

Term Information

Effective Term Spring 2025

General Information

Course Bulletin Listing/Subject Area Chemistry
Fiscal Unit/Academic Org Chemistry - D0628
College/Academic Group Arts and Sciences
Level/Career Graduate
Course Number/Catalog 7620
Course Title Towards a More Inclusive Higher-Education Environment: Post Qualitative and Quantitative Methods
Transcript Abbreviation PQQM
Course Description This course introduces students to the interdisciplinary field of narrative inquiry and QuantCrit methods, aiming to bridge the gap between qualitative narratives and quantitative analysis in chemistry education.
Semester Credit Hours/Units Fixed: 1.5

Offering Information

Length Of Course 7 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? No
Grading Basis Letter Grade
Repeatable No
Course Components Lecture
Grade Roster Component Lecture
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites
Exclusions
Electronically Enforced No

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 40.0501
Subsidy Level Doctoral Course
Intended Rank Masters, Doctoral

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors

Course Details

Course goals or learning objectives/outcomes

- **Understanding Narrative Inquiry:** Gain a comprehensive understanding of narrative inquiry as a research approach, including its theoretical foundations, methodologies, and applications across various disciplines.
- **QuantCrit Familiarity:** Develop familiarity with QuantCrit methods, learning to critically analyze quantitative data through a lens that considers social justice, equity, and power dynamics.
- **Integration of Qualitative and Quantitative Approaches:** Learn how to integrate qualitative narrative data with quantitative analysis, recognizing the value of combining both approaches to achieve deeper insights into complex social phenomena.
- **Research Design Skills:** Develop skills in designing research projects that incorporate both narrative inquiry and QuantCrit methods, including crafting research questions, selecting appropriate methodologies, and addressing ethical considerations.
- **Data Collection Techniques:** Acquire proficiency in a range of qualitative data collection techniques used in narrative inquiry, such as interviews, participant observation, and content analysis.
- **Critical Analysis:** Develop the ability to critically analyze narratives and quantitative data, identifying underlying assumptions, biases, and power structures that may influence research outcomes.
- **Social Justice Lens:** Understand the importance of applying a social justice lens to research, examining how narratives and quantitative data can be leveraged to address issues of inequality, discrimination, and marginalization.
- **Ethical Considerations:** Explore ethical considerations inherent in narrative inquiry and QuantCrit analysis, including issues related to informed consent, confidentiality, and the representation of research participants' voices.
- **Communication Skills:** Enhance communication skills to effectively convey research findings to diverse audiences, including academic, policy, and public stakeholders, while maintaining sensitivity to the complexities of the data.

Content Topic List

- Foundations of narrative inquiry and its applications across chemistry and STEM disciplines.
- Techniques for collecting and analyzing qualitative narratives, including interviews, participant observation, and content analysis.
- Introduction to QuantCrit methods and their relevance in addressing social justice issues within quantitative research.
- Ethical considerations and challenges in narrative inquiry and QuantCrit analysis.
- Case studies exploring the intersection of narratives, quantitative data, and social justice issues such as race, gender, and class.
- Practical skills in synthesizing narrative and quantitative data to produce rich, nuanced analyses.
- Strategies for communicating findings effectively to diverse audiences, including academic, policy, and public spheres.

Sought Concurrence

No

Attachments

- Chem 7620 Response Letter.docx: response letter re: contingencies/recommendations
(Other Supporting Documentation. Owner: Hambach, Jennifer Lynn)
- JN_5162024_Towards Decolonizing Chemistry Education Post Qualitative and Quantitative Methods_New Course Syllabus_2024.pdf: May 24 updated syllabus
(Syllabus. Owner: Hambach, Jennifer Lynn)

Comments

- Prerequisites removed from request and syllabus. Revised syllabus attached.

