to Picault (2021) who developed a Dynamic Learning model for online economics courses that included a team project component comprising 40 percent of the course grade. Though in AGB 456 the group project itself only counts for 25 percent, the peer evaluation accounts for 6 percent, the team contract assignment accounts for 3.5 percent, and the project evaluation accounts for 4 percent, all of which are directly or indirectly related to the group project. Hence the total weight of the group project is 38.5 percent of the final course grade.²

2.3 Group Project

The group project begins immediately in Week 1. Students are introduced to it by means of video tips for working in groups. They sign a team membership agreement that contains expectations, terms, and conditions for the group project. They fill out a group charter where they have to indicate which team member has which role in the group, such as CEO or lead developer, to hold them accountable, and they make themselves familiar with the corrective action plan. These documents are rooted in the literature where, for example, Tanner (2013) stressed that roles should be assigned to students in each group, so no one is left out. Picault (2021) mentioned that signing a team contract containing the rules set for each group is beneficial and described that students should be able to report negative behaviors of peers

² See Appendix 3 for the grading rubric of the group project.

without repercussions. For the latter, peer evaluations are used as part of the group project. These have to be submitted each week starting in the second week. In addition, the corrective action plan is put in place to allow groups to give warnings to inactive members.

Picault (2021) emphasized that having groups set up for an entire semester improves solidarity and socialization. This is adhered to in this course where students work consistently on the project for the whole semester. According to Tanner (2013), group sizes should be as small as possible, suggesting three to four students per group. Following this recommendation, most groups in this course have about four to five students.

The objective of the group project is to design and conduct a market research project to investigate whether a certain product development, i.e., product innovation will be successful in the food/agribusiness marketplace. The student groups work on the project throughout the semester, coming up with a new product they want to test in the market, developing a questionnaire, collecting data, analyzing data, and presenting their findings using VoiceThread. Students work on the project every week. A corresponding assignment is due to ensure that students are moving their project along rather than leaving it all for the end of the semester. In fact, students are encouraged to use the material from the weekly assignments to create their final presentation. See Appendix 1a as an example for this in Week 3 of the course and Appendix 1b for all group project instructions.

The product students choose to investigate must be from the food and agribusiness sector. They can come up with a new product themselves or investigate something already in the market. Examples are, Beyond Meat (vegan, plant-based meat substitutes), a Cuisine Coach App, Halo Top Ice Cream, a 3D Food Printer, Tru Fru (chocolate-covered, hyper-chilled, or hyper-dried fruit), Vita Boost Energy (energy vitamin tablets), Quiet Candy Packaging, Indoor Smokeless Food Smoker, Goodles (healthy mac and cheese), lab-grown meat, grab-n-go on-the-go meal replacement, super veg tortillas, no chill cookie dough, green paw raw dog food, plant-based dino nuggets, sushi burritos, and many more.

3 Methodological Background

3.1 Data Collection

To collect data on students' attitudes toward collaborative, research-based learning in an online environment, surveys were conducted in 2021 and 2022, during Spring A and Fall A in the online course AGB 456. Spring A and Fall A are 7.5-week courses that are taught in the first half of the spring and fall semesters. For example, in 2021, Spring was taught from 01/11/2021 to 03/02/2021 and Fall was taught from 08/19/2021 to 10/08/2021. This course is an asynchronous course. The study was considered exempt by the Internal Review Board (IRB) of a large university in the U.S. Southwest (IRB ID: STUDY00013094). Students received 25 points extra credit for their participation (total points in the course 1,000).

Data were collected using an online survey programmed in Qualtrics. Questions were asked about demographics (e.g., age, gender, and study major), and attitudes toward research-based group projects. In what follows, the survey instrument is briefly described with more detailed information provided in Appendix 2.

3.1.1 Sample Characteristics

As mentioned, data were collected from students in the online undergraduate class AGB 456 – Food Product Innovation and Development. Usually, in this class, a mix of students is enrolled. About 10 percent over the course of the study period were agribusiness majors, and the remaining 90 percent were students from across the university. A total of 182 students were enrolled in AGB 456 over the course of the four semesters during the study period. Of these, 11 students (6 percent) dropped the course. In Spring 2021, the sample consisted of 40 observations with a response rate of 73 percent. In

Fall 2021, the sample consisted of 34 observations with a response rate of 68 percent. In Spring 2022, the sample consisted of 30 observations with a response rate of 75 percent. In Fall 2022, the sample consisted of 32 observations with a response rate of 71 percent. The total number of observations is $n = 136$.

Sample characteristics can be found in Table 2. The majority of participants were female (59 percent) and on average 25 years old, ranging from 19 to 51 years. Average household size was three, and 14 percent had children they cared for. Five percent of respondents identified as African American and Asian, respectively. One percent identified as Native American. The majority identified as White (65 percent). Twenty-five percent indicated that they were Hispanic. In terms of employment, 36 percent were employed full-time, and 38 percent were employed part-time. Twenty-two percent of respondents indicated being a full-time student. For 93 percent of respondents, the United States is their home country, and 98 percent live in North America. Eighty-five percent speak English at home. Sixty-five percent are a business major, and 17 percent of the sample are an Honors student. All questions corresponding to these variables can be found in Appendix 2.

Table 2: Descriptive Statistics for Survey Respondents.

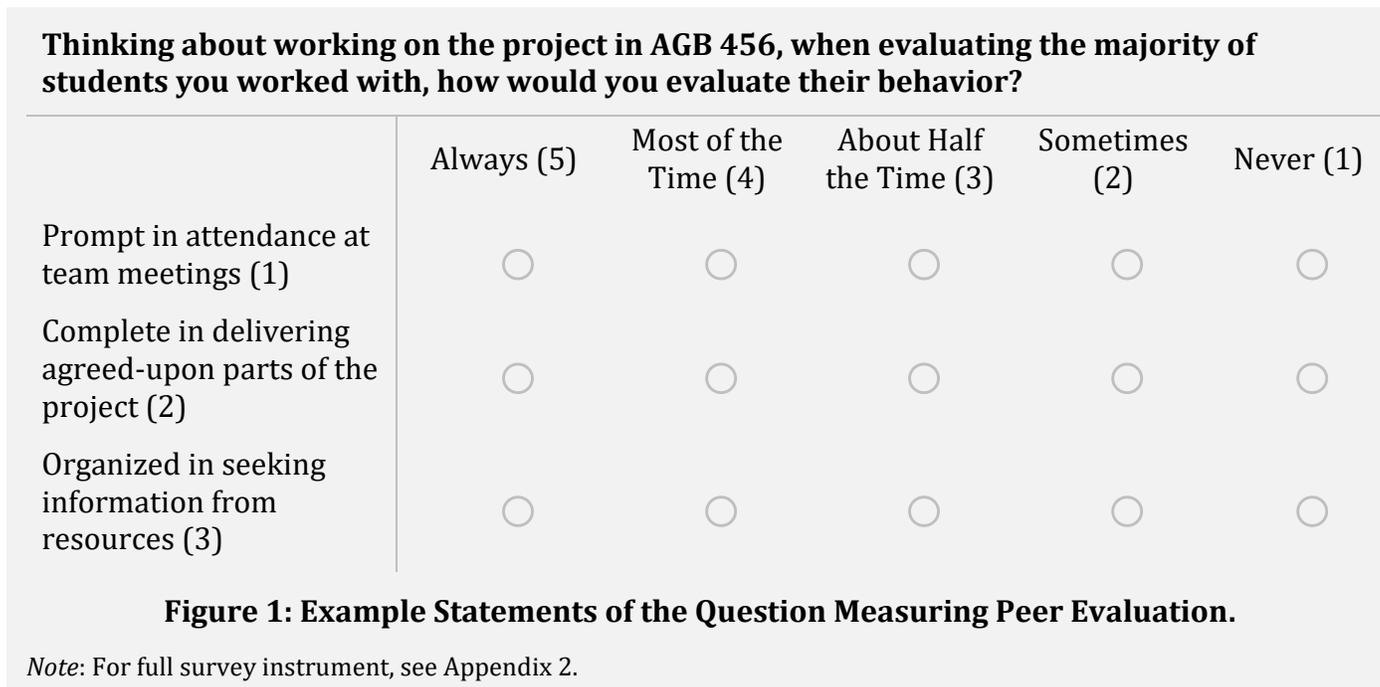
Characteristic	U.S. ¹	Mean	Standard Deviation	Min	Max	N	Variable Description
Gender female	55%	59%	49%	0	1	133	B
Age in years	<18: 9% 18–24: 64% Over 24: 27%	24.62	5.85	19	51	135	C
Household size		3.20	1.68	1	10	133	C
Caring for children		14%	35%	0	1	136	B
African American	11%	5%	21%	0	1	130	B
Asian	6%	5%	22%	0	1	136	B
Native American	1%	1%	12%	0	1	136	B
White	42%	65%	48%	0	1	103	B
Hispanic	17%	25%	43%	0	1	132	B
Full-time employed		36%	48%	0	1	136	B
Part-time employed		38%	49%	0	1	136	B
Full-time student		22%	42%	0	1	136	B
U.S. is home country		93%	26%	0	1	136	B
Lives in North America		98%	15%	0	1	136	B
Speaks English at home		85%	36%	0	1	136	B
Business major		65%	48%	0	1	136	B
Honors student		17%	37%	0	1	132	B

Note: B = Binary variable equal to 1 for the characteristic, and 0 otherwise. C = Continuous variable.

¹Undergraduate students enrolled in the United States (National Student Clearinghouse Research Center 2023)

3.1.2 Peer Evaluation

To understand how satisfied students were with the other members in their group, the question *“Thinking about working on the project in AGB 456. When evaluating the majority of students you worked with, how would you evaluate their behavior?”* was used. See Figure 1 for an example. Answers included items, such as *“Prompt in attendance at team meetings,” “Complete in delivering agreed-upon parts of the project,”* and *“Organized in seeking information from resources.”* Answers were evaluated on a five-point scale from Never (1) to Always (5).



3.1.3 Workload Evaluation

In addition, it was evaluated how the students assessed themselves in terms of workload. The question was phrased, *“Imagine there are 100 points available for the whole team, how many points would you pay yourself for your share in percent. For instance, if a team has two members and each member is equally involved, your share would be 50%.”*

3.1.4 Attitudes Toward Research-Based Group Projects

To measure attitudes toward research-based group projects, the following question was used: *“With regards to working in this particular group in AGB 456, what is your opinion on the following statements?”* Answers included, *“Because of this group project: I learned more than in courses without a group project (1); I benefitted from the other students’ skills and knowledge (2); I made new friends (3); ... I had to take on more work than others (8).”* See Figure 2 for an example. Agreement with these statements was evaluated on a Likert scale from Strongly disagree (1) to Strongly agree (5). These questions aimed to highlight different positive and negative attitudes toward group assignments as described, for example, by Buckenmyer (2000), Caspersz et al. (2003), and Pfaff and Huddleston (2003).

With regards to working in this particular group in AGB 456, what is your opinion on the following statements? Because of this group project:

	Strongly Agree (5)	Somewhat Agree (4)	Neither Agree nor Disagree (3)	Somewhat Disagree (2)	Strongly Disagree (1)
I learned more than in courses without a group project (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I benefitted from the other students' skills and knowledge (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 2: Example Statements of the Question Measuring Attitudes Toward Group Projects.

Note: For full survey instrument, see Appendix 2.

3.1.5 General Attitudes and Knowledge Toward Research-Based Group Projects

General attitudes and knowledge regarding group projects was measured using a bipolar 7-point scale following Joiner (1998). See Figure 3 for an example. The items included in the scale test, for instance, whether group projects are a favorite activity and how much students like working on group projects, as well as whether they are familiar with them and have experience working in groups.

Check the boxes that best describe your attitudes and knowledge regarding group projects, i.e., group assignments in teaching in general. For instance, group work similar to the one you participated in, in AGB 456.

	1 (7)	2 (6)	3 (5)	4 (4)	5 (3)	6 (2)	7 (1)	
Group projects are my favorite activity	<input type="radio"/>	Group projects are my least favorite activity						
I like working on group projects very much	<input type="radio"/>	I dislike working on group projects very much						
I am very positive about working on group projects	<input type="radio"/>	I am very negative about working on group projects						

Figure 3: Example of the Attitude and Knowledge Assessment.

Note: For full survey instrument, see Appendix 2.

3.1.6 Evaluating Whether the Group Project Is Good Practice Work

The goal of the group project is to prepare students for projects they might encounter when entering the work force, that is, during future jobs. To evaluate this, they were asked to indicate their agreement with the statement “*This was good practice work.*” on a Likert scale from 1 = Strongly disagree to 5 = Strongly agree.

3.2 Data Analysis

3.2.1 Principal Component Analysis to Determine General Attitude and Knowledge Factors

In order to determine general attitudes and knowledge, exploratory factor analysis was applied to the scale by Joiner (1998) described above. The resulting factors were then included in further analysis. Specifically, principal component analysis with varimax as a rotational strategy was employed in Stata to identify the number of factors. Factor analysis combines highly correlated items into a factor where the factors are independent and unrelated from each other. This analysis allows one to identify a latent structure among variables. The reliability of the generated factors is measured using Cronbach’s alpha for each factor, which should be greater than 0.5 in order to allow the factor to be included in the subsequent analysis (Kim and Mueller 1978; Hair et al. 1998).

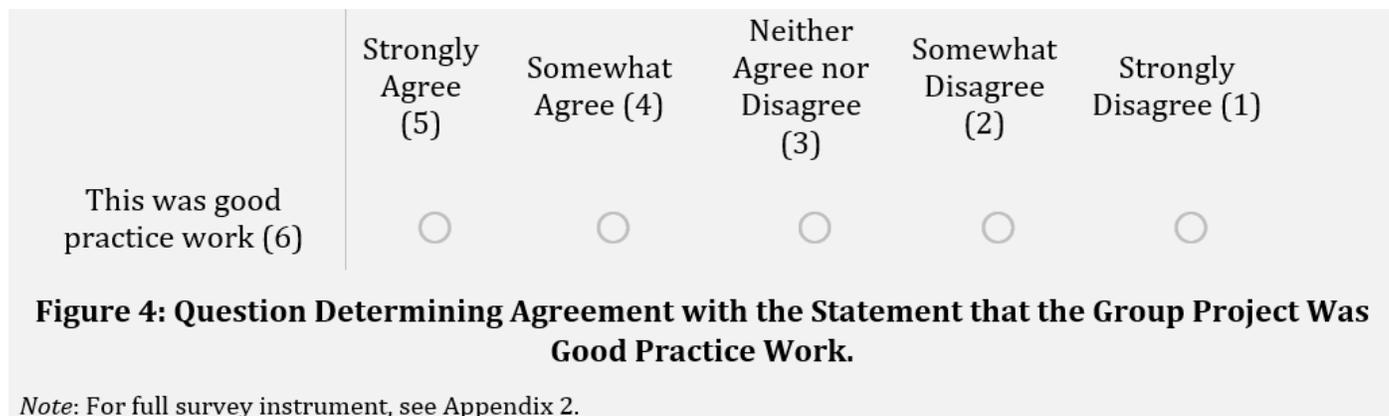
3.2.2 Analyzing Drivers of Student Attitudes Toward Group Projects

To analyze drivers of student attitudes toward group projects, a series of four models was estimated. Referring to Figure 1, the analysis starts by investigating what affects students’ peer evaluations. To do so, the statements presented in the question serve as individual dependent variables (Figure 1 displays example statements). Since they were measured on a 5-point Likert scale that is ordinal in nature from (1) Never to (5) Always, ordered probit models with robust standard errors are used following Greene (2012, pp. 787–791). The independent variables included in the model are gender (female equal to 1, 0 = otherwise), race (White, African American, Asian, all binary variables equal to 1, 0 = otherwise), Hispanic (equal to 1, 0 = otherwise), and age in years (continuous variable).

Referring to Figure 2, drivers of attitudes toward the group project are analyzed. To do so, the statements presented in the question serve as individual dependent variables (Figure 2 displays example statements). Since they were measured on a 5-point Likert scale that is ordinal in nature from (1) Strongly disagree to (5) Strongly agree ordered probit models with robust standard errors are used following Greene (2012, pp. 787–791). The independent variables are again gender, race, ethnicity, and age, as described above.

Referring to Figure 3, drivers of general attitudes and knowledge toward research-based group projects are analyzed. Again, the statements presented in the question serve as individual dependent variables (Figure 3 displays example statements). Since they were measured on a 7-point Likert scale that is ordinal in nature, ordered probit models are used with robust standard errors following Greene (2012, pp. 787–791). The same independent variables, as described above, are included in the estimation.

The fourth model estimates determinants regarding the opinion that the group project was good practice work based on the question displayed in Figure 4. In addition to the independent variables described above, this model also included the following independent variables: *U.S.* equal to 1 if United States is the home country, zero otherwise. *English* equal to 1 if English is the main language at home, zero otherwise. *Comfortable* equal to 1 if participant is comfortable speaking English, zero otherwise. *Honors* equal to 1 if participant is an Honors student, zero otherwise. For this model, marginal effects were determined. All estimations were conducted in Stata 17.



4 Empirical Results

4.1 Group Member Evaluations

The success of working in groups, whether in-person or online, hinges on how well the group members collaborate (Espey 2018b). Table 3 presents results for peer evaluations of group members that show the students believed that most of their group members meet deadlines, complete deliverables, develop ideas constructively with others, and volunteer when tasks need to be accomplished. Dimensions to improve include the concern of quieter members being excluded, being prompt in attendance, demonstrating knowledge in the subject area, and making sure the workload is evenly distributed. Overall, based on the descriptive results, it can be concluded that the students were mainly satisfied with their group members.

Several sociodemographic factors were regressed on these evaluations. Ordered probit model estimation results are provided in Table 4. Coefficients and significance are displayed. It becomes evident from Table 4 that being female leads to evaluating peers more positively. Students being White and Hispanic are more likely to evaluate their peers as being good listeners, while Asian students are less likely to evaluate their peers as pulling their fair share and being knowledgeable.

4.2 Workload Evaluations

In addition, it was measured how the students assess themselves in terms of workload. Results in Table 5 show that students allocate themselves on average about 40 percent of the workload. Given that most groups have 4–5 members, this means that they consider their own workload above average. In addition, there are students who assess their own workload to be at 100 percent (the minimum ranging between 16 percent and 20 percent). While we do not know whether the perceivably uneven split is true or not, a misperceived workload can lead to discontent when working in groups (e.g., Felder and Brent 1994). This calls for solutions to address this issue to prevent potential dissatisfaction with cooperative teaching methods if uneven working loads result or are perceived.

4.3 Attitudes Toward Cooperative Learning

Not every student will be in favor of group projects (e.g., Buckenmyer 2000). Hence, it is important to understand what underlying reasons for this are. Results in Table 6 show that most students agree with the statement that they benefitted from each other (75 percent Somewhat or Strongly agree), and a slim majority agrees that they enjoyed the course more than a course without a group project (51 percent Somewhat or Strongly agree). More students agree with the statement that they would choose a course with a group project again in the future—compared to those who disagree with this statement (47 percent Somewhat or Strongly agree, 27 percent Somewhat or Strongly disagree); and the same holds for the statement that they believe they learned more than in courses without a group project (44 percent Somewhat or Strongly agree, 28 percent Somewhat or Strongly disagree).

Table 3: Peer Evaluation of Group Members (in %, N = 136).

Statement	Never	Some- times	About Half the Time	Most of the Time	Always
Meeting deadlines	2.94	2.21	3.68	15.44	75.74
Good listeners	1.47	5.88	8.09	25.74	58.82
Complete in delivering agreed-upon parts of project	2.21	7.35	5.15	27.94	57.35
Developing ideas constructively with others	3.68	7.35	5.88	25.74	57.35
Volunteering appropriately during team meetings when tasks need to be accomplished	3.68	7.35	7.35	27.21	54.41
Able to solve problems	2.94	5.88	5.15	32.35	53.68
Organized in seeking information from resources	3.68	3.68	11.76	28.68	52.21
Making helpful suggestions on ways of accomplishing projects	3.68	2.21	11.03	33.82	49.26
Pulling fair share with regard to overall workload	5.15	10.29	7.35	30.88	46.32
Demonstrating knowledge in the subject area	3.68	3.68	8.82	38.24	45.59
Prompt in attendance at team meetings	2.94	6.62	8.82	40.44	41.18
Seeking input from quieter team members	8.09	11.03	17.65	22.79	40.44

Note: Question: Thinking about working on the project in AGB 456, when evaluating the majority of students you worked with, how would you evaluate their behavior?