An updated syllabus is attached along with a letter with responses to the contingencies that were required to be addressed *(by Hambach, Jennifer Lynn on 05/24/2024 11:18 AM)*

- Please see feedback email sent 5/23/24. *(by Neff, Jennifer on 05/23/2024 12:53 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Hambach, Jennifer Lynn	04/11/2024 12:45 PM	Submitted for Approval
Approved	Schultz, Zachary DALE	04/11/2024 02:32 PM	Unit Approval
Approved	Vankeerbergen, Bernadette Chantal	04/25/2024 03:58 PM	College Approval
Revision Requested	Neff, Jennifer	05/14/2024 04:30 PM	ASCCAO Approval
Submitted	Hambach, Jennifer Lynn	05/23/2024 10:45 AM	Submitted for Approval
Approved	Schultz, Zachary DALE	05/23/2024 10:49 AM	Unit Approval
Approved	Vankeerbergen, Bernadette Chantal	05/23/2024 11:07 AM	College Approval
Revision Requested	Neff, Jennifer	05/23/2024 12:53 PM	ASCCAO Approval
Submitted	Hambach, Jennifer Lynn	05/24/2024 11:18 AM	Submitted for Approval
Approved	Schultz, Zachary DALE	05/24/2024 11:42 AM	Unit Approval
Approved	Vankeerbergen, Bernadette Chantal	05/26/2024 02:37 PM	College Approval
Pending Approval	Jenkins, Mary Ellen Bigler Hanlin, Deborah Kay Hilty, Michael Neff, Jennifer Vankeerbergen, Bernadette Chantal Steele, Rachel Lea	05/26/2024 02:37 PM	ASCCAO Approval

Chemistry 7620: Towards Decolonizing Chemistry Education: Post Qualitative and Quantitative Methods (Spring 2025)

Instructor

Dr. Josie (she/her) Nardo
Newman and Wolfrom Laboratory of Chemistry 1104A
Nardo.11@osu.edu

Class: Tuesdays 12:45 PM – 3:25 PM; **University Hall 066**

Office Hours: [By appointment](#)

Course Mission

In our increasingly data-driven world, narratives often take a backseat to numbers and statistics. However, narratives hold immense power in shaping our understanding of complex phenomena, offering unique insights into human experiences, culture, and society. This course introduces students to the interdisciplinary field of narrative inquiry and QuantCrit methods, aiming to bridge the gap between qualitative narratives and quantitative analysis in chemistry education. Narrative inquiry is a research approach that centers on the study of stories as a means of understanding human experience. It acknowledges that individuals make sense of their lives through stories and that these narratives carry valuable information about identity, beliefs, and social interactions. Through a blend of theoretical exploration and practical application, students will delve into the various methods of collecting, analyzing, and interpreting narratives across different contexts. Complementing narrative inquiry, QuantCrit methods provide a critical lens through which to examine quantitative data, interrogating the underlying assumptions, power dynamics, and social implications embedded within numerical analyses. By integrating quantitative and critical approaches, students will learn to uncover the complexities and nuances often overlooked in traditional statistical analysis, particularly in relation to issues of social justice, equity, and power structures. Throughout the course, students will engage in hands-on activities, case studies, and collaborative projects to develop their skills in narrative analysis and QuantCrit assessment. They will learn how to craft research questions that blend qualitative and quantitative elements, design methodologies that incorporate narrative data collection alongside statistical analysis, and critically evaluate the implications of their findings within broader societal contexts. By the end of the course, students will emerge with a deeper understanding of how narratives and quantitative methods can intersect to provide comprehensive insights into complex social phenomena, empowering them to conduct research that is both rigorous and socially conscious. Whether pursuing further studies or entering professional fields such as social sciences, education, or public policy, students will be equipped with valuable tools for addressing pressing societal challenges through a narrative lens informed by QuantCrit principles.