Another positive aspect of cooperative techniques was recognized by the students with 48 percent somewhat or strongly agreeing that group projects enable them to make friends. Something not to be underestimated given that online students may not have as many opportunities to connect to their fellow students as compared to in-person students (e.g., Burke 2022). A main criticism was again that the students felt they had to take on more work than others (41 percent Somewhat or Strongly agree), which suggests once more that finding a mechanism to divide the workload fairly is important to make group projects successful in the classroom. Finally, 37 percent strongly or somewhat agree with the statement “I wish I could have worked on this by myself.” This is in line with findings by Caspersz et al. (2003). More in-depth analysis is required to understand why these students hold this attitude.

Hence, sociodemographic factors were regressed on the individual attitudes using ordered probit models as outlined in Section 3. Estimation results are provided in Table 7 for the estimated ordered probit models. Note, these are again individual ordered probit models where the attitudes (e.g., benefitted from others, made new friends) are the dependent variables, and the socio-demographics are the independent variables. Age is significant for multiple attitudinal statements. The older the student, the more likely they are to have negative attitudes toward group projects. Specifically, results indicate that an increase in age leads to disagreement with the statements “I enjoyed this course more than a course without a group project,” “I would choose a course with a group project again,” “I learned more than in courses without a group project,” and agreement toward the statement “I wish I could have

Table 4: Effects of Socio-Demographics on Evaluation of Peers (N = 100).

Evaluation Criteria (Dependent Variables)	Independent Variables									
	Female	White	African American	Asian	Hispanic	Age	Prob > chi ²	Wald chi ²	Pseudo LL	R ²
Meeting deadlines	0.528 * (0.283)	0.051 (0.376)	-0.270 (0.595)	-0.642 (0.603)	0.280 (0.385)	-0.032 (0.022)	0.046	12.80	-71.93	0.06
Good listeners	0.410 (0.262)	0.770 * (0.446)	0.893 (0.703)	-0.443 (0.494)	0.853 ** (0.433)	-0.014 (0.021)	0.000	29.38	-85.52	0.08
Complete in delivering agreed-upon parts of the project	0.927 *** (0.264)	0.116 (0.520)	0.358 (0.769)	-0.491 (0.630)	0.786 (0.494)	-0.003 (0.022)	0.001	23.54	-84.37	0.10
Developing ideas constructively with others	0.696 *** (0.251)	-0.240 (0.452)	0.016 (0.687)	-0.298 (0.662)	0.127 (0.415)	-0.002 (0.020)	0.217	8.30	-97.63	0.04
Volunteering appropriately during team meetings when tasks need to be accomplished	0.527 ** (0.243)	-0.254 (0.393)	0.049 (0.700)	-0.785 (0.596)	0.259 (0.351)	-0.018 (0.021)	0.125	9.98	-106.72	0.04
Able to solve problems	0.411 (0.256)	0.200 (0.443)	0.243 (0.653)	0.276 (0.575)	0.618 (0.415)	-0.022 (0.020)	0.543	5.00	-95.35	0.03
Organized in seeking information from resources	0.606 ** (0.247)	-0.169 (0.446)	0.092 (0.693)	-0.205 (0.599)	0.478 (0.423)	0.005 (0.020)	0.233	8.08	-106.39	0.05
Making helpful suggestions on ways of accomplishing projects	0.617 ** (0.243)	-0.260 (0.478)	-0.204 (0.684)	-0.684 (0.700)	0.141 (0.401)	-0.005 (0.021)	0.197	8.61	-96.48	0.05
Pulling fair share with regard to overall workload	0.598 ** (0.245)	-0.441 (0.398)	-0.301 (0.571)	-1.177 ** (0.508)	0.134 (0.355)	-0.034 (0.016)	0.001	22.91	-110.16	0.07
Demonstrating knowledge in the subject area	0.468 * (0.242)	-0.410 (0.489)	-0.386 0.652	-1.164 ** (0.574)	0.321 (0.427)	-0.025 (0.018)	0.001	23.21	-99.78	0.07
Prompt in attendance at team meetings	0.618 ** (0.254)	-0.672 (0.481)	-0.242 0.678	-0.523 (0.614)	-0.152 (0.437)	-0.019 (0.016)	0.137	9.72	-99.77	0.05
Seeking input from quieter team members	0.516 ** (0.236)	-0.136 (0.422)	0.144 (0.598)	-0.140 (0.483)	0.114 (0.423)	-0.006 (0.020)	0.430	5.94	-131.59	0.02

Note: p value < 0.1*; p value < 0.05**; p value < 0.01***. Standard errors in parentheses. LL = Likelihood. Socio-demographics were regressed individually on Attitude Statements.

Table 5: Evaluation of Workload (in %).

	Mean	SD	Min	Max
Spring 2021 (N = 40)	36	18	20	100
Fall 2021 (N = 34)	44	22	20	100
Spring 2022 (N = 30)	34	19	20	100
Fall 2022 (N = 32)	41	26	16	100
Overall (N = 136)	39	22	16	100

worked on this by myself.” These results offer an interesting perspective toward attitudes regarding group projects where perceivably this form of instructing resonates more with younger students. Some significant effects are also found for being female and White.

4.4 General Attitudes and Knowledge Toward Group Projects

Next, general attitudes and knowledge regarding group projects was measured using a bipolar 7-point scale following Joiner (1998). Table 8 shows the mean and standard deviation. Students agree most with the statements that they are familiar with group projects and have a great deal of exposure and experience with group projects. However, they indicate that group projects are not their favorite activity, and not particularly desirable.

The data were then analyzed using exploratory factor analysis, that is, principal component analysis. Appendix Table A1 (Appendix 4) shows the rotated component matrix. The Kaiser-Meyer-Olkin (KMO) criterion is 0.85, which is considered to be meritorious.³ The following two factors were found:

Factor 1 (F1): Knowledge regarding group projects. Factor 1 contains items related to knowledge, for example, that one is familiar with group projects and has a lot of experience and exposure to group projects. The Cronbach’s alpha measures 0.9284, which is considered to be excellent.⁴

Table 6: Attitudes Toward Group Projects (in %, N = 136)

Attitudes	Strongly Disagree	Somewhat Disagree	Neither/Nor	Somewhat Agree	Strongly Agree
I benefitted from the other students’ skills and knowledge	9	6	10	32	43
I enjoyed this course more than a course without a group project	14	12	23	30	21
I would choose a course with a group project again	13	14	26	28	19
I learned more than in courses without a group project	12	16	29	26	18
I made new friends	11	16	25	32	16
I had to take on more work than others	21	19	19	23	18
I wish I could have worked on this by myself	20	22	21	22	15

Note: Question: With regards to working in this particular group in AGB 456, what is your opinion on the following statements? Because of this group project:...

³ This is based on the KMO measures, which are defined as follows: 0.00 to 0.49 unacceptable; 0.50 to 0.59 miserable; 0.60 to 0.69 mediocre; 0.70 to 0.79 middling; 0.80 to 0.89 meritorious; and 0.90 to 1.00 marvelous.

⁴ Cronbach’s alpha determines internal consistency as follows: ≥ 0.9 excellent, 0.9 to 0.8 good, 0.8 to 0.7 acceptable, 0.7 to 0.6 questionable, 0.6 to 0.5 poor, and lower than 0.5 unacceptable.

Table 7: Effects of Socio-Demographics on Attitudes Toward Group Projects (N = 100).

Attitudes (Dependent Variables)	Independent Variables						Prob > chi ²	Wald chi ²	Pseudo LL	R ²
	Female	White	African American	Asian	Hispanic	Age				
I benefitted from the other students' skills and knowledge	0.599 ** (0.245)	-0.274 (0.462)	-0.419 (0.631)	-0.466 (0.566)	0.452 (0.431)	-0.010 (0.020)	0.02	15.80	-121.50	0.05
I enjoyed this course more than a course without a group project	0.305 (0.235)	-0.464 (0.444)	0.251 (0.591)	0.318 (0.590)	0.213 (0.408)	-0.031 ** (0.016)	0.02	14.82	-146.02	0.04
I would choose a course with a group project again	-0.202 (0.2270)	-0.364 (0.359)	0.519 (0.576)	-0.358 (0.523)	0.017 (0.349)	-0.039 ** (0.019)	0.09	11.02	-150.32	0.03
I learned more than in courses without a group project	0.180 (0.225)	-0.347 (0.383)	-0.223 (0.480)	0.024 (0.551)	0.227 (0.385)	-0.038 ** (0.017)	0.01	18.33	-146.57	0.03
I made new friends	0.166 (0.226)	-0.221 (0.387)	0.351 (0.640)	0.091 (0.496)	0.121 (0.353)	-0.013 (0.020)	0.67	4.04	-149.92	0.01
I had to take on more work than others	-0.340 (0.233)	0.260 (0.352)	0.039 (0.515)	0.809 (0.492)	-0.384 (0.378)	0.001 (0.016)	0.04	13.07	-153.28	0.03
I wish I could have worked on this by myself	-0.327 (0.233)	0.669 * (0.358)	-0.012 (0.506)	0.788 (0.597)	0.128 (0.334)	0.041 ** (0.018)	0.02	15.51	-153.31	0.04

Note: p value < 0.1*; p value < 0.05**. Standard errors in parentheses. LL = Likelihood. Socio-demographics were regressed individually on Attitude Statements.

Factor 2 (F2): Attitude regarding group projects. Factor 2 sums up the statements which express attitudes toward group projects, such as liking group projects and being positive about it. It also includes the opinions that group projects are excellent and desirable. The Cronbach's alpha measures 0.9458, which is also considered to be excellent.

demographics are the independent variables. Age has the most consistent statistically significant effect across models for the different statements assessed. The older the student, the more likely they are to have negative attitudes toward group projects. Specifically, results indicate that an increase in age leads to disagreement with the attitude statements, such as "I like working on group projects very much" and "I am very positive about working on group projects." The same holds for White students with the exception of "I am very positive about working on group projects." Female students more likely significantly disagree with the statements "Group projects are my favorite activity" and "Group projects are desirable," which is interesting given their rather positive evaluations in previous analyses. Hispanic students are significantly more likely to be familiar with group projects; although this model was insignificant.

4.5 Group Project as Practice Work

Given that the group project incorporates research-based teaching with the goal of preparing students for projects to be done in future jobs, it was of importance to evaluate this objective from their perspective. Four percent strongly disagree with this, and 5 percent somewhat disagree, while 10 percent indicated they neither agree nor disagree. The majority agreed that the project was good practice work, with 39 percent somewhat agreeing and 43 percent strongly agreeing ($M = 4.12$ and $SD = 1.03$). As Table 10 displays, there are differences again between the semesters, with students in spring agreeing with this statement more than those in fall semesters.

Table 8: Attitudes and Knowledge Toward Group Projects (N = 136).

Items	Mean	Standard Deviation
Group projects are my favorite activity/Group projects are my least favorite activity	3.49	1.79
I like working on group projects very much/I dislike working on group projects very much	4.01	1.81
I am very positive about working on group projects/I am very negative about working on group projects	4.73	1.56
Group projects are excellent/Group projects are poor	4.31	1.70
Group projects are desirable/Group projects are undesirable	4.00	1.76
I'm extremely familiar with working on group projects/I'm extremely unfamiliar with working on group projects	5.85	1.33
I have had a great deal of experience with working on group projects/I have had no experience with working on group projects	5.58	1.45
I have had a lot of exposure to group projects/I have had no exposure to group projects	5.68	1.47

Note: A bivariate scale with seven points was used. Seven indicates full agreement with left-hand side statements, one indicates full agreement with right-hand side statements. Question: Check the boxes that best describe your attitudes and knowledge regarding group projects, i.e., group assignments in teaching in general. For instance, group work similar to the one you participated in, in AGB 456.

To investigate this further, an ordered probit model with robust standard errors was used to analyze determinants of attitudes toward group projects being good practice work (see Table 11). Determinants in the model included socio-demographics, such as gender and age; being comfortable with speaking English; studying characteristics, such as being an Honors student; and employment. Results are reported in Table 11. In addition, Appendix Table A2 (Appendix 4) displays the average marginal effects (dy/dx) showing how the relationship between each independent variable and the change in probability of outcome changes as those variables change.

The results show that being female increases the likelihood to agree with the statement that group work is good practice work, that is, relevant for future jobs. The same holds for those who have a positive general attitude toward group projects. In fact, being female has the strongest impact on strongly agreeing that the group project was good practice work, followed by a generally positive attitude toward group projects. This suggests that motivating students to appreciate group projects and pointing out the positive aspects of it might have the biggest influence toward making group projects in online classes successful. However, being Asian decreases the likelihood to agree with this statement. Being Asian has the strongest negative relationship with strongly agreeing with group projects being good practice work.

In particular, being female will significantly increase the probability of choosing “Strongly agree” for the item that group projects are good practice work by 28 percent compared to being male. Compared to being a male, being female will decrease the probability of choosing “Strongly disagree, disagree, neither/nor, agree” for this item by 3 percent, 4.8 percent, 7.7 percent, and 12.6 percent, respectively. Being Asian will significantly increase the probability to choose “agree” by 13.4 percent compared to other ethnicity groups and will significantly decrease the probability to choose “Strongly agree” by 29.8 percent compared to other ethnicity groups.

Table 9: Effects of Socio-Demographics on Attitudes and Knowledge Toward Group Projects (N = 100).

Attitudes & Knowledge (Dependent Variables)	Independent Variables						Age	Prob > chi ²	Wald chi ²	Pseudo LL	R ²
	Female	White	African American	Asian	Hispanic						
Group projects are my favorite activity	-0.620 *** (0.227)	-0.669 * (0.347)	0.575 (0.557)	-0.052 (0.524)	-0.017 (0.358)	-0.045 ** (0.018)	0.000	32.86	-172.63	0.06	
I like working on group projects very much	-0.217 (0.232)	-0.613 * (0.348)	0.701 (0.639)	-0.084 (0.598)	0.047 (0.340)	-0.041 ** (0.019)	0.000	25.19	-176.57	0.04	
I am very positive about working on group projects	-0.230 (0.233)	-0.469 (0.291)	0.680 (0.611)	-0.152 (0.512)	0.034 (0.283)	-0.036 * (0.021)	0.022	14.80	-173.85	0.03	
Group projects are excellent	-0.284 (0.234)	-0.732 ** (0.314)	0.267 (0.578)	-0.319 (0.617)	0.003 (0.330)	-0.034 * (0.019)	0.001	22.03	-174.16	0.04	
Group projects are desirable	-0.487 ** (0.233)	-0.559 * (0.324)	0.603 (0.586)	-0.444 (0.523)	-0.139 (0.326)	-0.037 ** (0.017)	0.000	25.20	-175.22	0.04	
I'm extremely familiar with working on group projects	-0.031 (0.215)	0.226 (0.354)	0.709 (0.692)	0.414 (0.596)	0.678 ** (0.335)	-0.031 (0.019)	0.192	0.19	-136.26	0.03	
I have had a great deal of experience with working on group projects	-0.216 (0.224)	0.102 (0.401)	0.896 (0.778)	-0.108 (0.535)	0.521 (0.388)	-0.011 (0.025)	0.497	5.38	-152.24	0.02	
I have had a lot of exposure to group projects	-0.128 (0.214)	0.260 (0.344)	0.712 (0.682)	-0.139 (0.463)	0.353 (0.332)	-0.022 (0.022)	0.705	3.79	-152.07	0.01	

Note: p value < 0.1*; p value < 0.05**. Standard errors in parentheses. LL = Likelihood. Socio-demographics were regressed individually on Attitudes/Knowledge Items.

5 Conclusion

In online courses, students may not have much opportunity to work together with other students (e.g., Burke 2022). Active learning techniques, such as working in groups, allow students to interact with other students, while excelling at course material at higher cognitive levels (e.g., Felder and Brent 1994; Prince 2004; Espey 2018a). Such strategies of cooperative learning improve retention, motivation, and critical thinking but most importantly foster relationships among peers and prepare students for what is to come in the workplace, where collaboration is common (Caspersz et al. 2003).

This study tested group projects in an online environment and gathered data from four classes to shed light on students' attitudes toward an online group project that is research-based. Findings for peer evaluations showed that students were overall content with the members of their groups, for example, with regards to meeting deadlines and completing deliverables. However, results show that it is perceived as challenging to include students who are not very outgoing in the group project. In addition, group members who are not prompt in attendance at meetings and do not carry their fair share of the workload can cause dissatisfaction. Students often perceived their own workload above average. Even if

Table 10: Attitude Toward Group Projects Being Good Practice Work (in %).

Semesters	General Disagreement	Strongly Disagree	Somewhat Disagree	Neither/Nor	Somewhat Agree	Strongly Agree	General Agreement
Spring 2021 (N = 40)	8	0	8	3	55	35	90
Fall 2021 (N = 34)	9	6	3	12	35	44	79
Spring 2022 (N = 30)	0	0	0	10	30	60	90
Fall 2022 (N = 32)	18	9	9	16	31	34	65
Overall (N = 136)	9	4	5	10	39	43	82

that was a misperception, this would likely lead to dissatisfaction with group projects. Hence, it might be worthwhile to address this issue to avoid potential dissatisfaction with cooperative teaching methods.

Underlying reasons of favoring group projects seem to be that one can benefit from other students, which leads to enjoying the course more, as well as believing more was learned in the course due to the group project. Making friends was also high on the list of positive aspects of group projects in online environments. This is valuable given that online students may have less opportunities to connect with other students compared to in-person students (Burke 2022). Nevertheless, the distribution of work does remain a barrier to including group projects successfully in courses, and this indicates that one needs to find ways to ensure that the workload is evenly distributed. Future research could analyze potential solutions for this in order to implement group projects successfully. Another challenge is to cater to those students who truly prefer to work on group project assignments on their own.

A specific investigation of attitudes and knowledge toward group projects showed that in general students are content with group projects and are highly familiar with the concept. This suggests that collaborative techniques are widely used, and overall are well-received even if certain aspects might lead to discontentment in some cases. The study considered group projects as preparation for future work. The majority of students agree that such activities are a good opportunity to practice. Female students and those who hold a generally positive attitude toward group projects are more likely to view these activities as a good practice. This indicates that students' attitudes are critical. Hence, future research could investigate how to motivate students to fully engage in group projects to make it successful as a learning tool.

This study has limitations. Given that the surveys were conducted at the end of the class, it is possible that students who were unsatisfied with the group project dropped the class and hence, did not fill out the surveys noting their dissatisfaction. If this was the case, the study could be suffering from so-called Survivor Bias. However, the amount of students who dropped the class is about 6 percent, and students usually dropped the class within the first two weeks of the semester, when the group project had just begun. Thus, it may be reasonable to assume that the group project only marginally affects the decision to drop the course. Hence, it is assumed that Survivor Bias is low. Nevertheless, when interpreting the results, it is advisable to keep in mind that Survivor Bias could have caused an overestimation of the benefits of the group project and underestimation of its cost.

Another limitation is that this study does not allow for comparison of the results to in-person group projects. In fact, this study set out to analyze attitudes toward group projects in an online setting. Nevertheless, it would be interesting to see how online students' attitudes compare to in-person

Table 11: Determinants of Attitudes Toward Group Projects Being Good Practice Work (N = 96).

	Coefficient Estimate	Standard Error	Z-value	
F1: Attitude toward group projects	0.719	0.157	4.59	***
F2: Knowledge re. group projects	0.089	0.123	0.73	
U.S. is home country	-0.332	0.648	-0.51	
English main language at home	-0.076	0.557	-0.14	
Comfortable speaking English	0.785	0.736	1.07	
Female	0.984	0.311	3.17	***
Age	0.005	0.02	0.25	
Full-time employed	0.191	0.341	0.56	
Part-time employed	0.126	0.338	0.37	
White	-0.411	0.444	-0.93	
African American	-0.34	0.702	-0.48	
Asian	-1.048	0.576	-1.82	*
Hispanic	0.298	0.452	0.66	
Business major	0.465	0.287	1.62	
Honors student	-0.394	0.413	-0.95	
Wald chi ² (15)	48.65			
Prob > chi ²	0.000			
Log Pseudo LL	-83.41			
Pseudo R ²	0.212			

Note: p value < 0.1*; p value < 0.01*** LL = Likelihood. Conducting a correlation analysis reveals that there is no concern regarding collinearity among the independent variables. In addition, it was tested whether effects would differ based on distance from the pandemic by including variables from Fall 2021, Spring 2022, and Fall 2022. However, none of these variables showed significant effects.

students’ attitudes. Future research could address this by conducting a similar study in both in-person and online courses.

This course used random group building to form the teams for the group project. However, Brown et al. (2019b) showed that students want to be incorporated in creating their own groups. It would be interesting to explore this further for online formats, given that Picault (2021) mentioned that online environments make it more difficult to employ such efforts. The author’s own experience points toward the importance of getting the groups started immediately in a 7.5-week course. Having students build their own groups could hinder this. Nevertheless, the promising findings by Brown et al. (2019b) toward satisfaction with group projects might warrant a trade-off between speedy, random group formation and student team building. In particular, Brown et al. (2019b) describe how they have the class choose team leaders first and then build the groups around the leaders. This would be interesting to explore in an online, asynchronous environment. Though challenging to transfer their mechanism to find the leaders, this could give a new perspective for students on group projects and the importance of being present in an online course from day one. Brown et al. (2019b) themselves propose solutions to incorporate their mechanism in distance learning. Most interesting is their suggestion of having the group leader recommend grades for their peers to the teacher. This suggestion seems worth exploring in future research on cooperative learning online.

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Appendix 1a: Example of Course Structure Related to the Group Project Assignments

Constructs in Consumer Behavior Research

Welcome to Week 3: Theoretical Background on Relevant Constructs in Consumer Behavior Research

This week covers the theoretical underpinnings of consumer behavior research. When answering a research question—whether it’s for academic purposes or for the industry—we need to know what “construct” we are dealing with. Do we want to know how consumers perceive a new product? Are we interested in their attitudes toward sustainability, in order to successfully develop a more sustainable product? In order to pick the right data collection methods to answer our research question (e.g., we can collect data on perception via free elicitation techniques), we have to understand the underlying theories.

This week’s learning objectives:

1. Differentiate between attitude, perception, and evaluation.
2. Outline the difference between preferences and willingness to pay.
3. Categorize social relationships and networks.

Assignment 3

To research what consumers think about *ChocNoChub*, I need to decide what I want to know specifically. Do I want to know how they perceive the product, or do I want to know more about their attitudes or willingness to pay? What do you want to focus on to make sure your product will be successful?

- **Discuss in your group** which theoretical constructs (e.g., attitudes, perception) are most important for you when collecting data for Assignment #8.
- **Write** about 300–400 words explaining which constructs you want to research. Again, this is an **individual assignment**, but you can draw on your group discussions for content.
- **Submit** your work in MS Word or PDF format.
- **Check** the Course Schedule for due dates.

Appendix 1b: Group Project Instructions

The group assignments are presented as follows (note each week also contains an individual assignment).

Week 1 (Assignment 1)

In order to complete the group assignment (Assignment 8) in this class, your group needs to pick a recent innovation or product to be developed from the food/agribusiness. Note, this product does not have to exist, yet. In fact, if you come up with a brand new product that you wish was on the market, it will be more interesting for you to work on this assignment. In this first assignment, I want you to work with your group to decide on this product. I myself came up with “Fat-Free Chocolate that tastes delicious” I’ll call it ChocNoChub.

Meet with your group and pick a study product that you want to use for your Assignment 8. Provide a short description of why you chose this product. Note, this product does not have to be your “final choice.” This assignment is meant to get you started.

For me, ChocNoChub would be the perfect product, because then I could eat chocolate all day long without worrying about the calories. However, that might not be true for all consumers. For example, health-conscious consumers could worry about why it tastes so good without fat. Therefore, I would need a consumer survey to test whether this product would be successful in the market.

Please note, your product does not have to be a food product.

Submit your work in MS Word or PDF format.

In addition to the group assignment in the first week, each student has to upload their signed Team Contract, which is based on a discussion of the Team Membership Agreement and Group Charter in the group. Students decide who will serve in which capacity. For example, which group member will be the CEO, CTO, etc.; all roles are outlined in the document “Team Membership Agreement and Group Charter.” Finally, they complete the Team Membership Agreement Terms and Conditions, which is meant to increase a feeling of responsibility to contribute to the group projects.

Week 2 (Assignment 2)

In your group, finalize your choice of product and begin thinking about the questionnaire you could use to investigate whether your product would be successful in the marketplace. For example, what would consumers think about it?

You find an example questionnaire that I created for my *ChocNoChub* below. In my questionnaire I have chosen a mix of quantitative data collection methods because I want to know what a lot of people think about the product before I start producing. If people don’t like it, I will have to revise my ideas.

To research what consumers think about *ChocNoChub*, I have decided to go with an online survey. I can easily put my questions online, for example using Qualtrics and then send the link to a lot of people. How will your group do the survey?

In order to choose your method for your own questionnaire, Assignment 2 asks you to do the following:

- **Discuss** the advantages and disadvantages of quantitative data collection methods regarding the questionnaire that you will have to create for this class.

- **Explain** whether you will use a face-to-face, phone, or online questionnaire. Argue about the advantages and disadvantages of the different methods.
- **Write** about 200–300 words. Note, this is an **individual assignment, I expect you to write the 200–300 words** by yourself, not in your group. However, you can use the group discussion for the content. I understand that the content will be similar; however, your wording should be individual.
- **Submit** your work in MS Word or PDF format.
- **Check** the Course Schedule for due dates.

Peer Evaluation 1 (*There is one in every week from Week 2 to Week 8.*)

This assignment is an opportunity to evaluate your group members. This helps me to understand if all members are equally involved. Please fill out the Excel evaluation sheet. Include yourself as a member. A self-evaluation helps me to also understand where potential misperception within a group might be. Please let me know if you have any questions. Also, if you would like me to reach out to a group member, let me know.

Week 3 (Assignment 3)

To research what consumers think about *ChocNoChub*, I need to decide what I want to know specifically. Do I want to know how they perceive the product, or do I want to know more about their attitudes or willingness to pay? What do you want to focus on to make sure your product will be successful?

- **Discuss in your group** which theoretical constructs (e.g., attitudes, perception) are most important for you when collecting data for Assignment #8.
- **Write** about 300–400 words explaining which constructs you want to research. Again, this is an **individual assignment**, but you can draw on your group discussions for content.
- **Submit** your work in MS Word or PDF format.

Week 4 (Assignment 4)

This assignment has two parts.

Part 1

In my questionnaire, among other techniques, I have used Likert scales and the free elicitation technique.

- **With your group, pick** some methods that we discussed in the course, and describe why you decide to use them to research (future) success of your study product.
- **Describe** the methods you want to use in your own words and explain how to use them. As before, this is an **individual assignment**, but you can draw on content from your group discussions.

Part 2

Below you can see the questionnaire I used for my project. You can download the Word document and use that as a template for your own.

For this assignment, **work in your group to create** the first draft of your questionnaire consisting of at least 20 questions, using some of the methods covered in class.

You can use the example questionnaire I created to get started with your own questionnaire.

- **Display** all your questions. Add how you will collect your data, for example, through an online survey. For this part, **each group member can submit the same.**
- **Submit** your work including Part 1 and Part 2 in one MS Word document.
- **Check** the Course Schedule for due dates.

Week 5 (Assignment 5)

Now it is time to interview people! Once you have collected your data, you will need to enter them, e.g., in Excel, so you can analyze them. That will allow you to find out if your product is going to be successful in the market.

For your assignment:

- **In your group: Finalize** your questionnaire.
- **Interview at least 15 individuals per group member.** For example, if you decide to collect your data online, you can use Google Forms or Survey Monkey. Please do a Google search for both in order to use the free version. If you use an online survey, feel free to post your link on Yellowdig or the discussion board. You can take the other groups' surveys.
- Here is information on how to create a Qualtrics account to program your survey in Qualtrics. When using Qualtrics, you will receive a link that you can email to participants. The data are then automatically collected in Qualtrics.
- **Enter** the data in Excel or SPSS (or another similar software). See examples for coding below.
- **Submit** the data file in XLS including a variable description (e.g., Gender: female = 1, male = 0). Even though you collect the data together, submit your own data file where you included the variable descriptions. That allows you to understand the data before you start working with it.

Note: Assignments 6 and 7 in Week 6 are unrelated to the group project.

Week 7 (Assignment 8)

Final Report Guidelines – This is a group project.

You will be using VoiceThread to submit this assignment. VoiceThread requires a microphone and webcam. To learn about VoiceThread and how to create a VoiceThread, view [Using VoiceThreadLinks to an external site.](#)

[Access VoiceThread Here](#)

Step 1: Analyze the data that you collected with your questionnaire, using some of the methods covered in class. For example, perform and interpret the output from a cross tabulation. Add some figures and tables. This is a group project, so distribute the work evenly among you.

Step 2: Prepare a presentation of your process and results. To create your presentation, you can use all the material from previous assignments. The presentation should be about 20 slides. You may prepare figures and tables in the form of PowerPoint, Word, Tableau, Realtimeboards, or another compatible file format to generate the figures and tables. Because this is a group project, make sure everyone contributes to the presentation.

Step 3:

Part 1: Use the **VoiceThread video recorder** to prepare a presentation that covers each of the following, specific to your market research project:

- Title slide (1 slide)
- Outline of the presentation (1 slide)
- Introduction (1–3 slides)
- Theoretical background (1–3 slides)
- Methodological background (2–4 slides)
- Empirical results (sample description and descriptive statistics) (5–10 slides)
- Conclusions (1–3 slides)
- References (1 slide)
- Contribution of each member, state “who did what,” **make sure you all contribute equally to your project** (1 slide)

Part 2: **SUBMIT** your video for grading by clicking the blue Submit Assignment button within VoiceThread.

- The final project should be made using VoiceThread, and should be 15–20 minutes long.
- References and citations should be listed at the end of the presentation.
- Not obeying the above guidelines will result in a penalty.
- Spelling and grammatical errors should be avoided as they signal a lack of precision and attention to detail.
- Late projects will be penalized one letter grade per day. You should anticipate that grading for this project will be demanding yet fair.

Appendix 2: Survey Questions (Coding in Parentheses)

Thinking about working on the project in AGB 456, when evaluating the majority of students you worked with, how would you evaluate their behavior?					
	Always (5)	Most of the Time (4)	About Half the Time (3)	Sometimes (2)	Never (1)
Prompt in attendance at team meetings (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Complete in delivering agreed-upon parts of the project (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organized in seeking information from resources (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Volunteering appropriately during team meetings when tasks need to be accomplished (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pulling fair share with regard to overall workload (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Developing ideas constructively with others (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Making helpful suggestions on ways of accomplishing projects (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good listeners (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seeking input from quieter team members (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meeting deadlines (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Demonstrating knowledge in the subject area (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Able to solve problems (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Imagine there are 100 points available for the whole team, how many points would you pay yourself for your share in percent. For instance, if a team has two members and each member is equally involved, your share would be 50%.

My share of the group work in % ()	
-------------------------------------	--

With regards to working in this particular group in AGB 456, what is your opinion on the following statements? Because of this group project:

	Strongly Agree (5)	Somewhat Agree (4)	Neither Agree nor Disagree (3)	Somewhat Disagree (2)	Strongly Disagree (1)
I learned more than in courses without a group project (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I benefitted from the other students' skills and knowledge (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I made new friends (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I enjoyed this course more than a course without a group project (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I wish I could have worked on this by myself (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This was good practice work (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would choose a course with a group project again (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I had to take on more work than others (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Check the boxes that best describe your attitudes and knowledge regarding group projects, i.e., group assignments in teaching in general. For instance, group work similar to the one you participated in, in AGB 456.

	1 (7)	2 (6)	3 (5)	4 (4)	5 (3)	6 (2)	7 (1)	
Group projects are my favorite activity	<input type="radio"/>	Group projects are my least favorite activity						
I like working on group projects very much	<input type="radio"/>	I dislike working on group projects very much						
I am very positive about working on group projects	<input type="radio"/>	I am very negative about working on group projects						
Group projects are excellent	<input type="radio"/>	Group projects are poor						
Group projects are desirable	<input type="radio"/>	Group projects are undesirable						
I'm extremely familiar with working on group projects	<input type="radio"/>	I'm extremely unfamiliar with working on group projects						
I have had a great deal of experience with working on group projects	<input type="radio"/>	I have had no experience with working on group projects						
I have had a lot of exposure to group projects	<input type="radio"/>	I have had no exposure to group projects						

What is your major? _____

Are you an Honors student?

- Yes (1)
- No (0)

What is your age in years? _____

How many people live in your household? A household means that you share resources like income and groceries. _____

What is your employment status?

- Employed full-time (1)
- Employed part-time (2)
- Unemployed looking for work (3)
- Unemployed not looking for work (4)
- Retired (5)
- Student (6)
- Disabled (7)

Which best describes your gender? _____

Do you have children you care for?

- Yes, all the time (1)
- Yes, some of the time (2)
- No (0)

Is the U.S. your home country?

- Yes (1)
- No (0)

What is the main language that is spoken at your home? _____

How comfortable are you speaking English?

- Extremely comfortable (1)
- Moderately comfortable (2)
- Slightly comfortable (3)
- Neither comfortable nor uncomfortable (4)
- Slightly uncomfortable (5)
- Moderately uncomfortable (6)
- Extremely uncomfortable (7)

How do you identify yourself in terms of race and ethnicity? _____

Which continent do you live in?

- Asia (1)
- Africa (2)
- North America (3)
- South America (4)
- Antarctica (5)
- Europe (6)
- Australia (7)

Appendix 3: Rubric for Group Project

Criteria	Ratings					Pts
<p>This criterion is linked to a Learning Outcome</p> <p>Organization (15%)</p>	<p>37.5 pts Exemplary (Far Exceeds Standard) Ideas are arranged logically and are clearly linked. Writing flows smoothly, and reader can follow reasoning.</p>	<p>33.33 pts Above Average (Exceeds Standard) Ideas are arranged logically and are linked. Most writing flows smoothly, and reader can follow reasoning.</p>	<p>24.99 pts Adequate (Meets Standard) Ideas are arranged logically, but may not be clearly linked and/or writing may leave some gaps in reasoning.</p>	<p>16.67 pts Needs Improvement (Below Standard) Ideas may not be arranged logically and/or may not be clearly linked and/or writing may leave gaps in reasoning.</p>	<p>0 pts No Credit Did not submit assignment or submitted late.</p>	<p>37.5 pts</p>
<p>This criterion is linked to a Learning Outcome</p> <p>Content (25%)</p>	<p>62.5 pts Exemplary (Far Exceeds Standard) Submission included creative and insightful analysis and included detailed explanation of the study of the product. Submission addresses an organized set of ideas consistent with the given guidelines. Submission is consistent with the research of an innovative product.</p>	<p>50 pts Above Average (Exceeds Standard) Submission is sufficiently conveyed, but lacks creative analysis and/or the submission is inadequately motivated and/or is not consistent with the given guidelines.</p>	<p>37.5 pts Adequate (Meets Standard) Submission is underdeveloped or insufficiently conveyed and/or is inconsistent with the given guidelines.</p>	<p>25 pts Needs Improvement (Below Standard) Submission is haphazardly conceived, underdeveloped, and/or inconsistent with the rest of the plan.</p>	<p>0 pts No Credit Did not submit assignment or submitted late.</p>	<p>62.5 pts</p>

Criteria	Ratings					Pts
<p>This criterion is linked to a Learning Outcome</p> <p>Development (25%)</p>	<p>62.5 pts Exemplary (Far Exceeds Standard) Main points well developed with high quality and quantity support. Reveals high degree of critical thinking. All components are thoroughly discussed with supporting evidence and other materials provided.</p>	<p>50 pts Above Average (Exceeds Standard) Main points well developed with quality supporting details and quantity. Critical thinking is weaved into points. May be missing an obvious important factor specific to the research of the product.</p>	<p>37.5 pts Adequate (Meets Standard) Main points are present with limited detail and development. Some critical thinking is present. May be missing explanation and/or the product is poorly analyzed.</p>	<p>25 pts Needs Improvement (Below Standard) Main points lack detailed development. Ideas are vague with little evidence of critical thinking.</p>	<p>0 pts No Credit Did not submit assignment or submitted late.</p>	<p>62.5 pts</p>
<p>This criterion is linked to a Learning Outcome</p> <p>Strength of Evidence (15%)</p>	<p>37.5 pts Exemplary (Far Exceeds Standard) Submission is well-supported by evidence (e.g., published research, published or group-administered surveys), and anecdotal or suggestive evidence, as needed. Uses properly formatted citations, when applicable.</p>	<p>33.33 pts Above Average (Exceeds Standard) Submission was generally well-supported, but lacked evidence in parts. Complete and properly formatted citations are generally present, when applicable.</p>	<p>25.01 pts Adequate (Meets Standard) Submission lacked crucial evidence. The provided evidence was weak or inappropriate. Occasional and/or incomplete references are provided, when applicable.</p>	<p>16.67 pts Needs Improvement (Below Standard) Submission contains a minimal amount of useful evidence. References may not be provided and/or are incomplete, when applicable.</p>	<p>0 pts No Credit Did not submit assignment or submitted late.</p>	<p>37.5 pts</p>

Criteria	Ratings					Pts
<p>This criterion is linked to a Learning Outcome</p> <p>Grammar, Spelling, & Mechanics (10%)</p>	<p>25 pts Exemplary (Far Exceeds Standard) Writing utilizes proper spelling and grammar, and follows formatting instructions when provided or demonstrates logical formatting for the assignment.</p>	<p>16.66 pts Above Average (Exceeds Standard) Writing utilizes proper spelling and grammar with few errors and follows appropriate formatting constructs.</p>	<p>8.34 pts Adequate (Meets Standard) Writing shows errors in spelling and/or grammar and/or formatting is inconsistent.</p>	<p>4.16 pts Needs Improvement (Below Standard) Writing shows numerous spelling and/or grammar errors and/or inconsistent formatting.</p>	<p>0 pts No Credit Did not submit assignment or submitted late.</p>	25 pts
<p>This criterion is linked to a Learning Outcome</p> <p>Style (10%)</p>	<p>25 pts Exemplary (Far Exceeds Standard) Shows outstanding style going beyond usual college level; rhetorical devices and tone used effectively; creative use of sentence structure and coordination.</p>	<p>16.66 pts Above Average (Exceeds Standard) Attains college level style; tone is appropriate and rhetorical devices are used to enhance content; sentence variety used effectively.</p>	<p>8.34 pts Adequate (Meets Standard) Approaches college level usage of some variety in sentence patterns, diction, and rhetorical devices.</p>	<p>4.16 pts Needs Improvement (Below Standard) Mostly in elementary form with little or no variety in sentence structure, diction, rhetorical devices, or emphasis.</p>	<p>0 pts No Credit Did not submit assignment or submitted late.</p>	25 pts
<p>Total Points: 250</p>						

Appendix 4: Supplementary Tables.

Table A1: Attitudes and Knowledge Rotated Factor Loadings Matrix (N = 136)		
KMO = 0.8484	Factor F1 Attitude	Factor F2 Knowledge
Cronbach's alpha	0.9458	0.9284
Group projects are my favorite activity	0.9060	0.1408
I like working on group projects very much	0.9479	0.0495
I am very positive about working on group projects	0.8372	0.0831
Group projects are excellent	0.9224	0.0337
Group projects are desirable	0.9043	0.0270
I'm extremely familiar with working on group projects	0.0462	0.9179
I have had a great deal of experience with working on group projects	0.0747	0.9478
I have had a lot of exposure to group projects	0.0660	0.9347

Table A2: Marginal Effects of Determinants of Attitudes Toward Group Projects Being Good Practice Work (N = 96)

	y = 1	y = 2	y = 3	y = 4	y = 5
F1: Attitude toward group projects	-0.023*	-0.035*	-0.056***	-0.092***	0.205***
F1: Attitude toward group projects (SE)	-0.012	-0.018	-0.019	-0.025	-0.036
F2: Knowledge re. group projects	-0.003	-0.004	-0.007	-0.011	0.026
F2: Knowledge re. group projects (SE)	-0.004	-0.006	-0.009	-0.016	-0.035
U.S. is home country	0.010	0.016	0.026	0.042	-0.095
U.S. is home country (SE)	-0.020	-0.035	-0.051	-0.083	-0.185
English main language at home	0.002	0.004	0.006	0.010	-0.022
English main language at home (SE)	-0.017	-0.026	-0.044	-0.072	-0.159
Comfortable speaking English	-0.024	-0.038	-0.061	-0.100	0.224
Comfortable speaking English (SE)	-0.026	-0.039	-0.061	-0.093	-0.207
Female	-0.030*	-0.048*	-0.077**	-0.126***	0.280***
Female (SE)	-0.017	-0.028	-0.031	-0.045	-0.081
Age	0.000	0.000	0.000	-0.001	0.001
Age (SE)	-0.001	-0.001	-0.002	-0.003	-0.006
Full-time employed	-0.006	-0.009	-0.015	-0.024	0.054
Full-time employed (SE)	-0.010	-0.017	-0.028	-0.043	-0.097
Part-time employed	-0.004	-0.006	-0.010	-0.016	0.036
Part-time employed (SE)	-0.010	-0.017	-0.027	-0.043	-0.096
White	0.012	0.020	0.032	0.053	-0.117
White (SE)	-0.014	-0.025	-0.038	-0.054	-0.125
African American	0.010	0.017	0.027	0.043	-0.097
African American (SE)	-0.021	-0.037	-0.055	-0.089	-0.199
Asian	0.032	0.051	0.082	0.134*	-0.298*
Asian (SE)	-0.023	-0.033	-0.053	-0.078	-0.160
Hispanic	-0.009	-0.015	-0.023	-0.038	0.085
Hispanic (SE)	-0.015	-0.023	-0.036	-0.057	-0.128
Business major	-0.014	-0.023	-0.036	-0.059	0.132
Business major (SE)	-0.011	-0.017	-0.024	-0.040	-0.081
Honors student	0.012	0.019	0.031	0.050	-0.112
Honors student (SE)	-0.014	-0.022	-0.032	-0.054	-0.117

Note: y1 = Strongly Disagree, y2 = Somewhat Disagree, y3 = Neither/Nor, y4 = Somewhat Agree, y5 = Strongly Agree. SE = Standard Error.