Course Objectives

1. **Understanding Narrative Inquiry:** Gain a comprehensive understanding of narrative inquiry as a research approach, including its theoretical foundations, methodologies, and applications across various disciplines.
2. **QuantCrit Familiarity:** Develop familiarity with QuantCrit methods, learning to critically analyze quantitative data through a lens that considers social justice, equity, and power dynamics.
3. **Integration of Qualitative and Quantitative Approaches:** Learn how to integrate qualitative narrative data with quantitative analysis, recognizing the value of combining both approaches to achieve deeper insights into complex social phenomena.

4. **Research Design Skills:** Develop skills in designing research projects that incorporate both narrative inquiry and QuantCrit methods, including crafting research questions, selecting appropriate methodologies, and addressing ethical considerations.
5. **Data Collection Techniques:** Acquire proficiency in a range of qualitative data collection techniques used in narrative inquiry, such as interviews, participant observation, and content analysis.
6. **Critical Analysis:** Develop the ability to critically analyze narratives and quantitative data, identifying underlying assumptions, biases, and power structures that may influence research outcomes.
7. **Social Justice Lens:** Understand the importance of applying a social justice lens to research, examining how narratives and quantitative data can be leveraged to address issues of inequality, discrimination, and marginalization.
8. **Ethical Considerations:** Explore ethical considerations inherent in narrative inquiry and QuantCrit analysis, including issues related to informed consent, confidentiality, and the representation of research participants' voices.
9. **Communication Skills:** Enhance communication skills to effectively convey research findings to diverse audiences, including academic, policy, and public stakeholders, while maintaining sensitivity to the complexities of the data.

Textbooks and Other Resources (All materials will be provided on the CarmenCanvas page for students; these are supplemental resources)

Patel, L. (2015). *Decolonizing educational research: From ownership to answerability*. Routledge.

Mattingly, V., Grice, S., & Goldstein, A. (2022). *Inclusalytics: How diversity, equity, and inclusion leaders use data to drive their work*. Mattingly Solutions.

Salient journals: *Journal of Chemical Education*, *Chemistry Education Research and Practice*, *Journal of Research in Science Teaching*, *Science Education*, *Qualitative Inquiry*, *Journal of the Learning Sciences*, etc.

Pre-requisite Courses

None

Format and Required Materials

Lecture, small group discussion, in-class polling questions/quizzes, readings, classroom activities, student presentations, and multiple modalities in which students can participate (thinking aloud, writing thoughts down, sharing representations, enacting gestures, etc.). Please download either [Zotero](#) or [Mendeley](#) as your reference manager and **please bring your computer, a mouse, and charger for every class session.**

Attendance

Punctual attendance is highly recommended considering the frequency and duration of this course. Nevertheless, life happens. If you miss a class session, are late, and/or must leave early, I recommend reaching out to a classmate or myself and identify what was missed. If there is a reason for repeated attendance problems, please speak with me privately. If there are extenuating circumstances that affect your ability to participate fully, please make arrangements to also speak with me privately and confidentially. Given the student-centered nature of this course, I will not be streaming and/or recording the class. Most of what you learn will be dependent on interactions with myself and your peers. Below are outlined university guidelines to help navigate your participation in the course if you need to have additional resources.

Disability Services

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the [Safe and Healthy Buckeyes site](#) for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.

Religious Accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement and the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the [Office of Institutional Equity](#).

Policy: [Religious Holidays, Holy Days and Observances](#)

Mental Health Statement

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad

range of confidential mental health services available on campus via the Office of Student Life’s Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling [614-292-5766](tel:614-292-5766). CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at [614-292-5766](tel:614-292-5766) and 24 hour emergency help is also available 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

Participation

Because of the student-centered nature of this course, participation is essential for your learning, your peers’ learning, and my learning as well. However, I recognize that there are many ways in which one *can* participate. Contributing to discussions, posing questions, synthesizing literature, deeply reflecting, and drawing upon your lived experiences are all legitimate ways to participate. This course will emphasize students *talking, writing, organizing, and drawing* as indicators for participation. This course will challenge you to think about education research and science broadly in new and sometimes uncomfortable ways. It’s important to remain openminded and respectful of your peers. **It’s important to find a balance between listening and speaking as well as being mindful of how others are participating in the space.** Below are outlined university guidelines that impact participation.