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Research Article

Nudging Agricultural Business Students into Successful Online Networking

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JEL Codes: A22, M50, J43

Keywords: Networking, nudge theory, professional branding, professional development, social media

Abstract

In an increasingly digital and interconnected world, businesses continue to rely more on applicants' online networking efforts as a positive marker in the hiring process. If students' career prospects rely on savvy professional social media use, it is incumbent on agricultural business programs to emphasize the importance in the classroom and incorporate education about the responsible use of those tools into the curriculum. In this study, students in an agricultural sales course developed LinkedIn profiles with incrementally stricter rubrics and requirements to determine how stressing specific components could nudge them to improve their professional online presence. In particular, the assignment required students to connect with other LinkedIn users outside their "safe" network (i.e., not professors, friends, or alumni of their university), leveraging those external reviewers as a mechanism to improve digital profile quality. Different treatments varied the numbers of required connections in the assignment. This external review put students' "skin in the game," since their public profiles would be scrutinized by real-world professionals. Results indicate that with stricter external-validation requirements, students' efforts improved. The long-term objective is to convince students of the value and efficacy of building and maintaining an active professional social media presence and brand.

1 Introduction

Regardless of teaching philosophies and pedagogies, a major objective of any agricultural economics or business program is to prepare students for success on the job market. Not every program has a designated agricultural career planning and development course, and as such, the responsibility for this training often falls either on administrative career services offices or on individual students. Alternatively, it may be incorporated deliberately into course content, with instructors bearing the primary burden of convincing students that career planning and networking are valuable (if not indispensable) activities. Although professors are experts in their disciplines, many are—at least to some degree—disconnected from the professional world. Many if not most professors have opted out of private-sector careers in favor of academia, consulting work notwithstanding. And even for those with prior industry experience, the relevance of that background diminishes rapidly with the professor's academic tenure (Lipinski & Kosicek, 2016).

Networking can build social capital, and it is correlated with long-run career success in terms of salary growth (Wolff & Moser, 2009). Connections made and maintained over time often provide inroads for students entering the job market as well as useful steppingstones for those midcareer professionals seeking advancement. Social media increasingly provide digital networking opportunities that act as a supplement to the traditional options. Although in-person networking often is still viewed as a first-best option for building social capital, the COVID-19 pandemic made it difficult for instructors to maintain experiential learning opportunities where students could safely network in person and access valuable face-to-face time with potential employers. This further illustrated the increasing value of digital networking platforms such as LinkedIn in contemporary society. Even years after the onset of the

pandemic, the labor market has retained some of the changes it adopted out of necessity for mere convenience.

Strategic online networking through LinkedIn provides substantial professional information benefits and improves users' social capital (Nikitkov & Sainty, 2014; Utz, 2016). Although there is little evidence that social media assessments can predict candidates' performance on the job (Roth et al., 2016), recruiters nonetheless use them in the hiring process; hence, the social capital associated with social media use can translate to improved outcomes on the job market. Evidence is mounting—for better or worse—that social media and LinkedIn specifically can help students' career prospects (Brewer & McCarthy, 2023; Peterson & Dover, 2014). However, convincing students to internalize this reality can be a challenge for professors, especially those in applied majors outside of traditional business. Recent research has indicated that students' use of LinkedIn exhibits systematic flaws prior to entering the job market (Daniels et al., 2023). In particular, Daniels et al. (2023) found that students failed to adequately describe their relevant experience (including poor or incomplete description of tasks and responsibilities), included limited or inadequate introductions with grammatical and spelling errors, and approximately one in four neglected to include any profile image/photograph (some of those profiles including an image/photograph did not use an appropriate or professional one). With that in mind, there has been an effort to introduce LinkedIn as a tool in marketing and business courses (Cooper & Naatus, 2014; McCorkle & McCorkle, 2012). This can be incorporated as an experiential learning opportunity with real-world implications (Slone & Gaffney, 2016). Although buy-in might be high for business students, this lesson can be particularly difficult to teach for incoming students with a rural or farming background, where technology and digital networking are not yet fully woven into the fabric of local agribusiness activity. There remains considerable work yet to be done to examine Generation Z's perception, preferences, and adoption of technology, but early work suggests that students studying in colleges of agriculture exhibit a distaste for digital technology and social media (Blackwell, 2020). Blackwell (2020) finds that though many agriculture students recognize the necessity of social media in professional development, the costs in terms of mental health and other issues are substantial. Regardless of students' perception of the dangers of digital media, the professional world has increasingly embraced social media as low-cost, high-value tools for marketing and recruitment. The growing prevalence of social media as a source of knowledge dispersion in agriculture (Morris & James, 2017), especially in light of the recent proliferation of artificial intelligence and increasing complex farming technologies, seems to indicate an expanding necessity for young agriculturists to engage in social media for their career success, in terms of both knowledge enhancement and career development.

Incorporating the creation of a LinkedIn profile into a professional development module in an early agribusiness course—either Introduction to Agricultural Business or Introduction to Agricultural Sales—prepares students early on for the importance of social media in the current business environment. This allows them to curate an adaptive outward-facing professional profile that can jump-start their career search and aid them in securing internships along the way. However, if student buy-in is low, this approach could backfire. Students may not put in the mandatory effort up front, or they could let their accounts languish in disuse. This is where “nudge theory,” a concept developed by Thaler and Sunstein (2008), comes into play. This directed approach, also dubbed “libertarian paternalism,” gives individuals the ability to make decisions for themselves (i.e., freedom of choice) while subtly promoting an option deemed to be in the subject's best interest, particularly when subjects empirically have demonstrated a limited likelihood of pursuing that better path. This theory has been applied to a wide variety of problems since it was first developed, from health care (Last et al., 2021; Nwafor et al., 2023) to finance (Cai, 2019; Gajewski et al.) to education (Damgaard & Nielsen, 2018), and Richard Thaler earned the 2017 Nobel Prize in Economic Sciences in large part due to the broad applicability of nudge theory. Although the ethics of nudge theory and its potential manipulation and subversion of individual liberties have been discussed and contested extensively (Schmidt & Engelen, 2020), applications continue unabated.

Incorporating nudge theory, this research proposes two tactics agribusiness programs can undertake simultaneously to maximize student buy-in to a career-enhancing social media project. First, require students to make professional connections that are both internal and external to the university system. Students are generally less reluctant to make connections with their peers and professors. Those are “safe” connections that will likely forgive grammatical and other minor errors, recognizing that early college students are not yet fully prepared for the workforce. As those connections can be pivotal down the road as students enter the workforce, the significance of internal connections should not be undervalued. However, students do not have any real skin in the game, so to speak, when they only connect to people already within their university sphere. External connections, on the other hand, are crucial for the present expansion of one’s professional network. Requiring students to find contacts external to the university system leaves them open to a more intensive scrutiny. This has multiple facets that will be useful to students: it gently nudges students toward creating a social media profile that will stand up to external validation; it expands students’ professional networks; it signals to potential employers outside the university/alumni sphere that the student is prepared for a career after completing their academic studies.

There are risks associated with an assignment that requires students to connect with professionals outside their safety zone extending beyond the general risks of “stranger danger.” If students fail to recognize the potential impact of a poor social media profile, they may advertise themselves as a poor job candidate or an unprofessional professional. However, failing this way early on in their undergraduate studies will allow time for their reputations to recover, and it should allow their professors to help them construct a better professional outreach effort with minimal long-run consequences. If students create such a profile after their studies conclude with no help from their instructors, the damage may be more substantial and harder to ameliorate.

Another risk inherent in this project involves its timing. Students who are at an early stage in their undergraduate studies may not have their long-run goals as firmly in mind. This may lead to a social media profile that becomes inaccurate or incomplete as time progresses and the students’ plans come into narrower focus. This could be addressed in several ways, but perhaps the most feasible way for the academic institution to help would be for the profile to be a continuous project that shows up in multiple places through the agribusiness curriculum. For example, any course with a prerequisite that requires this social media profile project would be a candidate to continue the project in a more advanced professional development unit or module. For example, if an upper-division Farm Management course included Introduction to Agribusiness as a prerequisite, then that upper-division course could require students to revise their profile. This would encourage students to maintain their profile between semesters, presumably nurturing a sense of relevance for students who might be skeptical about the usefulness of this type of online networking tool.

Many agribusiness programs include a pre-professional work experience, whether it comes in the form of a practicum or a traditional internship. This does not take the place of networking, but it can help expand the student’s professional connections. Use of an online networking platform can improve students’ likelihood of obtaining internship opportunities, and employers, in turn, can endorse students’ skills directly. It has the potential to create a virtuous cycle. For professional development opportunities, it is important to use a university’s resources—for example, a career planning and development office—to help students gain general knowledge about career planning and joining the workforce. However, by relying exclusively on a career office, faculty may underestimate the value of their own field-specific expertise. It is important that students have access to both.

On a general level, social media presence and savvy have become necessities for many careers. In the hiring process, businesses examine candidates’ social media behavior (Alexander et al., 2019). A student who is not appropriately represented will garner less attention late in the hiring process. For hiring managers, social media are evaluated for content quality, major criteria for elimination (e.g., drunken fraternity shenanigans captured on film), and minor criteria for elimination (e.g., poor grammar

or personal content that does not reflect positively on the job candidate and may have consequences for the business). Absence from social media can signal to hiring managers either non-transparency (if the candidate has a hidden account) or an inattention to the broader digital world—a severe misstep in an ever-increasingly connected world. Social media provide opportunities to showcase one’s professionalism, tact, attention to detail, and a curated public persona or personal brand that the candidate will likely continue in the workplace. For this technology-driven generation, a social media profile is likely to provide the invaluable first impression that previously had been created on a first in-person encounter.

2 Data and Experimental Design

Across five semesters in an Introduction to Agricultural Business course, students were required to create and activate a LinkedIn account.¹ Similar to the assignment outlined in Peterson and Dover (2014), a rubric was provided with guidelines and expectations for profile construction (see Table 1 for the rubric and the Appendix for sample guidelines). This rubric included requirements for a name and headline, a professional-looking photograph, a short biographical blurb, education and experience sections, skills, and interests. Additionally, the instructor provided verbal descriptions of each section during class time as well as examples (static image files) of high-quality LinkedIn profiles embedded in the assignment. This assignment included no milestones or benchmarks, but it is worth noting that students were required to create a separate resume at least one month prior to this LinkedIn profile assignment, so much of the required information would have been readily accessible for transfer into

Table 1: Rubric for Grading the LinkedIn Profile Assignment as Presented to Students

Criteria	Description	Points Possible
Profile Photo and Intro	Is this photograph professional and appropriate to the types of connections and positions the student might be targeting? Does the student list a title/position/etc. along with the photo? Will this work for networking purposes?	4
Short Bio	Is this short bio appropriate? Is spelling and grammar accurate? Is there an adequate mix of personal and professional information that may entice potential employers?	10
Experience	Does the student list experiences similarly to the resume? Does this properly introduce the student’s work/volunteering background?	4
Education	Does the student list educational experiences similarly to the resume? Does this properly introduce the student’s educational background?	4
Skills and Endorsements	Does the student list skills similarly to the resume? Does this properly introduce the student’s skills?	4
Interests	This is an excellent section to offer more information about yourself than the resume allows. Does the student list some interests (professional and/or personal)? Are they appropriate?	4
Connections Requirement	Are there the appropriate number/type of connections? [Points correspond with specific levels of compliance, provided explicitly for each treatment.]	10
Organization, Appropriateness, and Success as an Introduction	How well/clearly is the profile organized? Is this profile professional and appropriate to the situation? Based on this profile/introduction, would someone searching for this person prior to a meeting be likely to work with them?	10

¹ All procedures for this study were pre-approved by the university’s Institutional Review Board (IRB-2020-818-E05-4005).

the online platform. The resume and LinkedIn profile jointly satisfy a course learning objective involving career planning and active professional development.

In the first treatment, students were required to make connections, but the affiliations of those connections were not specified (i.e., students could earn credit for connections with anyone; classmates, family members, professors, or professionals outside the university). In the second treatment, students were required to obtain the same number of connections, but 40 percent had to be external (i.e., not family, not affiliated with the university, either past or present). Ensuing treatments varied the proportion of external connections among those required.

The objective of this experiment is to determine whether having “skin in the game” via external validation improves the quality of students’ efforts in developing a professional social media profile. The rubric outlined clear explanations for how students could earn points for the assignment, with detailed instructions to ensure objectivity in scoring.

To evaluate profile quality, a profile quality score (PQS) was developed, taking into account several key elements of the LinkedIn profile that were not directly graded in the assignment but that recruiters noted as important (*The 10 Components of a Great LinkedIn Profile*, 2017; Grant, 2018). These elements included word count and summary quality (freedom from errors), listed skills and interests evaluated on quality and appropriateness, depth of education and experience entries, and the quality and professionalism of the profile image and other visuals and/or design elements. Figure 1 provides a more detailed outline of elements included in PQS construction. Although an individual’s number of LinkedIn connections is beneficial in terms of building a professional network and improving the evaluation of recruiters, connections are excluded from the PQS because of their likely strong correlation with the treatment group.

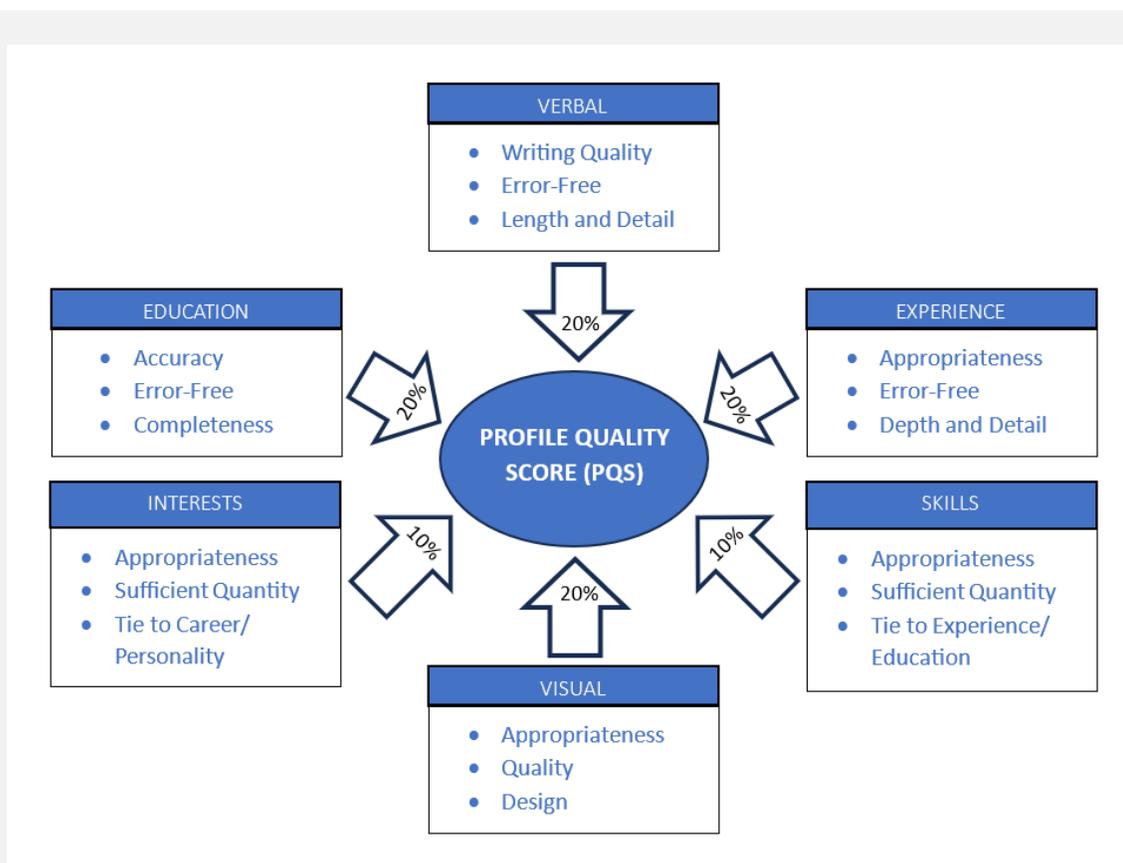


Figure 1: Schematic of Profile Quality Score (PQS) Construction

Table 2: Pooled Demographics Across All Five Semesters

Class	Variable	Percentage Represented
Sex	Self-Identify as Female	39.36%
	Self-Identify as Male	60.64%
Class Rank	Freshman	18.58%
	Sophomore	36.07%
	Junior	25.68%
Race	Senior	19.67%
	Self-Identify as White	95.74%
	Accounting	0.53%
	Agricultural Business	85.11%
Major	Agriculture (General)	11.17%
	History	0.53%
	Interdisciplinary Studies	1.60%
	Natural Resources Management	0.53%
	Veterinary Science and Technology	0.53%

There were 188 observations across five semesters. Demographics are presented in **Error! Reference source not found.** Approximately 18.6 percent were first-year students, 36.1 percent were second-year students, 25.7 percent were third-year students, and 19.7 percent were in their last year of undergraduate studies. More than half of the students self-identified as male (60.6 percent), which was appropriately representative of the Agricultural Business major at the time. The course was taught at the same time every semester by the same instructor. Treatments are shown in **Error! Reference source not found.**, and average PQS and participation rates are presented in **Error! Reference source not found.** To accurately assess the difference in PQSs for completed profiles, observations for students who did not submit the assignment were dropped (leaving 176). This is noteworthy in that the more rigidly structured treatments may have influenced completion rates; however, differences in participation between the second and third treatments seem similar.

Table 3: Treatments and Specifics for Each Semester in the Experiment

Semester	Requirement
Spring 2020	No connections required
Fall 2020	3 connections required (1 external)
Spring 2021	3 connections required (1 external)
Fall 2021	5 connections required (2 external)
Spring 2022	5 connections required (3 external)

3 Model and Results

To assess the impact of various treatments on the quality of student LinkedIn profiles, the following model was estimated using a basic ordinary least squares (OLS) regression:

$$PQS = \beta_0 + \sum_{i=1}^3 \beta_i D_i + \dots + \epsilon$$

where D_i indexes the three treatment groups for varying connection requirements. Demographic information and other controls were also included to check the robustness of the regression results.

Table 4: Profile Quality Scores (PQSs) and Participation by Semester

Semester	Verbal	Experience	Education	Visual	Skills	Interests	PQS (%)	Class Pop.	Skip Rate
Spring 2020	50.583%	40.000%	56.667%	35.8333%	46.700%	30	46.700%	30	3.333%
Fall 2020	55.690%	72.198%	83.405%	61.638%	70.125%	58	70.125%	58	5.172%
Spring 2021	56.319%	74.479%	81.076%	70.833%	72.288%	36	72.288%	36	11.111%
Fall 2021	54.038%	72.436%	80.128%	70.513%	71.064%	39	71.064%	39	5.128%
Spring 2022	51.600%	45.500%	76.000%	53.000%	59.120%	25	59.120%	25	12.000%

Regressing PQS on connection requirements and course grades, there is a strong and statistically significant positive effect of requiring external connections (see **Error! Reference source not found.**). Course grades were reconstructed to exclude the LinkedIn Profile Assignment, but as expected, students with higher course grades (in percentage terms) tended to do better constructing their profiles. The first treatment implementing an initial mandatory number of external connections (33.3 percent) yielded a sizeable positive impact on LinkedIn profile quality. A slightly larger improvement occurred when the requirement was increased to 40 percent external connections. Those gains flagged when the more stringent 60 percent requirement was mandated, indicating a potential upper bound for the effectiveness of the proposed grading nudges.

Including additional regressors—semester hours, age, sex, and undergraduate classification (freshman, sophomore, and junior)—improved the explanatory power of the model without substantively altering the interpretation of the initial variables. Students identifying as female tended to fare better on profile qualities scores, and the treatment indicators remained statistically significant. Controlling for these additional regressors increased the magnitude of all three connection treatments. Neither age nor the number of hours each student enrolled in for the semester significantly impacted their PQS. Likewise, none of the classifications (freshman, sophomore, and junior) had a statistically significant impact on PQS, and in another robustness check, there was no significant impact of semester dummy variables (since some treatments were repeated in multiple semesters). Some majors had significantly lower PQSs relative to the control group of General Agriculture. Most heavily represented in

Table 5: Results from Regression on Benchmarking by Percentage of External Connections

Variable	Model 1		Model 2		Model 3	
Constant	-1.131	(3.255)	-8.172	(4.976)	-4.791	(4.269)
33% external connections	4.535***	(1.253)	4.958***	(1.185)	5.291***	(1.117)
40% external connections	4.891***	(1.305)	5.696***	(1.308)	6.403***	(1.280)
60% external connections	3.094**	(1.408)	3.663***	(1.342)	3.432**	(1.314)
Course grade	0.143***	(0.038)	0.123***	(0.035)	0.133***	(0.033)
Semester hours			0.225	(0.159)	0.184	(0.155)
Age			0.206	(0.135)	0.175*	(0.957)
Female			1.615**	(0.646)	1.433**	(0.649)
Sophomore			-0.499	(0.790)	-0.364	(0.793)
Junior			-1.231	(0.906)	-1.124	(0.869)
Senior			0.937	(1.121)	0.532	(1.142)
Agriculture Business Major					-3.577***	(1.011)
Major Dummies Included	No		No		Yes	
Observations	176		176		176	
R-squared	0.2787		0.3473		0.4193	

Notes: Statistical significance is reported at the 90% (*), the 95% (**), and the 99% (***) levels.

the sample were Agricultural Business majors, who demonstrated significantly and substantially lower PQSs. It is noteworthy that the marginal impact of the two initial treatments were larger in magnitude, respectively, than the major effect for Agribusiness students, indicating a net improvement, whereas the most stringent treatment was closer to a net zero effect, accounting for only treatment and major.

Breusch-Pagan and White's tests indicate the presence of heteroskedasticity, so the standard White correction was applied and robust standard errors reported for both models in **Error! Reference source not found.** The low R-squared for the initial model indicates that the treatments and course grade account for only a little over one-fourth of the variability in the PQS. This indicates that there are additional factors influencing PQS that were not captured in our data. The additional variables included in the subsequent regression presented in **Error! Reference source not found.** do not strongly increase the explanatory power of the model. Even given the limited data at hand, the nudge does play a significant role, regardless of the level.

The regression results are interesting, but they do not capture the entire picture. With few exceptions, students who spent more time on the About section of the LinkedIn profile—in terms of writing quality rather than word count—tended to fare better on all other sections of the assignment. Perhaps once students made the decision to invest in the clarity of their profiles' verbal component, they bought into the entire assignment. In that respect, the About section could have served as a proxy for overall PQS. Many students were unclear on how to indicate their interests in a professional space. Many students selected unrelated or inappropriate interests to the detriment of their overall PQS. Hiring managers are most interested in education, experience, and relevant skills (preferably endorsed), but with more competitive positions, those missteps in the details could have a negative impact for marginal job candidates. Also notable in the data was the weak relationship between the number of connections and PQSs. Although the mandate affected profile qualities, the direct effect of total connections on PQS was less pronounced. Not all students met the connection requirements of the assignment, and some had far more connections than necessary. As the goal was to improve students' self-promotion efforts, the mandate served its purpose regardless of whether students satisfied that requirement.

One potential limitation of this research involves the timeline of its implementation. COVID-19 peaked in the first semester, right after the assignment deadline. While this was unlikely to affect student effort in that semester, students quickly became more aware of the importance of social media and technology in career planning and education in the following semesters as classes migrated online for a year. That could account for some of the improvements in PQSs. However, a semester-specific dummy indicated no clear statistically significant effects. Neither class size nor mode of delivery (virtual classroom vs. in-person) had any significant effect.

4 Concluding Remarks

As in many disciplines, the careful development and management of a professional online presence has become a crucial networking must for agricultural business and economics students to access internship opportunities and gainful employment upon graduation. Nudging students to network through social media—especially early in their university studies—leads them to more deliberately develop their online professional persona, likely improving their long-run career potential. By adding more stringent requirements for external profile validation, professors can actively push students to more fully engage and improve their outward-facing efforts. Revisiting these profiles sequentially across the curriculum can give credence to their significance. Continuously updated professional profiles can create a virtuous cycle of improving network reach and career development opportunities, hence bolstering the efficacy of the process and further embedding it in the students' minds as an important tool for career improvement in agricultural business.

Although this research presents some clear, intuitive results, there are some limitations. In particular, a not insubstantial number of rural agricultural business students have confirmed or tacitly

agreed upon employment opportunities prior to entry in the university (e.g., returning to run the family farm). For those students, networking may not seem as crucial for career success. Likewise, grades cannot be used as a motivator when completion is the goal as opposed to GPA. It is reasonable to expect that this nudge would be more successful for grade-motivated students without prior arrangements for employment.

The next objective for this project includes tracking student profiles and employment opportunities over time to assess the long-term effectiveness of pushing students to seek external validation of their professional profiles. Less than 5 percent of students reported having LinkedIn profiles prior to this assignment. At the time of this writing, nearly all former students' LinkedIn profiles are still active, in varying degrees of use. Comparing prior to current PQSs, it is possible to assess how well this project succeeded in convincing students how valuable an updated online professional networking profile is to career development.

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Appendix

Guidelines for “Profile Assignment”

Positive self-promotion is one key to getting a job or making a sale. In this media-saturated world, where the network of who you know can extend far beyond your physical location, social media is becoming unavoidably entangled in the self-promotion process.

For this assignment, students are expected to create a social media profile in [LinkedIn](#). At the very least, this should include a photo, a short bio (essentially an introduction), and anything else you feel is important to include in a professional introduction. For example, take your resume and include all your education, experience, and skills and incorporate them in your LinkedIn account profile.

If you already have a LinkedIn account, feel free to use that for this assignment but make sure you update it appropriately. The goal is to create a professional introduction that will serve as a client or potential employer’s first impression of you, your goals/values, and your personality.

[Spring 2022 Version:] In addition to building a professional social media profile, students will need to “Connect” with at least five other people. Two can be students in the class or UTM friends, faculty, or alumni, but at least three must be professionals who are not in any way affiliated with UTM (and not family). In other words, you’re going to have some skin in the game. Even if you have an existing LinkedIn account, you will need to make *at least five new connections* for this assignment. To receive a grade for the “Connections” portion of the assignment, you will also need to “Connect” with me. Since this is necessary for grading, your connection with me will **not** count as one of your five.

This assignment will be graded based on completeness, professionalism, and accuracy (grammar, spelling, etc.). The purpose of this assignment is for students to begin preparing to join the labor force. Maintaining a professional online presence is becoming an important element in the business world. It influences companies’ purchasing choices, managers’ hiring decisions, and many other aspects of your career. This assignment should give students a head start on building a profession online presence. And as I mentioned above, you can certainly use your actual online presence for this assignment. It is also a good way to introduce yourself to the instructor and your fellow classmates.

You will need to keep your LinkedIn account active at least until the assignment is graded, though I encourage you to keep it at least until the end of the semester. You may choose to attach your new resume that you created/revised earlier this semester to your LinkedIn account to provide potential employers with additional information.

If you have questions or concerns about this assignment, do not hesitate to contact me. For reference, here is a [link] to my own LinkedIn account. This should make it easier to “Connect” with me. For more information, see the LinkedIn lecture slides, and some additional hints can be found online (for example, at <https://www.linkedin.com/business/sales/blog/profile-best-practices/17-steps-to-a-better-linkedin-profile-in-2017>).

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Teaching and Educational Methods

Responsible Conduct of Research for Graduate Students: What Should They Know?

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Abstract

This paper provides exploratory evidence on research misconduct in social sciences with an emphasis on applied economics. We review peer-reviewed published work to discuss how these trends of research misconduct compromise the trust, honesty, reliability, and credibility of scientific work. In addition, we offer suggestions to incorporate content on the responsible conduct of research in graduate education in social sciences. This paper should be of interest to graduate programs and academics interested in graduate education in applied economics, and likely benefit graduate students in social sciences as they build their research profiles and establish a reputation in the field.

Introduction

"If I have seen further, it is by standing on the shoulders of giants." –Sir Isaac Newton, 1675

This statement aptly applies to graduate students in social sciences who are passionate about building research programs and establishing a reputation in professions based on trust and integrity. Graduate education is a time of creativity and opportunities, as well as growth of professional values and integrity. Graduate students are faced with both the privilege to undertake research and develop an intellectual and moral responsibility for their research conduct (i.e., research ethics).

Even though yet to be integrated into curricula, borrowing from biomedical sciences, most agricultural and applied economics graduate programs in the U.S. universities require university-wide responsible conduct of research (RCR) training as a prerequisite part of graduate education. This is meant to impart baseline knowledge about the core concepts, standards, and procedures for responsible conduct of research (Heitman et al. 2007). Many universities offer services about responsible conduct of research to graduate students across all disciplines and are intended "to promote safe, responsible, and productive research practices." One such example is Texas Tech University's (TTU) responsible conduct of research resources offered through the TTU's Office of Research and Innovation.¹ These resources include (i) RCR Training, (ii) TTU National Science Foundation (NSF) Ethics Plan, and (iii) iThenticate services meant to aid research conduct for the TTU community. However, how much of this information is internalized by graduate students is unknown. Uncorroborated evidence would suggest that most graduate students pay little attention to these "required" training modules.

Research misconduct creates a credibility problem that can affect a graduate student's career. There are a few courses primarily devoted to research ethics education. This is despite a plea decades ago for the profession to devise ways of teaching graduate students the importance of maintaining the highest levels of honesty and integrity (Litzenberg, Gorman, and Schneider 1983), which has been re-affirmed more recently (Gillespie and Bampasidou 2018).

The public accepts or rejects research based on reliability and trust of scientific results that impact public health, the environment, the economy, and society in general (Anderson 2016). To many graduate

¹ <https://www.depts.ttu.edu/research/integrity/RCR/index.php>.

students, the research writing and publication process is a mystery (Shepherd and Arrow 1995). In a curious graduate student's mind, innocent blunders are a possibility.² The primacy of publications as a key transmitter of scientific knowledge and a signal in promotional decisions in the applied economics profession puts research ethics at a premium.³ However, for many graduate students, research misconduct and publication blunders can prove to be disastrous for their future careers. Given the increasing importance of scientific research in academia and society, this paper seeks to discuss some developments in research conduct that threaten the credibility of work conducted in agricultural and applied economics. Specifically, the study follows how research misconduct raises ethical issues in the design, collection, management, and analysis of data, as well as the transformation of ideas into publications in the field by extending the analysis in Josephson and Michler (2018). Josephson and Michler (2018) discuss ethical issues in agricultural and applied economics and suggest possible ways in which the profession can address these issues. The main objective of this commentary is to clarify what is research misconduct and how graduate students can avoid it with resources available on campus and in the public domain as they build their research profiles. This is the gap that the current study seeks to address.

The rest of the paper is organized as follows. Section 2 presents an (unproven) theory of research misconduct. Section 3 describes the responsible conduct of research in the United States. In Section 4, research misconduct is defined, and Section 5 describes training resources available on campus and in the public domain for graduate students. Sections 6 and 7 give recommendations and conclude the paper.

2 An (Unproven) Explanation of Research Misconduct

It is hard to precisely explain the reasons behind the emergence and persistent rise in counts of misconduct. An (unproven) explanation to potentially account for these trends builds on the theory that research misconduct generally comes from scholars who place a disproportionate weight on status and gains.⁴ It usually happens when one values the result more than the research process, the prize money more than the game. When this happens, one is tempted to look the other way when facing ethical dilemmas, thus leading to misconduct in one's work.

This unfortunate reality usually follows the culture and practice presently dominant in the academic profession. Academicians are evaluated based on their research, appearing in top journals, for jobs, promotion, and tenure (Griffiths and Winters 2005; Heckman and Moktan 2020). It is how high and big you score that carries significant weight in an academic economist's career prospects. At present, one is not directly evaluated on academic integrity, though this is debatable as other scholars are of the view that not having this evaluation criterion can have significant consequences if caught.⁵ Academics are traditionally evaluated on research, teaching, and service with the quantity and quality of research carrying significant weight in job offers and promotion decisions. The field of agricultural and applied economics has not yet established a market and price for one's efforts to diligently catch flaws in one's work (Dorfman et al. 2024).⁶

3 Responsible Conduct of Research in the United States

Research writing and publication are an integral part of the U.S. academic system. At best, the system identifies the best ideas, improves them, and spreads them, and at worst, it suppresses original, new, and creative thoughts by maintaining erring orthodoxy (Shepherd and Arrow 1995). In either case, the system

² This forms the sour education in the school of hard knocks (Hamermesh 1992).

³ In this paper, the words agricultural and applied economics and applied economics are used interchangeably.

⁴ This intuition is attributed to a tweet by Ariel Ortiz-Bobea dated June 18, 2023, which can be accessed at the following link <https://x.com/arielortizbobea/status/1670436298979708928?s=46>.

⁵ However, there are limits to this view. At many land-grant institutions, and others, teaching and Extension are very important components of promotion and tenure evaluations. There may at times be a greater weight on research, depending on the institution. We thank an anonymous reviewer for these points.

⁶ This is the general case in other fields.

generates a marketplace for ideas. With or without market failures existing, it shapes the path of economic thought and eventually determines careers for economists. In the United States, there are generally accepted norms that shape research conduct. Many universities offering graduate training in the United States have a designated office that specifically handles issues related to RCR.⁷ Some of the respect for U.S. scientific research across all fields can be credited to the norms and views of this process (Shepherd and Arrow 1995). This is to be expected given how seriously the United States regards research efforts as signaled by a significant number of resources allocated toward research and development (R&D). For example, in 2008, total private and public expenditure on R&D constituted at least 2.5 percent of the gross domestic product (GDP) in the United States (Shamoo and Resnik 2009) with economic activity directly linked to scientific research estimated at 6 percent of U.S. GDP (Resnik 2007).

In 1974, the U.S. Congress established the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. This followed findings about the Tuskegee Syphilis Study that details a U.S. Public Health Service survey in which unethical research practices were conducted in a long-term study of untreated syphilis using a sample of approximately 400 African-American black men (Josephson and Michler 2018). Misconduct manifested in that the researchers intentionally withheld effective treatment from these men consequently leading to the death of some of them.

Following the Tuskegee Syphilis Study, the Belmont Report was issued in 1979 by the commission to try and define key principles to guide the ethical conduct of research in the United States. The key objective of the report was to address the mistreatment of human subjects in the research process. The report lays out guidelines and ethical principles, including (i) respect, (ii) beneficence, and (iii) respect for persons (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research 1979; Josephson and Michler 2018).

Although social sciences were not the focus of the Belmont Report, our profession (economics in general and agricultural and applied economics in particular) has adopted several of the report's guidelines as evidenced by the growing presence of Institutional Review Boards (IRBs) and Research Ethics Boards (REBs) at universities in a bid to foster application and upholding of ethical principles outlined in the Belmont Report.⁸ It is common in the United States and Western universities to require researchers to obtain prior approval for studying human subjects and instrument design before fieldwork is carried out. Informal guidelines and specific requirements [commonly for Department of Health and Human Services (HHS) and IRB applications] exist to aid economists in designing research projects to meet stipulated standards by review boards (Barrett, Cason, and Lentz 2020).

Klitzman (2015) examines variations between IRBs and argues that IRBs differ in colors and flavors, and vary from nit-picky to user-friendly. As such, this variation is expected across fields and disciplines, impacting and reflecting differences in values regarding research ethics.

4 Research Misconduct Defined

What is research misconduct? Before we attempt to answer this question, we first define the constituent parts of this question—"research" and "misconduct." The *Webster's Collegiate Dictionary* (1977, p. 1,758) gives a general definition of research as the "studious inquiry or examinations, especially investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws in the light of such new or revised theories or laws."⁹

⁷ Offices of responsible research collaborate with the academic community in a bid to promote safe, responsible, and productive research practices and promote dialogue about the ethical concerns arising naturally from endeavors to do creative science.

⁸ This is also required by many funding agencies, especially for federal grants if conducting human subjects research to even get funds. There are specific guidelines laid out by the Department of HHS and referenced by NIH that one may check (<https://www.hhs.gov/ohrp/index.html>). In addition, one can also look at FERPA requirements.

⁹ Building on this definition, other scholars such as Andrew and Hildebrand (1982) and Ghebremedhin and Tweeten (1988) define research on terms of a scientific inquiry into what is not known.

In the early 2000s, the United States adopted and effected a generic definition of research misconduct for federally funded research projects as fabrication, falsification, or plagiarism, denoted as FFP (Resnik et al. 2015). The *Compact Edition of the Oxford English Dictionary* defines plagiarism as “the action or practice of plagiarizing; the wrongful appropriation or purloining, and publication as one’s own, of the ideas, or the expression of ideas (literary, artistic, musical, mechanical, etc.) of another” (Murray 1971, p. 2,192). Artificial Intelligence (AI) has become instrumental in aiding and detecting plagiarism (Francke and Bennett 2019).

Using categories outlined in the Belmont Report (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research 1979), we define research misconduct as including but not limited to the fabrication or falsification of data and all forms of plagiarism committed intentionally or unintentionally. A key condition for misconduct to be established is that the allegation must be proven by sufficient and strong evidence. Building on previous efforts from biomedical research, we review studies examining deceit, dishonesty, and research misconduct in the collection, management, and analysis of data and communication of results (through publication).

4.1 Research Misconduct in Social Sciences

There is growing evidence in the social sciences as indicated by the increase in the frequency of retracted papers in psychology, business and management, and economics. In psychology alone, of the estimated 250 retracted papers, 12 percent of them report incorrect *p* values to validate researchers’ preconceived notions (Craig et al. 2020).

Table 1 shows some evidence of paper retraction reasons reported by Cox, Craig, and Tourish (2018); Tourish and Craig (2018); and Craig et al. (2020).

Craig et al. (2020) examined 160 retracted articles to show some evidence of research misconduct in psychology compared to economics and business and management. Many retracted papers in psychology are due to data fabrication (48 percent) compared to 0 percent in economics and 33 percent in business and management. A sizeable number of retractions in economics result from fake peer reviews.

The rate of retractions as a percentage of total retractions owing to all forms of plagiarism is significantly lower in psychology (13 percent), compared to economics (22 percent), and business and management (25 percent). This is consistent with findings by Horbach and Halfman (2019). Although fake peer review is common in economics, psychology, and business and management, other reasons cited for paper retractions include (i) publishing without consent from all named authors; (ii) making substantial changes to a paper after its acceptance; (iii) violating ethical, privacy, or intellectual property

Table 1. Reasons for Paper Retractions in Economics, Business and Management, and Psychology, 1998 to 2017.

Reason	Economics		Business & Management		Psychology	
	No.	%	No.	%	No.	%
Data manipulation	0	0	51	33	77	48
Self-plagiarism	6	11	23	15	8	5
Plagiarism	6	11	16	10	12	8
Statistical errors	2	4	18	12	36	22
Fake peer review	12	22	0	0	0	0
Other ¹⁰	0	0	33	22	19	12
No reason	28	52	12	8	8	5

Notes: The table is adopted and modified from Cox et al. (2018), Tourish and Craig (2018), and Craig et al. (2020). The percentage points in Table 1 represent percentage of total retractions and not percentage of published articles.

¹⁰ Other refers to uncategorized reasons for retraction.

protocols; and (iv) making administrative errors. In an attempt to discuss ethical issues facing the profession and some possible ways of addressing them, Josephson and Michler (2018, p. 5) argue that while “MSc and Ph.D. econometrics courses may include a conversation about data manipulation, most graduate students and present-day professionals do not receive formal training in ethical treatment or cleaning of data sets. This contrasts to the hard sciences, where research ethics courses are frequently a prerequisite to lab or field work.”