Sexual Misconduct and Relationship Violence

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at titleix@osu.edu. Please do not hesitate and report as soon as you can.

Diversity Statement

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Grades

Your final grade in this course will be determined by the total number of points earned, rounded to the nearest whole number percentage. For equity considerations, there will be no curve applied to this course.

Grade component	Total number of opportunities	Total Number of counted attempts	Points Allotted (1000)
Participation	30 opportunities	20 opportunities * 5 points	150 points
Journals	5 journals	4 journals * 100 points	400 points
Workshops	3 workshops	3 workshops * 100 points	300 points
Final project	1 project	1 project * 100 points	100 points
Final exam	1 final exam	1 final exam * 50 points	50 points

93% - 100% A
 90% - 92% A-
 87% - 89% B+
 83% - 86% B
 80% - 82% B-
 77% - 79% C+

73% - 76% C
 70% - 72% C-
 67% - 69% D+
 50% - 66% D
 49% < E

Late Policies on Assignments

All assignments are due at the date and time listed in the course schedule **unless you email me at minimum 12 hours beforehand that you need more time; you can only use this 3 times**. If you decide you need more time on an assignment, that is okay, but if you do not communicate this need to me beforehand, the assignment will be considered late and graded up to half-credit. For late assignments, please provide me with a new due date and time that no more than one week late. Journals are due before each class period (i.e., before Tuesdays at 11:59am) and workshops will take place every alternating week (i.e., after completing a type of method). Below are outlined university guidelines that impact assignments.

Academic Misconduct

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>

Course Schedule

Week	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
1	3/4	3/5 Activity 1	3/6	3/7	3/8	3/9	3/10
2	Spring Break (No Class)						
3	3/18	3/19* Activity 2 Journal 1 (Due 3/26)	3/20	3/21	3/22	3/23	3/24
4	3/25	3/26 Workshop 1 Journal 2 (Due 4/2)	3/27	3/28	3/29	3/30	3/31
5	4/1	4/2 Activity 3 Journal 3 (Due 4/9)	4/3	4/4	4/5	4/6	4/7
6	4/8	4/9 Workshop 2 Journal 4 (Due 4/16)	4/10	4/11	4/12	4/13	4/14
7	4/15	4/16 Activity 4 Journal 5 (Due 4/23)	4/17	4/18	4/19	4/20	4/21
8	4/22	4/23 Workshop 3 Final project (Due 4/30)	4/24	4/25	4/26	4/27	4/28
9	4/30 (Final given Tuesday 12:45-3:25)						
*I will be at ACS that week and will conduct the course asynchronously, meaning I will record and upload my presentation along with the in-class participation.							

Course Sessions

Unit	Class Dates	Class Schedule	Classwork	Homework
Introduction	Week 1 3/5	Start Time 12:45 45 minutes Overview and Class Norms -Break (10 minutes)- 45 minutes Activity -Break (10 minutes)- 45 minutes Reflection (3-2-1) End Time 3:25	Activity 1: Writing research questions	Readings (Due 3/19) 1. Patel, L. (2015). Decolonizing educational research: From ownership to answerability. Routledge.
	Week 3 3/19	Remote Session Overview of Qualitative Methods	Activity 2: Selecting a Theoretical Framework	Readings (Due 3/26) 1. Polkinghorne, D. E. (2007). Validity issues in narrative research. <i>Qualitative Inquiry</i> , 13(4), 471-486. 2. Denzin, N. K. (2006). Analytic autoethnography, or déjà vu all over again. <i>Journal of Contemporary Ethnography</i> , 35(4), 419-428. Journal 1 (Due 3/26)
Narrative Inquiry	Week 4 3/26	Start Time 12:45 45 minutes Jigsaw Paper Discussion -Break (10 minutes)- 45 minutes Workshop -Break (10 minutes)- 45 minutes Write-up End Time 3:25	Workshop 1: Applying a Theoretical Framework	Readings (Due 4/2) 1. Riessman, C. K. (2008). <i>Narrative methods for the human sciences</i> . Sage Publications. 2. Sparkes, A. C. (2002). Narrative analysis and performance enhancement. <i>Sport Psychologist</i> , 16(2), 172-191. Journal 2 (Due 4/2)
	Week 5 4/2	Start Time 12:45 45 minutes Overview of Quantitative Research -Break (10 minutes)- 45 minutes Activity -Break (10 minutes)- 45 minutes Reflection (3-2-1) End Time 3:25	Activity 3: Selecting a Methodology	Readings (Due 4/9) 1. Mattingly, V., Grice, S., & Goldstein, A. (2022). <i>Inclusalytics: How diversity, equity, and inclusion leaders use data to drive their work</i> . Mattingly Solutions 2. Van Dusen, B., Nissen, J., Talbot, R. M., Huvad, H., & Shultz, M. (2021). A QuantCrit investigation of society's educational debts due to racism and sexism in chemistry student learning. <i>Journal of Chemical Education</i> , 99(1), 25-34. Journal 3 (Due 4/9)
QuantCrit	Week 6 4/9	Start Time 12:45 45 minutes Jigsaw Paper Discussion -Break (10 minutes)- 45 minutes Workshop -Break (10 minutes)- 45 minutes Write-up End Time 3:25	Workshop 2: Applying a Methodology	Readings (Due 4/16) 1. Journell, W., & Kubinak, B. (2020). Applying Quantitative Critical Race Theory to Education Research. <i>Educational Researcher</i> , 49(4), 279-288. 2. Bicchieri, M., & Diminescu, D. (Eds.). (2018). <i>Quantcrit: A new toolkit for research in critical security studies</i> . ECPR Press. 3. Asencio, E. K., & Waheed, M. (2020). QuantCrit: An Introduction and Framework for Critical Quantitative Literacy. <i>Digital Humanities Quarterly</i> , 14(4). Journal 4 (Due 4/16)
	Week 7 4/16	Start Time 12:45 45 minutes Overview of Mixed-Methods Research -Break (10 minutes)- 45 minutes Activity -Break (10 minutes)-	Activity 4: Analysis of Data	Readings (Due 4/23) 1. Dumas, M. J., & Ross, K. M. (2016). QuantCrit: Jump-starting the dialogue on race and policy analysis. <i>Critical Sociology</i> , 42(5), 737-746. courses?.
Final Project (Mixed-				

		45 minutes Reflection (3-2-1) End Time 3:25		2. Grzanka, P. R., & Mann, E. S. (2014). Queering heteronormativity: Theorizing straight normalization with QuantCrit approaches. <i>Journal of Homosexuality</i> , 61(5), 727-748. 3. Ladson-Billings, G. (2006). From the Achievement Gap to the Education Debt: Understanding Achievement in US Schools. <i>Educational Researcher</i> , 35(7), 3-12. Journal 5 (Due 4/23)
	Week 8 4/23	Start Time 12:45 45 minutes Jigsaw Paper Discussion -Break (10 minutes)- 45 minutes Workshop -Break (10 minutes)- 45 minutes Write-up End Time 3:25	Workshop 3: Writing up the project	Loveless, T. (2016). The 2016 Brown Center report on American education: Trends in NAEP math, reading, and civics scores. Brookings Institution. Study for Final Exam Finalize final project
Final	Week 9 4/30	Start Time 12:45 45 minutes Individual, closed notes -Break (10 minutes)- 45 minutes Group, open notes -Break (10 minutes)- 45 minutes Group, reflection End Time 3:25	Final exam and project	Celebrate!