5 Responsible Conduct of Research Training for Graduate Students

Training of technical skills for graduate students in social sciences is fairly rigorous. It is generally believed however that the skills required to perform research are neither well taught nor rewarded by institutions. Deeper training on research integrity in scholarly work is a skill in short supply.¹¹ This is even lacking more among graduate researchers.¹²

Training graduate students on matters concerning responsible conduct of research is key in helping them conduct effective research. Graduate schools exist to impart advanced technical skills to students to become effective at conducting relevant and original independent scientific work (Hartnett and Katz 1977).¹³ To accomplish this goal, graduate students need to include in their toolkit both technical skills and sound ethical research awareness.¹⁴

An online review of 10 top schools in agricultural economics in the United States suggests that graduate training in responsible conduct of research is not a common practice.¹⁵ None of the surveyed schools prescribe a formal course in responsible conduct of research in their graduate programs in agricultural economics. This does not suggest that topics relevant to responsible research conduct are not addressed in other courses. It is conceivable that a course in research methodology includes topics of responsible research conduct. Six of the top 10 schools surveyed appear to offer at least one graduate-level class (with varying credit hours) in research methodology. Table 2 summarizes our survey results related to course offerings research methodology at these schools.

Table 2. Survey Results of Course Offerings in Research Methodology in Top 10 Schools in Agricultural Economics in the United States.

University	Course in Research Methodology
Cornell University	None
Texas A&M University	Yes, AGECE 607 – Research Methodology, 3 credits
Univ. of Illinois	Yes, ACE 561 – Adv Res and Scholarly Comm, Seminar
Purdue University	None
University of Georgia	Yes, AAEC 8300 – Agricultural Economics Research, 2 credits
University of Florida	None
University of Wisconsin	Yes, AAE 721 – Professional Communication of Applied Economic Analysis, 1 hour; AAE 780 – Research Colloquium, 3 credits
University of Nebraska	Yes, AECN 821 – Orientation to Research, 1 credit
Ohio State University	None
North Dakota State University	Yes, AGECE 701 – Research Philosophy, 1 credit

¹¹ This point came about in an informal discussion with Jerry Parwada in 2019.

¹² Many programs cover academic dishonesty and plagiarism. In addition, students get exposed to human subjects research training if conducting it, as it is mandatory. What may often be less publicized is the impacts of violating research ethics.

¹³ Ruttan and Weisblat (1965) complain that “American graduate training in agricultural economics tends to be technique-rather than problem-oriented.”

¹⁴ The Department of Agricultural and Applied Economics at Texas Tech University has a special training for its graduate students. In addition to rigorous technical training, the department offers special training in research methodology in economics. This complements the research ethics training offered by the university.

¹⁵ <https://www.collegefactual.com/majors/agriculture-ag-operations/agricultural-economics-business/agricultural-economics/rankings/top-ranked/>.

Building on this present practice, there is an opportunity to design and teach a course or module specifically on RCR to graduate students in social sciences purposefully and intentionally. Resnik and Dinse (2012) explore the degree to which United States-based research institutions meet or even exceed mandates stipulated by the National Institutes of Health (NIH) and National Science Foundation (NSF) in terms of guidance and instruction in responsible conduct of research. Responses received from 144 institutions, representing 72 percent of the sample, indicate that they have a formal responsible conduct of research program aimed at promoting research integrity while 47.9 percent of the institutions report that only federally mandated persons take RCR training. There is a possibility to increase the fusing of ethics in graduate-level curriculums in social sciences to foster integrity in RCR.

Most business school disciplines, compared to applied economics, advocate for the introduction of ethics into graduate program curricula. To explore this, Nicholls et al. (2013) review the infusion of ethics, corporate social responsibility (CSR), and sustainability in teaching approaches and evaluation by business schools accredited by the Association to Advance Collegiate Schools of Business International (AACSB or AACSB International). This paper is the first to take a marketing view of ethics. In the marketing of undergraduate and graduate programs, the deans and heads of departments are observed to react to signals sent to them from their accrediting bodies. The authors uncover a very important snapshot of the status quo of ethics integration, CSR, and sustainability in marketing curricula at the undergraduate and graduate level.

One may ask, why should social sciences graduate programs offer training on responsible conduct of research and ethics as a part of the curriculum? Education on ethics of research can increase graduate students' awareness of their intellectual responsibility. An integral part of the responsible conduct of research is disseminating research findings—writing, publishing, and professionally presenting research. Bellemare (2020) argues that although many graduate students and research economists, by instinct, know how to do so, many of them hardly think about how to write good research papers. Even the most seasoned and successful struggle to come up with a clear answer to this question.

Thomson's (2001) book is an invaluable reference source for graduate students preparing their dissertations and initial papers for submission to professional journals. It is also a guide for one to prepare to give their first professional talk at academic conferences or take their first refereeing assignment professionally and ethically. The central theme of the book is an attempt to make both the writing and oral presentations inviting and efficient by giving general principles to help guide graduate students. Earlier on, Ethridge (2004) provides a reference guide to instruct graduate students on the research and writing process by integrating philosophy, concepts, and procedures in research methodology. By doing this, the author sheds light on the organization and conducting of research, which can help graduate students increase the efficiency of the research process and its outcomes. However, less is talked about in this book as far as RCR is concerned. The author focuses heavily on research methodology and not on RCR.

McCloskey (2019) offers 35 tips to write clearly and persuasively, and maintains that "writing better will pay." Writing is likened to mathematics. Mathematics is a language, an instrument of communication. In the twelfth chapter of the book, the author challenges graduate students and early career researchers to imitate the best by being students of the masters and making the wisdom of the wise theirs. To the consolation of graduate students, the author argues that reading and writing are learnable crafts and not inherited genius. Bellemare (2020) recommends a structure along with unspoken rules and norms that guide the writing of applied economics papers. The author demystifies the paper writing process, and the paper is a relevant guide for graduate students. Bellemare (2022) presents unwritten rules of the economics profession by faithfully discussing what economists should have learned in graduate school but did not.

6 Recommendations

We have discussed what research misconduct is and is not in social sciences in general (and agricultural economics in particular) and identified resources available to graduate students both on campus and in the public domain. We recommend more training on the ethics of research conduct to graduate students, specifically as an integral part of an organized class or topic. Integrity in the research and publication process is an important part of the academic system. Graduate programs can commit to upholding norms that shape research conduct by offering a Responsible Conduct of Research course or significant module to graduate students. RCR is currently being offered in some optional form in some of the graduate programs and in agricultural economics graduate programs. The intention is there and is good, but purposeful implementation is still missing. Graduate students need to understand what research misconduct is and is not. There is a need to purposefully and intentionally bring the topic to graduate students.

The proposed course or module should be required of all graduate students and be offered each academic term, as well as reviewed regularly. It would introduce best practices to graduate students to deepen their knowledge of responsible conduct and ethics. As argued by Oscar S. Sarasty, Elisha K. Denkyirah, and Mohammad Rezoanul Hoque, it is good to have an RCR course for graduate students to help them to be transparent with data and properly give credit where it is due in this age of AI and paraphrasing.¹⁶ The objectives of the course could be to cultivate and foster a culture of honesty and integrity among graduate students in social sciences.

In Appendix A, we propose a possible course structure and outline for a course or a module on RCR for graduate students. This course or module should introduce graduate students to the best practices and deepen their understanding of responsible conduct of research and ethics education in applied economics research. The general objective of the course is to cultivate and foster a culture of honesty and integrity among graduate students in social sciences.

7 Conclusion

We review literature and define responsible conduct of research. Because research misconduct is present in biomedical research, economics in general, social sciences, and agricultural and applied economics, there is an urgent need to purposefully train graduate students on RCR and the ethics of conducting research. We focus on both theoretical and empirical work to answer the questions “What is research misconduct?” and “How can graduate students in social sciences avoid this?”

We present resources available to graduate students on campus and in the public domain to guide responsible conduct of research. These include resources on responsible conduct of research training, ethics education, and plagiarism in the form of RCR training and orientations, NSF Ethics Plan, iThenticate service, and RCR online courses. These resources are available on campus through research offices and graduate schools and in the public domain through abstract and cross-reference databases.

By taking advantage of the resources presented in this paper, graduate students can see further and circumvent some of the avoidable pitfalls. As Randy Skeete would put it, “*Self-honesty is man’s Gethsemane.*”¹⁷ The moral, ethical, and professional consequences of research misconduct are far and wide, with few social sciences teaching the principles of research conduct in their curriculum.

In academic disciplines, the integrity and reputation of researchers are important because of the perception it creates. The public accepts or rejects research based on reliability and trust of scientific results that impact public health, the environment, the economy, and society in general (Anderson 2016). Despite the increased proliferation of RCR training programs, it is not yet clear how RCR programs have impacted the trust and integrity of both researchers and the scientific work they do as perceived by the

¹⁶ This was communicated verbally in an in-person seminar.

¹⁷ [Randy Skeete on X: “Self-honesty is man’s Gethsemane!”/X](#)

public. We leave this for future research. Another equally important dimension of this topic is the ethical costs of research misconduct in the non-academic research environment and the role of graduate education. We leave this for future deliberation as well.

What is the implication of our study? We recommend that graduate programs in social science introduce more training on the ethics of research conduct, in conjunction with training on research methodology. One way of achieving that is to offer a graduate course on responsible conduct of research with possible content suggested in this paper. This program needs to be introduced in the first year of graduate education before undertaking research work with continuing education through the graduate student's academic career.

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Appendix A: Proposed Course Structure and Outline

Course: "Course Title"

Course Description:

This course introduces graduate students to best practices in conducting research and deepens their understanding of responsible conduct of research and ethics education in applied economics research. The primary objective of this course is to introduce research methodology and clarify what research misconduct is and is not and how graduate students can avoid it.

Responsible Conduct of Research Statement

Responsible conduct of research is taking responsibility and being honest in one's research work and ensuring ethical behavior in data collection, management, and analysis. Responsible conduct in research is a personal choice reflecting on personal values to do what is right and intellectually honest. Integrity, honesty, and responsible conduct are integral to establishing credibility in agricultural economics research.

Course Objectives:

The general objective of the course is to cultivate and foster a culture of honesty and integrity among graduate students in social sciences. The specific objectives of the course are:

- Educate graduate students about the acceptable systematic approach to obtaining new and reliable knowledge.
- Suggest a decision framework that guides graduate students to be diligent about all the aspects of research misconduct and how to manage them.
- Develop a culture in which a graduate student is constantly making salient efforts to catch flaws in one's research work diligently.

Course Outline:

1. Knowledge
 - a. Positivistic vs. normativistic knowledge.
 - b. Private vs. public knowledge.
 - c. Ways to obtain knowledge.
 - d. Reliability of public knowledge.
 - e. The role of research in the discovery of reliable knowledge.
2. The Process of Research
 - a. Research defined and described.
 - b. Classifications of research.
 - c. Creativity in the research process.
 - d. Planning the research.
3. Responsible Conduct of Research
 - a. Examples of research misconduct in applied economics.
 - b. Maintaining accountability and upholding high ethical standards.
 - c. Collaborative research.
 - d. Research integrity and responsible authorship.
 - e. The ethics of writing and publishing in professional journals.
 - f. The ethics of giving professional talks.
 - g. Authorship, peer-reviewing, and plagiarism.

- h. Ethical issues in survey design, data collection, management, and analysis in applied economics research.
- i. Data stewardship.
- 4. Other Protocols Related to Responsible Conduct of Research
 - a. Export controls.
 - b. International research.
 - c. Foreign influence.
 - d. Human and animal research regulations.
 - e. Intellectual property considerations in research.
 - f. Graduate Advisor–Advisee relationship.
 - g. Conflicts of interest.

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Teaching and Educational Method

Analyzing and Visualization of Data: A Team Project in an Undergraduate Course Evaluating Food Insecurity in U.S. Households

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JEL Codes: A22, C8, I30

Keywords: Food insecurity, data analytics, infographic, data visualization

Abstract

This paper presents a case study that integrates data analysis and visualization in a team project introduced in an undergraduate course focusing on food, nutrition, and health. The project is guided by a Ten Steps framework proposed by the instructor, involving the establishment and self-evaluation of student learning goals, identification of research questions, selection of data sources and analytic tools, task allocation among students, data analysis, data visualization, and finalizing the overall project. Throughout this project, students gain valuable insights into (1) the prevalence and inequality of food insecurity in the United States; (2) practical skills in conducting data analysis; (3) effective visualization of research findings for impactful presentations; (4) cultivating advanced critical thinking and decision-making skills; (5) improving skills on teamwork, presentation, and communication, ultimately enhancing employability; and (6) gaining active and personalized learning experiences. The Ten Steps framework can be easily applied to team projects centered on data analysis and data visualization in undergraduate courses. The case study can be adapted for undergraduate courses in food security, food and nutrition, and agricultural economics.

1 Introduction

Economists are known for their adeptness in data analysis, yet effectively conveying findings to a broader audience, especially non-economists, may not be as well-established (VanderMolen and Spivey 2017). Agricultural economists have a historical track record of conducting research that balances theoretical and empirical analyses (Fox 1986), with agricultural extension research regularly communicated to benefit farmers and industry groups (Leeuwis 2013). However, challenges persist in the “big data” era, particularly in equipping our students with skills in both data analysis and the art of delivering impactful data visualization to enhance discussions and dissemination of research findings.

In the current “big data” era, companies increasingly seek proficiency in both data analysis and effective communication of findings (VanderMolen and Spivey 2017). This case study, set in a classroom project environment, is designed to provide undergraduate students a hands-on opportunity to gain practical experience in both data analytics and data visualization. Recognized as essential components of economic education (Allgood and Bayer 2016; VanderMolen and Spivey 2017), these skills are also likely to benefit students in their future career paths (Kroes, Chen, and Mangiamelia 2013). However, these critical skills are often underdeveloped and inadequately addressed in traditional educational approaches (Grenci 2022).

This paper presents a case study that integrates data analysis and data visualization for a team project introduced in an undergraduate course focusing on food, nutrition, and health. The project’s success is guided by a Ten Steps framework proposed by the instructor (see Figure 1). The Ten Steps

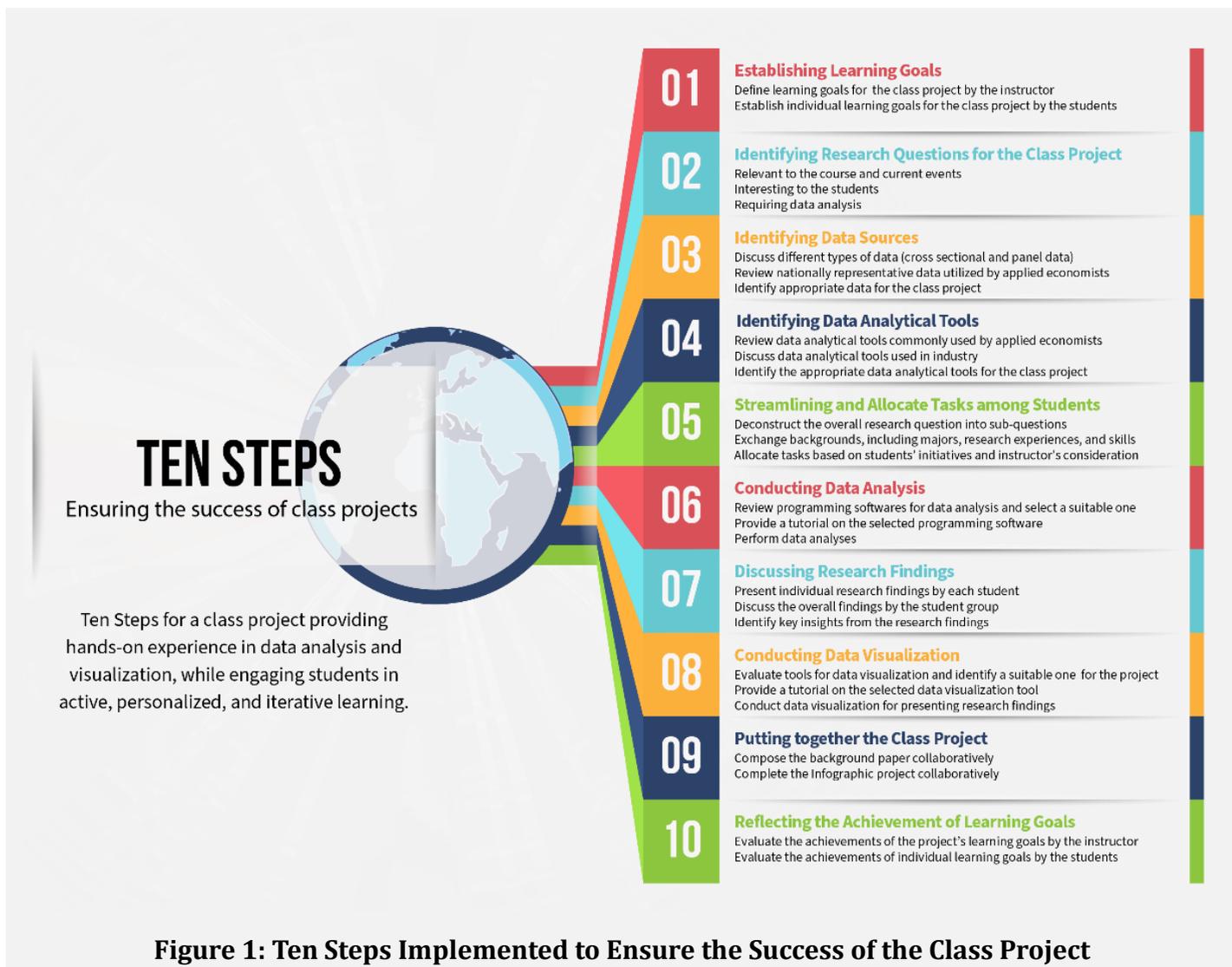


Figure 1: Ten Steps Implemented to Ensure the Success of the Class Project

framework includes the establishment and self-evaluation of student learning goals, identification of research questions, selection of data sources and analytic tools, task allocation among students, data analysis and data visualization, and finalizing the overall project. This approach not only increases the likelihood of project success but also provides students with active and personalized learning throughout the project. The Ten Steps framework can be easily applied to enhance the success of team projects centered on data analysis and data visualization in undergraduates.

Under the Ten Steps framework, the objective of the team project for the course was to investigate food insecurity among U.S. households during the COVID-19 pandemic. Students were challenged to conduct data analysis and data visualization for impactful presentation of their research findings. Throughout the project, students improved their skills in data analysis, data visualization, teamwork, presentation, and communication, ultimately enhancing their employability. This case study can be readily adapted for undergraduate courses in fields such as food security, food and nutrition, and agricultural economics.

2 Overview and Background of the Project

The team project has students conduct research addressing a pressing societal issue and utilizing data analysis and data visualization methods. It was introduced in an undergraduate course titled “Food, Nutrition, and Health.” The students in this course decided to investigate food insecurity among U.S.

households during the COVID-19 pandemic (see details on how they chose their research question in Section 2.2). They were challenged to justify the selection of their research questions.

Despite economic growth and policy support, food insecurity remains prevalent worldwide. Figure 2 plots the population percentage experiencing moderate and severe food insecurity in different types of countries using World Bank data. Before the COVID-19 pandemic, approximately 7–8 percent of the population in high-income countries and more than half in low-income countries suffered from moderate and severe food insecurity. Figure 3 shows that approximately 10–15 percent of U.S. households experienced food insecurity, with 3–6 percent experiencing severe food insecurity before the pandemic.

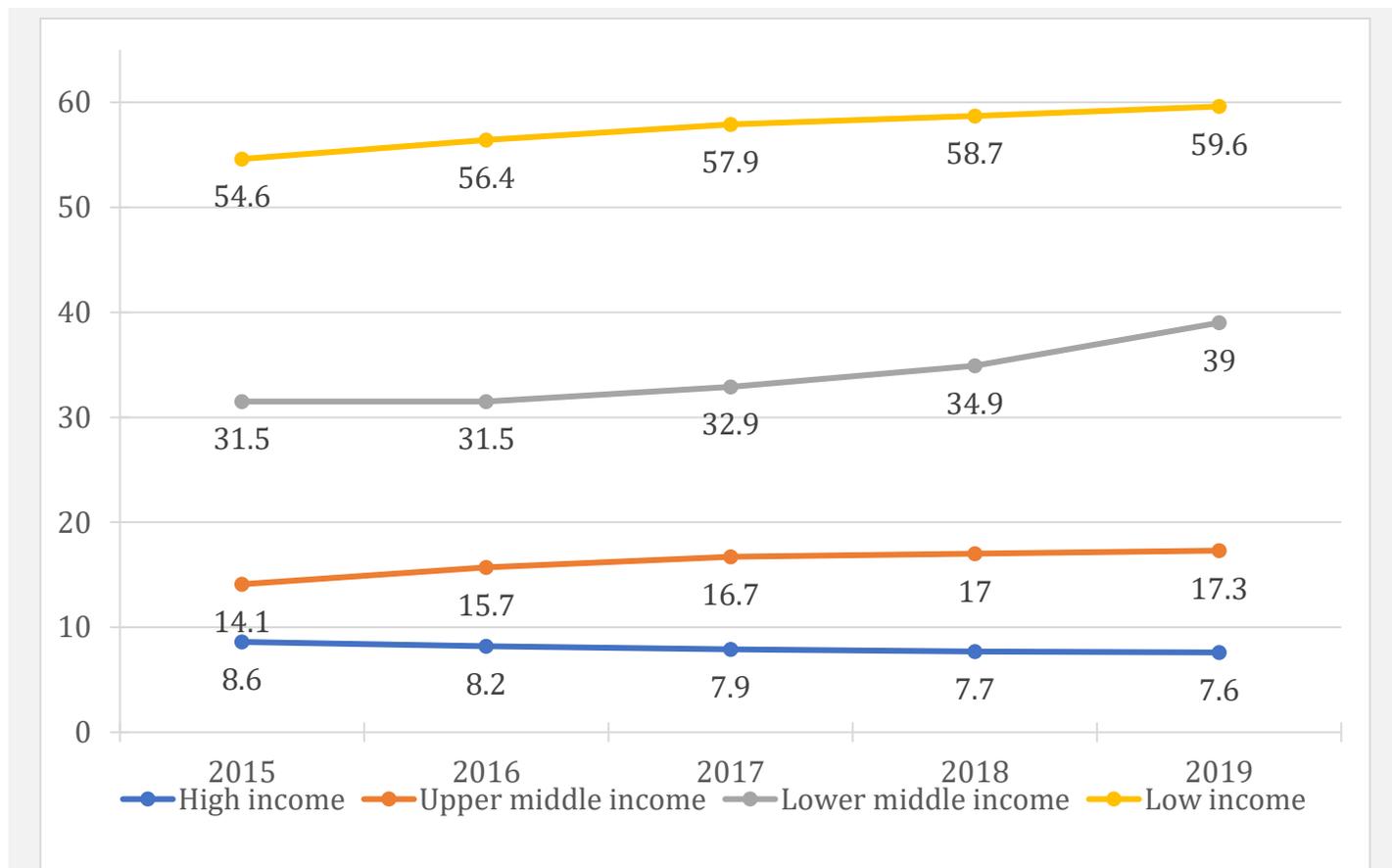
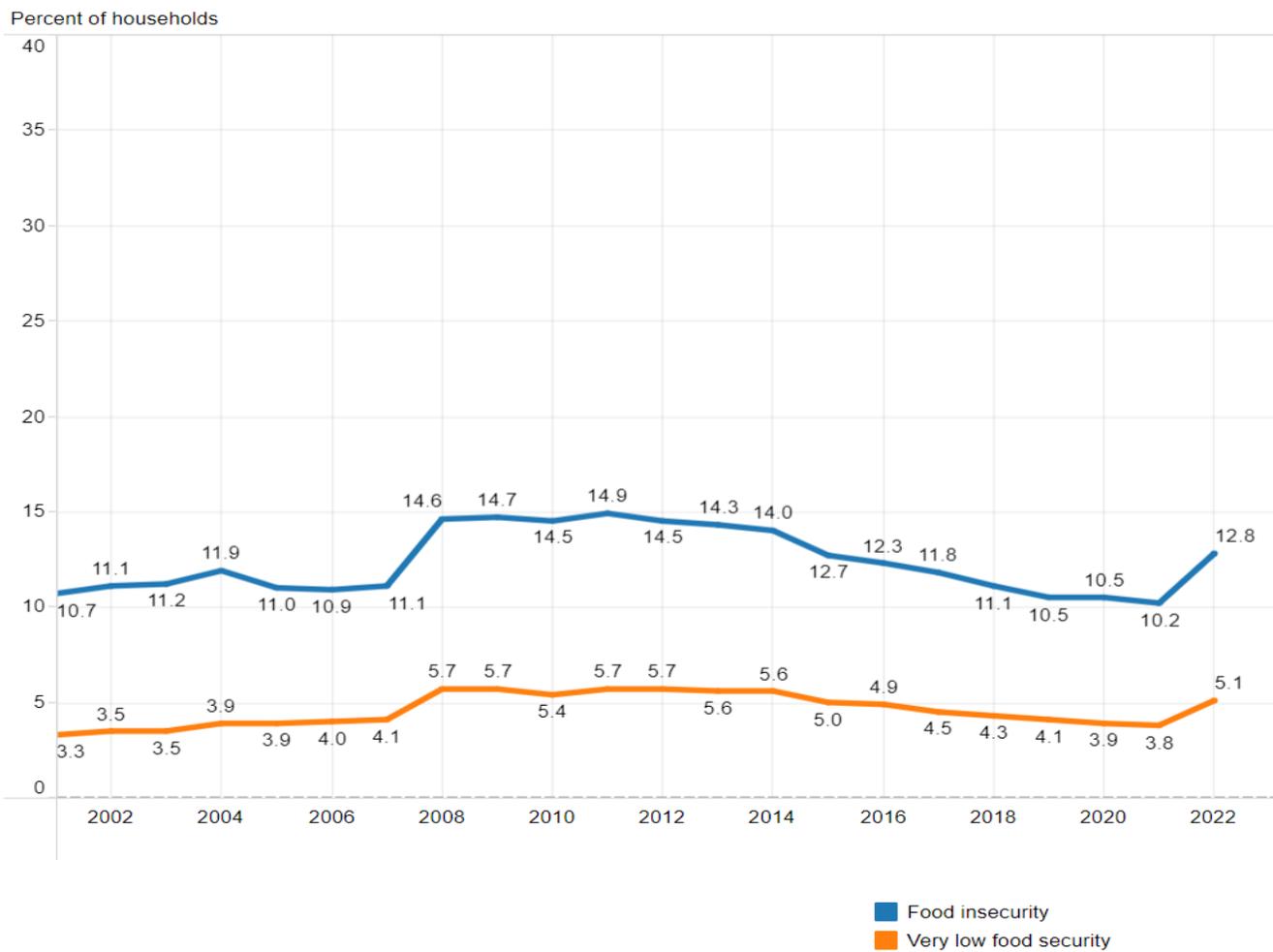


Figure 2: Trends in the Moderate and Severe Food Insecurity by Country Groups (%)

Source: World Bank Data on prevalence of moderate and severe food insecurity among population (%) at <https://data.worldbank.org/indicator/SN.ITK.MSFI.ZS>. Last access on November 29, 2023.

The impacts of food insecurity extend beyond physical health, affecting various aspects of individual well-being. For example, food insecurity can lead to nutritional deficiencies, affecting physical health, growth, and development, particularly in children (Eicher-Miller et al. 2009; Hanson and Connor 2014; Ke and Ford-Jones 2015). Chronic food insecurity is associated with an elevated risk of various health issues such as malnutrition, stunted growth, and a compromised immune system (Sasson 2012; Chaka 2023). Individuals facing food insecurity are more susceptible to chronic diseases and encounter greater challenges in recovering from health setbacks (Seligman, Laraia, and Kushel 2010; Nagata et al. 2019; Chaka 2023). Furthermore, food insecurity can hinder educational attainment, as hunger and malnutrition adversely impact cognitive development and concentration (Belachew et al. 2011; Faught et al. 2017). These individual-level impacts of food insecurity ripple out to affect communities, regions,



Source: USDA, Economic Research Service calculations using Current Population Survey Food Security Supplement data.

Figure 3: Trends in the Prevalence of Food Insecurity and Very Low Food Security Across U.S. Households (2001–2022)

Note: Estimated by the Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA) at <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/interactive-charts-and-highlights/> Last access on November 29, 2023.

and nations, hindering workforce productivity (Agarwal and Herring 2015), exacerbating socioeconomic disparities (Otsuka 2013), destabilizing communities (Hendrix and Brinkman 2013), and placing an additional burden on health care infrastructure and resources (Baer et al. 2015; Tarasuk et al. 2015; Berkowitz et al. 2018).

The COVID-19 pandemic unleashed economic, social, physical, and emotional upheavals, affecting individuals across diverse backgrounds and socioeconomic status. One of the most pervasive and urgent challenges arising from the crisis was escalated food insecurity. The United States had a food insecurity problem prior to the pandemic, with approximately 10.54 percent of households being low food secure and 4.11 percent being very low food secure in 2019.

Based on this motivation, the specific objectives of the team project are to (1) investigate the prevalence and inequality of food insecurity of U.S. households; and (2) provide visualization of research findings for an impactful presentation.

3 Ten Steps Framework for Team Project Design and Implementation

Figure 1 outlines the ten steps implemented to ensure the success of the class project. The first five steps, including the establishment of learning goals, identification of research questions, selection of data sources and tools for data analysis, and the streamlined allocation of tasks among students, are pivotal to the project's success and require iterative deliberations and discussions. The subsequent four steps, including data analysis, discussion of research findings, data visualization, and project finalization, demand both individual and collaborative efforts. Additionally, in the last step, students were also provided with an opportunity to reflect on their learning experiences and evaluate the achievement of their learning goals. In this section, we delve into the specific activities conducted in each step.

3.1 Step 1: Establishing Learning Goals

Achievement goal theory stands out as a prominent framework for understanding student motivations, academic engagement, and achievement (Leeuwis 2013; Urdan and Kaplan 2020). The establishment of learning goals, for both the class project and individual students, serves to align commitment, responsibilities, and expectations between the instructor and students. It also engages students in active, personalized, and iterative learning.

For this class, the instructor delineated and discussed the following learning goals for this project with the class: (1) cultivating independent and interdependent learning through individual and teamwork efforts; (2) fostering active, personalized, and iterative learning; (3) developing skills in data analysis and data visualization; (4) improving presentation and communication skills; (5) gaining firsthand experience in scientific research and publishing; and (6) applying critical thinking to comprehend current events and enhance informed decision-making.

Each student was required to establish individual learning goals, with an option to revise these goals. Table 1 provides a comprehensive summary of individual students' learning goals, categorized into the following areas: improving data analysis skills; gaining knowledge about food, nutrition, and economics while staying attuned to current events; mastering the utilization of infographics to highlight research findings; and refining skills in teamwork, communication, presentation, and time management. These student-established learning goals aligned well with the instructor's goals.

These established goals served as reference points for students to assess their progress and accomplishments throughout the project. They were provided with chances to communicate and deliberate on their goals with the instructor. Upon the completion of the project, they were also required to evaluate the achievement of their learning goals (see the 10th step in Figure 1). The iterative nature of this process encouraged adaptable and reflective assessments of personalized learning and growth.

3.2 Step 2: Identifying Research Question

A well-crafted research question, vital for the success of class projects, should align with course content, resonate with current events, captivate students, and be achievable within the designed time frame. In line with the learning goals for this class project, the instructor required the use of data analysis to address the research question. Additionally, to empower students to take ownership of the project, the instructor facilitated discussions for students to explore potential research questions and allowed them to select the research question for their project.

The students gravitated toward examining food insecurity among U.S. households during the pandemic, primarily due to its relevance to the course, current events, and personal interests. They were challenged to further justify the importance of their research question (see Section 2 for detailed background). Recognizing the significance of this issue, students decided to address food insecurity in the United States. Once the research topic on food insecurity was well justified as interesting and relevant, students were introduced to several U.S. Department of Agriculture (USDA) reports on food insecurity (Coleman-Jensen et al. 2022) to build their knowledge of the topic. Additionally, they were

Table 1: Individual Students’ Learning Goals and Their Self-Evaluation for the Team Project

Learning Goals	Selective Quotes from Students
A. Improve data analysis skills	<p>1) <i>“The process of extracting and analyzing data was new to me.”</i></p> <p>2) <i>“Even though the data analysis and charts were not used in the brief, I created the analysis based on race and employment loss and found an unfortunate correlation between minority populations and increased loss of employment income.”</i></p> <p>3) <i>“Gaining practice with Excel taught me most of all that data analysis and research overall is an ongoing process which cannot be expected to be completed overnight. It is a long and detailed process that allows for revisions, organization, and eventually, conclusions.”</i></p> <p>4) <i>“I had to really think outside the box and understand the data. It was my first time using Excel, and the census to this capacity. So it was a challenge but I learned so much.”</i></p> <p>5) <i>“All of my work was done on Excel/spreadsheets, which helped me to sharpen my skills and learn some new things on Excel.”</i></p> <p>6) <i>“I also learned how to utilize Excel to create graphs. It was the first time I used Excel to such lengths so I’m really proud of how much I challenged myself.”</i></p> <p>7) <i>“I was able to use my critical thinking and analysis skills to understand what the data was telling me.”</i></p> <p>8) <i>“There was so much trial and error, something I was not expecting with research. At first, it was frustrating because I kept having to change and correct my data. But I would eventually learn that this is all part of the process. Now, I can confidently say I know what to expect with research and to know not to give up on the first try.”</i></p>
B. Gain knowledge and strengthen connection with current events	<p>1) <i>“From my outcome and other classmates’ graphs, I understood better about the issue of food insecurity from different aspects.”</i></p> <p>2) <i>“Have a better understanding of what food and nutrition have tied to each other with the process of economics.”</i></p> <p>3) <i>“This project motivated me to apply my critical thinking about current events.”</i></p> <p>4) <i>“Get a better sense of what research is.”</i></p>
C. Learn how to use Infographic to highlight research findings	<p>1) <i>“During the process, I understood what components are necessary for infographics as well as visualizing data.”</i></p>

Table 1 continued.

Learning Goals	Selective Quotes from Students
	<p>2) <i>"I also learned so much about creating my infographics such as labels and bar labels."</i></p> <p>3) <i>"Had to put infographic together with rest of class and helped me look at fine details like theme colors, types of graphs, and placements."</i></p>
D. Improve teamwork ability	<p>1) <i>"Working with the different class members and seeing the styles of data analytics and organization allowed for me to learn from them and to adapt my style for analytics. It also allowed me to get a good taste of what is genuinely needed and not when it comes to publishing data because of feedback from our connection with our professor."</i></p> <p>2) <i>"I felt happy to help others make graphs and communicate a lot with them [student peers]. Also, I appreciate those who supported me when I asked about problems."</i></p> <p>3) <i>"Collectively, the members of the class created a group chat to be able to reach out to contact and update each other, ask questions, confirm due dates, and to offer suggestions on how to improve each respective part of the overall deliverable. Also, we were able to send our data to ensure that other people were able to contextualize what they were individually studying. The result of this was a cohesive project, and a smooth road to get there because of effective communication."</i></p> <p>4) <i>"In-class check-ins from Dr. Jin certainly improved the flow of this project compared to projects completed in previous courses. These meetings allowed for ideas and suggestions to be exchanged, and since they were held in front of other students, they allowed for suggestions on how to solve the relevant problem from more people. Additionally, they provided opportunities to discuss lingering problems with Excel/data analysis in groups before chapter lectures began."</i></p>
E. Improve time management skills	<p>1) <i>"I tried to submit all assignments many days in advance, so as to avoid an emergency at the last minute, which could interfere with the timely delivery of all documents and spreadsheets. This surely was beneficial, as it allowed for the most thought and analysis to be completed, as well as allowing me to then become a resource to my classmates who struggled with different problems throughout the process, helping them from experience."</i></p> <p>2) <i>"I made sure to work on my assigned task every week especially on the weeks where my data was still incorrect."</i></p>
F. Improve employability	<p>1) <i>"Gaining practice with Excel, extracting data from the Census, and using functions of Excel to find measures of center, standard deviation, and to create charts were all immensely helpful for the future, whether in classes or in the workplace."</i></p>

exposed to various definitions of food (in)security from diverse organizations and challenged to adopt a specific definition to address their research question. For example, based on the 1996 World Food Summit (Food and Agriculture Organization 2008), food security is defined as the condition when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and preferences for an active and healthy life. This definition highlights four primary dimensions of food security: physical availability of food, economic and physical access to food, food utilization, and stability of the other three dimensions over time. Yet, students found it challenging to locate data to measure these four dimensions.

The Food and Agriculture Organization (FAO) employs the Food Insecurity Experience Scale (FIES) to classify a person as food insecure when lacking regular access to enough safe and nutritious food for normal growth, development, and an active and healthy life.¹ Contributing factors to food insecurity include the unavailability of food and/or lack of resources to obtain food. Severe food insecurity occurs when people are unable to meet their minimum food requirements over a sustained period.

U.S. Agency for International Development defines food security and nutrition as access to - and availability, utilization, and stability of - sufficient food to meet caloric and nutritional needs for an active and healthy life (U.S. Agency for International Development 2019). Food insecurity is characterized by extreme poverty, hunger, malnutrition, and increased vulnerability to food shocks, stresses, and stunting.

The USDA distinguishes two types of food security.² Low food-secure households have enough food to avoid substantially disrupting their eating patterns or reducing food intake by using coping strategies and leveraging government and community food assistance programs. Very low food-secure households are those who are forced to disrupt their normal eating patterns and reduce food intake as they have insufficient money or other resources to expend on food. Given that students focused on food security in the United States, adopting the USDA definitions of food insecurity made it relatively easier for them to locate appropriate data to address their research question.

After several group discussions, the students opt to adopt USDA's definitions of food (in)security, facilitating their search for publicly available data of U.S. households. Specifically, the students initially aim to examine (a) the prevalence and inequality of food insecurity of households in the United States; (b) the support and assistance received by food insecure households; and (c) food insecurity for children.

3.3 Step 3: Identifying Data Sources

The instructor first provided an overview of different types of data (e.g., cross-sectional vs. panel data, qualitative vs. quantitative data, primary vs. secondary data), using both publicly available data sets and survey data used by the instructor for research. In line with the course content, the instructor also outlines various nationally representative data sets commonly used by applied economists and policymakers. Through this exercise, students were exposed to various data sources and gained a better understanding of how data are utilized by researchers and policy makers.

Among the various data sources students explored, they chose the Household Pulse Survey conducted by the U.S. Census Bureau. This 20-minute online survey focuses on how the COVID-19 pandemic affected households throughout the United States economically and socially. Initiated in April 2022, the survey collected information about the COVID-19 vaccine, income, employment, and child care

¹ Details of the FAO's definition of food (in)security can be found at <https://www.fao.org/hunger/en/> Last access on November 27, 2023.

² See details on the definitions of low- and very low-food security by the U.S. Department of Agriculture, Economic Research Service at <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/key-statistics-graphics/>. Last access on April 21, 2024.

along with social-demographic information.³ Participants were asked about whether their households experienced food insufficiency in the last seven days, with response options ranging from (1) enough of the types of food wanted; (2) enough food, but not always the types wanted; (3) sometimes not enough to eat; and (4) often not enough to eat.⁴ Aligning with the USDA's definition of food security, students classified households as low food secure if they chose "sometimes not enough to eat," and very low food secure if they chose "often not enough to eat."

Students decided to work with the first 48 weeks of data in the Household Pulse Survey, collected from April 2020 to August 2022, as shown in Table 2. Each survey reached out to a significant number of participants, and those who answered the survey represented the U.S. population aged 18 years old and above. It was the first time many have handled such a substantial amount of data, as indicated by their self-evaluation of their learning goals (see Table 1 for details).

Table 2: Data from the Household Pulse Survey by the U.S. Census Bureau

Phase	Dates	Week
Phase 1	April 23, 2020–July 21, 2020	Weeks 1–12
Phase 2	August 19, 2020–October 26, 2020	Weeks 13–17
Phase 3	October 28, 2020–March 29, 2021	Weeks 18–27
Phase 3.1	April 14, 2021–July 5, 2021	Weeks 28–33
Phase 3.2	July 21, 2021–October 11, 2021	Weeks 34–39
Phase 3.3	December 1, 2021–February 7, 2022	Weeks 40–42
Phase 3.4	March 2, 2022–May 9, 2022	Weeks 43–45
Phase 3.5	June 1, 2022–August 8, 2022	Weeks 46–48

Students were then asked to review their research question for the subsequent evaluations: (1) assessing if the data set identified could effectively address their research questions; and (2) determining which variables should be extracted from the data set for their project. This process presented an opportunity for iterative learning. For example, students found that the Household Pulse Survey data did not provide information for them to examine food insecurity for children during this period, leading to the revision of research questions. They acknowledged data limitations and adjusted their focus accordingly. Specifically, they dropped the third research aim on food insecurity for children.

Additionally, the instructor discussed the sampling methods of the Household Pulse Survey. Recognizing the potential challenges for undergraduate students, the objective of this discussion was to provide them with an opportunity to comprehend how authentic research was conducted, including the

³ Details of the U.S. Census's Household Pulse Survey can be found at <https://www.census.gov/data/experimental-data-products/household-pulse-survey.html>. Last access on May 29th, 2024.

⁴ This survey question can be found on page 19 of the Household Pulse Survey Questionnaire at https://www2.census.gov/programs-surveys/demo/technical-documentation/hhp/Phase_4-1_HPS_Questionnaire_English.pdf. Last access on April 21, 2024.

complexities of sampling. The representation of the sample is critical in validating and generalizing research findings.

3.4. Step 4: Identifying Data Analytic Tools

The instructor provided a brief overview of various programming software commonly used for data analysis, including Excel, STATA, R, and SAS, with a particular focus on STATA and Excel. This discussion expanded their understanding and knowledge of tools for data analyses.

Collaboratively, the instructor and students delved into the structure of their identified data set and research questions they aimed to address. They worked toward assessing specific tools for data analysis that would help them achieve their goals within the designated time window, enhancing their proficiency in using these tools.

Despite the advantages of using STATA, students decided to employ Excel for data analysis for the following reasons. First, it was the first time they were engaging in authentic research requiring data analysis, and they found it challenging to learn STATA within the tight timeframe required to complete the project. Second, Excel was deemed sufficient for addressing their research needs and its proficiency could prove useful in their future jobs.

An Excel tutorial was given by the instructor. Suggested Excel Tutorial are *Excel Basics for Data Analysis* in *Coursera*.⁵ This tutorial includes five modules: Introduction to Data Analysis using Spreadsheets, Getting Started with Using Excel Spreadsheets, Cleaning and Wrangling Data Using Spreadsheets, Analyzing Data Using Spreadsheet, and the Final Project.

3.5 Step 5: Streamlining and Allocating Tasks among Students

Given their refined research questions and the identified Household Pulse Survey data, the instructor and students deconstructed the overall research aims into categories outlined in Table 3, including (1) food expenditures, distinguishing between home and away from home; (2) trends in the prevalence of low and very low food security; (3) disparities in food insecurities based on race and household income levels; (4) self-reported reasons for food insecurity; and (5) assistance and support received by food-insecure households, including free meals, groceries, and Supplemental Nutrition Assistance Program (SNAP) benefits. These results will be represented using key concepts such as time trends, mean, and standard deviation, which have been thoroughly discussed and demonstrated using Excel.

To effectively allocate tasks among students, they were asked to share their background, including majors, research experiences, and skills. Concerns about distributive justice in grading team projects (Kidder and Bowes-Sperry 2012; Clarke and Blissenden 2013; Riebe, Girardi, and Whitsed 2016) and issues like social loafing and free riding (Kidder and Bowes-Sperry 2012) are well documented in the literature. To address these concerns, the students engaged in a discussion to ensure fair workloads.

Among the identified questions, the instructor allocated tasks to individual students based on their initiative and the instructor's evaluation of their backgrounds. Table 3 summarizes the specific tasks for each student, with the understanding that individual grades would be based on the quality of the team project, as well as individual performance and effort. Simultaneously, the team strategized on the division of labor, ensuring responsibility and accountability among team members. Furthermore, since it was the first time for all students to conduct empirical research requiring analyses of "big data," each student was teamed up with their peers so that they could support and help each other.

⁵ This Coursera course can be found at <https://tinyurl.com/Excel-4-Data-Analysis>. Last access on April 21, 2024.

Table 3: Each Student’s Focus Area and Student Groups for Tasks on the Team Project

Student	Tropical Area for Each Student	Groups
S1	Food spending	S1 and S2
S2	Trends of food insecurity and comparison with the pre-pandemic period	
S3	Prevalence of food insecurity by household income levels	S3 and S4
S4	Disparities of food insecurity by race	
S5	Self-reported reasons for food insecurity	S5, S6 and S7
S6	Percent of food insecurity households received either free meals/groceries or SNAP benefits	
S7	Where did food insecurity households receive help	
S8	Background paper	With S1–S7

3.6 Step 6: Conducting Data Analysis

The instructor provided a tutorial on Excel, with a specific focus on data analytic commands. Additionally, key concepts such as population and sample, mean, median, variance, standard deviation, and statistical tests (e.g., Student t test) were reviewed and demonstrated using Excel, as detailed in Table 4. A couple of students with prior experience in Excel were designated as leaders for the data analysis tasks. Furthermore, the instructor and students jointly established a set of steps for compiling, cleaning, and organizing data before proceeding with the data analysis.

Project-based learning in a small group has been found to improve student engagement through knowledge sharing and discussion (Almulla 2020). Consequently, the students were given the opportunity to form small groups for collaborative data analysis, as indicated in Table 3.

3.7 Step 7: Discussing Research Findings

In this step, each student presented individual research findings. As a group, they collectively discussed all the findings and identified key insights. Through this exercise, they gained a better understanding of their research findings and linked research results with policy implications.

The team summarized their key results as follows. During the pandemic, U.S. households spent, on average, \$293.67 weekly on food both at home and away from home. Broken down by region, households in the West had the highest food spending (\$317.72), while those in the Midwest had the lowest (\$295.23). The prevalence of low and very low food security was 8.62 percent and 2.26 percent in 2020; 7.39 percent and 2.12 percent in 2021; and 8.27 percent and 2.65 percent in 2022, respectively. Inequality of food insecurity was pronounced—disproportionately affecting people of color, low-income households, households with employment income loss, and households with children. Given that these household types had a disproportionately higher prevalence of food insecurity before the pandemic, the pandemic elevated the inequality of food insecurity to even more serious levels.

The top reason given by survey respondents for food insecurity was found to be a lack of affordability resulting from income loss and inflated food prices (43.78 percent). Among food insecure households, 22.22 percent of households received free meals and/or groceries, and 32.03 percent received SNAP benefits. Most food insecure families received free groceries and/or meals from shelters and soup kitchens (51.34 percent), followed by food pantries or food bank (28.73 percent), families and friends (26.86 percent), religious organizations (26.80 percent), and meal on wheels and other food deliveries (23.70 percent).

Table 4: Data Analytic Concepts Reviewed

Concept	Definition	Example
Population	A population is a complete set of individuals with certain characteristics	All the households in the United States
Sample	A sample is a part of fully defined population	The surveyed households in the Household Pulse Survey in the United States
Mean	An average of a variable	Average household income
Median	The value in the middle of a variable, implying that 50 percent of data points have a value smaller or equal to the median and 50 percent of data points have a value higher or equal to the median	Median household income
Variance	Variance is the expected value of the squared deviation from the mean of a random variable	Distribution comparisons of several household income distribution with different variances/spread
Standard Deviation	The standard deviation is obtained as the square root of the variance.	
Student’s t test	The Student’s t-test is to test whether the means of two normally distributed samples are equal.	Test whether Hispanic and non-Hispanic white households have the same probability of experiencing food insecurity

3.8 Step 8: Conducting Data Visualization

Existing research consistently demonstrates that creative expression promotes active and personalized learning (Kousoulas 2010; Brown 2015; Beghetto 2021). Creative expression not only makes experiential learning enjoyable, but also stimulates reflections that are important in active and personalized learning. Additionally, students on this project were tasked with creating appealing data visualization to present their research findings.

After considering various options, the team decided to utilize an infographic project to present their findings in a visualizing and compelling way. Utilizing infographics allows students to actively engage with their research findings, enhancing their understanding, retention of information, and presentation and communication skills (VanderMolen and Spivey 2017).

Given their selection of an infographic, the instructor led them to *Choices*, a journal of the Agricultural and Applied Economics Association (AAEA). *Choices* features data visualizations that focus on timely and important topics grounded in sound economics and are sometimes presented through infographics. This serves as an excellent resource for agricultural and applied educators aiming to involve students in infographic projects. The instructor and students collectively reviewed several infographics downloaded from *Choices* and identified the strengths and weaknesses of each.

We then discussed how to design their own infographic. The following questions and requirements were presented and discussed: (1) What is your favorite infographic, and what aspects contribute to your preference? (2) Considering the infographics shared by the instructor from *Choices*, what features do you

appreciate the most and find less appealing? (3) What is your preferred method for presenting the findings of the specific aspect of food insecurity you have concentrated on? (4) Would combining the preferred infographics from all team members result in a visually cohesive and compelling presentation? During the discussion session, students explored diverse strategies to make their findings visually appealing and coherent.

A suggested tutorial focusing on visualizing data includes the first two modules in the Coursera course titled “Data Visualization and Dashboards with Excel and Cognos.”⁶ These two modules are “Visualizing Data Using Spreadsheets” and “Creating Visualizations and Dashboards with Spreadsheets.” A suggested tutorial for infographics is “Design and Make Infographics (Project-Centered Course)” at *Coursera*.⁷

3.9 Step 9: Finalizing the Class Project

The class project comprises two components: a background paper and an infographic. Students completed the background paper first by synthesizing research findings from each student, incorporating the objectives and data sections. Subsequently, they selected key findings to highlight in their infographic. Both the background paper and the infographic underwent multiple rounds of revision. We showcased both the early and final versions of the infographic. The early version, presented in Figure 4, spanned four pages but failed to captivate the audience with the key findings. In contrast, the final version, presented in Figure 5, not only zeroed in on the key findings, but also presented them in a well-organized and aesthetically pleasing manner. In the end, students presented their project in class and elaborated on what they learned from the project.

3.10 Step 10: Reflecting the Achievement of Learning Goals

At the outset of the project, students were asked to establish their learning goals, with an option to revise these goals. These goals served as reference points for assessing their progress and accomplishments throughout the project. Students had opportunities to communicate and deliberate on their goals with the instructor. The iterative nature of this process encouraged an adaptable and reflective assessment of their personalized learning and growth.

As shown in Table 1, many students underscored their exposure to and knowledge acquisition about food security and food economics. They articulated an increased awareness of and sensitivity to current events. Progress was reported for data analysis and data visualization skills, with several students experiencing the use of Excel for data analysis for the first time. One student shared, *“It was my first-time using Excel and the Census [data] to this capacity. So it was a challenge, but I learned so much.”*

Several students recognized the iterative nature of research. One student emphasized that *“data analysis and research overall is an ongoing process which cannot be expected to be completed overnight.”* They learned that *“it is a long and detailed process that allows for revisions, organization, and eventually, conclusions.”* Despite initial challenges, students understood the importance of perseverance in research, with one sharing, *“There was so much trial and error, something I was not expecting with research. At first, it was frustrating because I kept having to change and correct my data.”* They learned to anticipate challenges and not give up on the first try. Some students expressed pride and ownership upon completing their work, with one stating, *“It was the first time I used Excel to such lengths so I’m really proud of how much I challenged myself.”*

⁶ The details of this course can be found at <https://tinyurl.com/Excel-4-Data-Visualization>. Last access on April 21, 2024.

⁷ The details of this course can be found at <https://www.coursera.org/learn/infographic-design#modules>. Last access on April 21, 2024.

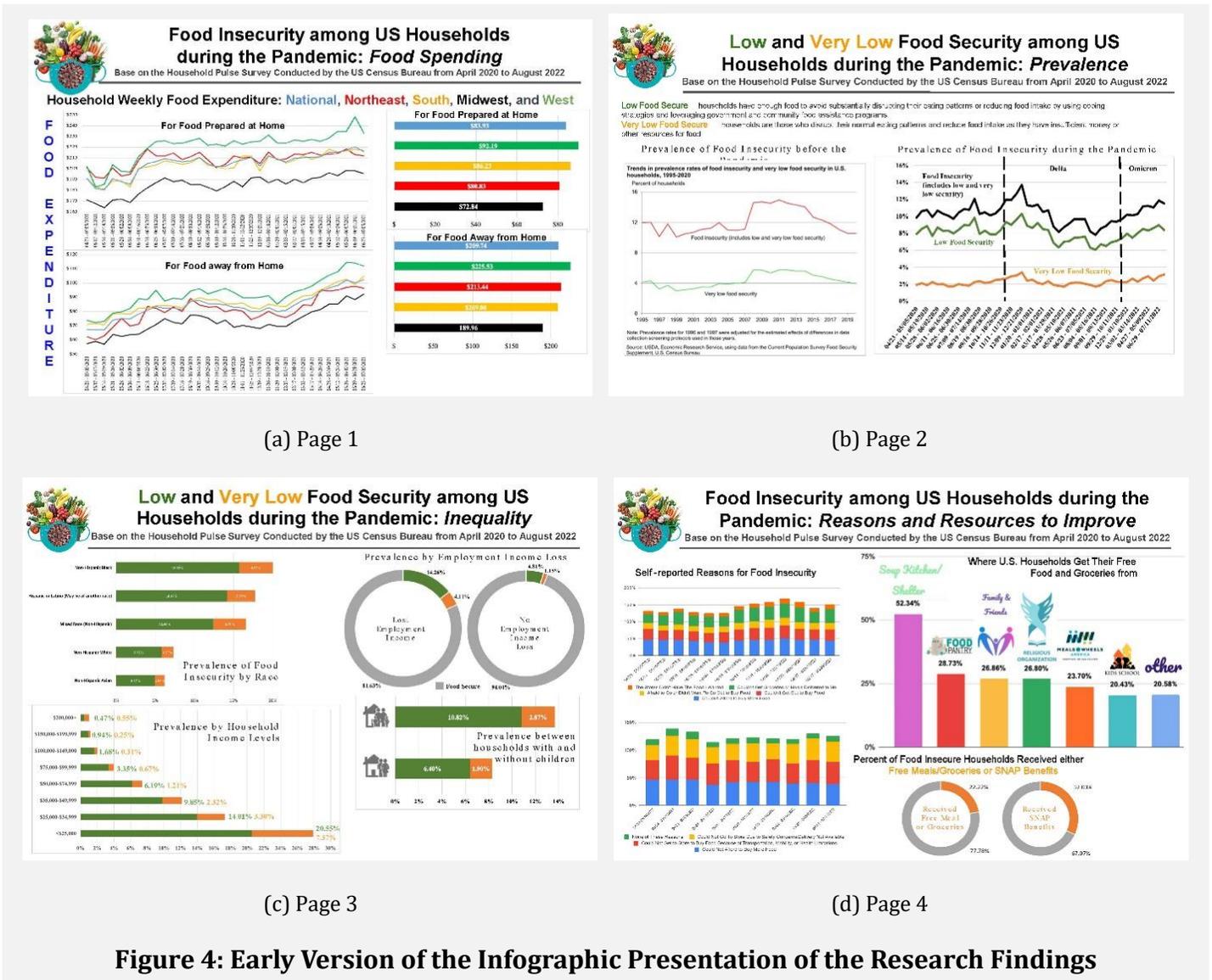


Figure 4: Early Version of the Infographic Presentation of the Research Findings

Effective teamwork and communication were pivotal to project success, as highlighted by a student who emphasized the collaborative efforts of this class:

“Collectively, the members of the class created a group chat to be able to reach out to contact and update each other, ask questions, confirm due dates, and to offer suggestions on how to improve each respective part of the overall deliverable. Also, we were able to send our data to ensure that other people were able to contextualize what they were individually studying. The result of this was a cohesive project, and a smooth road to get there because of effective communication.”

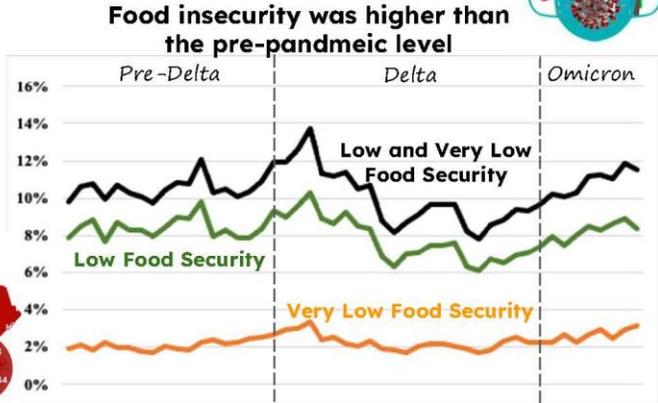
Furthermore, students emphasized the transferrable nature of the improved skills to enhance employability, with one student stating, *“Gaining practice with Excel, extracting data from the Census, and using functions of Excel to find measures of center, standard deviation, and to create charts were all immensely helpful for the future, whether in classes or in the workplace.”*

Food Insecurity among US Households during the Pandemic

Based on the Household Pulse Survey Conducted by the US Census Bureau from April 2020 to August 2022

During the Covid-19 pandemic, household expenditure of food prepared at home and away from home experienced a **3.5%** increase in the US. Inflation and disruptions to the food supply chain by the pandemic contributed to the increase. The regional differences in households food expenditure was pronounced – highest for the the **West** and the lowest in the Midwest.

Weekly Household Food Expenditure:
Nation, Northeast,
South, Midwest, and West

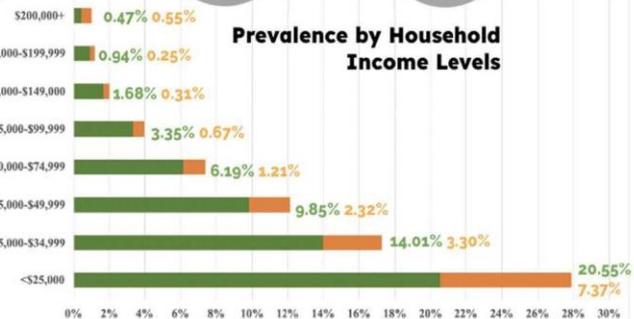


Disparities of Low and Very Low Food Insecurity by Race



13.69% Households with children had high food insecurity

Low and very low food insecurity consistently **rose** as household income level **decreased**. About **28%** of households in the the lowest income group are food insecurity.



Top Three Self-Reported Reasons for Food Insecurity



Percent of Food Insecure Households Received either Free Meals/Groceries or SNAP Benefits



Where Food Insecure Households Received Help



Figure 5: Final Version of the Infographic Presentation of the Research Findings

4 Student Evaluation of the Team Project

The iterative process embedded in the Ten Steps framework, illustrated in Figure 1, played an important role in fostering both active and personalized learning, evident through the following specific components: (a) the continuous cycle of establishing, refining, and evaluating individual learning goals throughout the project, which provided ongoing opportunities for active and personalized learning; (b) from identifying the research question to securing data and utilizing software for analysis and visualization, students engaged in both individual deliberations and team and discussions, contributing to active and personalized learning; and (c) while students worked independently on their tasks, collective discussion, group learning sessions for both data analysis and software, and mutual assistance between students created valuable team learning opportunities for active and personalized learning.

To assess students' perceptions of the project's role in their active and personalized learning, five questions were incorporated into the Rutgers student teaching evaluation survey for this course. Participants were required to express their agreement with the statements listed in Table 5 on a scale from one (strongly disagree) to five (strongly agree). Although only four students completed the evaluation, their responses provided some insights.

As shown in Table 5, each student attested to the project's efficacy in fostering active learning on both an individual and collective level, contributing to their personalized learning. Furthermore, they acknowledged the pivotal role of learning goals in shaping their personalized learning experiences.

Table 5: Students' Perception on Active and Personalized Learning from Course Evaluations

Statement	4 (Agree)	5 (Strongly Agree)
Learning goals specified by individual students were helpful for personalized learning	75% (N=3)	25% (N =1)
The project improved personalized learning	25% (N=1)	75% (N=3)
The project engaged students in active learning individually as well as a group	0% (N =0)	100% (N=4)
The project brought learning into students' daily life	50% (N=2)	50% (N=2)

Note: Four students completed the student teaching evaluation in the end of the semester.

5 Conclusions

This paper presents a case study that integrated data analysis and visualization in a team project on food security in the United States introduced in an undergraduate course focusing on food, nutrition, and health. The project's success is guided by a Ten Steps framework that includes the establishment and self-evaluation of student learning goals, identification of research questions, selection of data sources and analytic tools, task allocation tasks among students, data analysis and data visualization, and finalizing the overall project. The Ten Steps framework can be easily applied to enhance the success of team projects centered on data analysis and visualization for undergraduate courses.

Throughout this project, students gained valuable insights into (1) the prevalence and inequality of food insecurity in the United States; (2) practical skills in conducting data analysis; (3) effective visualization of research findings for impactful presentations; (4) cultivating advanced critical thinking

and decision-making skills; (5) improving skills in teamwork, presentation, and communication, ultimately enhancing employability; and 6) gaining active and personalized learning experiences.

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