Groupwork Descriptions

Creating effective groupwork within a research project starts with forming balanced teams where members have complementary skills, backgrounds, and perspectives. Clearly define the group's objectives, goals, and deliverables to ensure everyone understands the project's purpose and their roles within it. Establishing clear communication channels is crucial, whether through regular meetings, online collaboration tools, or messaging apps. Setting ground rules for interaction, deadlines, and responsibilities helps in maintaining accountability and fostering a positive and productive group dynamic. Encourage open dialogue and active participation from all members to leverage diverse viewpoints and expertise, which can lead to more innovative and comprehensive outcomes. Effective management of groupwork involves ongoing monitoring and support to keep the project on track. Assign a group leader or coordinator to oversee progress, facilitate meetings, and resolve conflicts. Use project management tools like Gantt charts, task lists, and timelines to visualize progress and ensure that tasks are completed on schedule. Regular check-ins and progress reports help identify any issues early and provide opportunities for feedback and adjustments. Promote a collaborative and inclusive environment where each member feels valued and motivated. Address any conflicts or challenges promptly with a focus on constructive solutions and maintaining team cohesion. Recognize and celebrate milestones and achievements to keep the team motivated and engaged throughout the project.

Workshop

Students will work together in groups to accomplish a set task by leveraging a collaborative and structured approach. Initially, each group will establish clear objectives and divide the task into manageable components, assigning specific roles and responsibilities to each member based on their strengths and expertise. Regular group meetings will be scheduled to ensure consistent communication, allowing members to discuss progress, share insights, and address any challenges. Effective use of collaboration tools, such as shared documents and project management software, will facilitate coordination and track contributions. Encouraging an environment of mutual respect and active participation, students will provide constructive feedback to one another and collectively solve problems as they arise. By fostering a cooperative team dynamic and ensuring accountability, the group will efficiently work towards completing the task, leveraging diverse perspectives and skills to achieve a high-quality outcome.

Descriptions

Classwork Descriptions

Activity 1: Writing research questions

Writing research questions is a critical step in the research process. These questions guide the direction, focus, and scope of your study, shaping your research design, methodology, and analysis. A well-formulated research question

ensures that your research is purposeful, systematic, and meaningful. Here are key aspects to consider when writing research questions:

1. Clarity and Precision

- **Clear Language:** Use straightforward and unambiguous language. Avoid jargon and complex terms unless they are essential to the research context.
- **Specificity:** Define the scope of your question clearly. Vague questions lead to broad and unfocused research.

2. Researchable

- **Feasibility:** Ensure that the question can be answered with the resources, time, and data available to you.
- **Empirical Focus:** Formulate questions that can be answered through empirical evidence and research methods such as experiments, surveys, or data analysis.

3. Relevance

- **Significance:** Choose questions that address important issues in your field and contribute to existing knowledge.
- **Context:** Consider the broader context of your research. Your questions should align with current trends, debates, and gaps in the literature.

4. Scope

- **Manageable:** Ensure the question is narrow enough to be manageable within the constraints of your study but broad enough to allow for a comprehensive analysis.
- **Depth:** A good research question often leads to in-depth exploration and understanding of the topic.

5. Types of Research Questions

- **Descriptive:** Aim to describe the characteristics of a phenomenon or a population (e.g., "What are the key factors influencing job satisfaction among teachers?").
- **Comparative:** Compare two or more groups or variables (e.g., "How does the academic performance of students in online learning environments compare to those in traditional classrooms?").
- **Relational:** Explore relationships between variables (e.g., "What is the relationship between social media usage and mental health among teenagers?").
- **Causal:** Investigate cause-and-effect relationships (e.g., "What is the impact of exercise on reducing anxiety levels in adults?").

6. Formulating the Question

- **Literature Review:** Conduct a thorough review of existing literature to identify gaps and refine your question.
- **Pilot Studies:** Preliminary studies can help in testing the feasibility and refining the research question.
- **Feedback:** Seek feedback from advisors, peers, or experts to ensure your question is well-formulated.

Example of a Good Research Question:

- "How does the use of technology in the classroom affect the engagement and learning outcomes of elementary school students?"

Activity 2: Selecting a Theoretical Framework

Selecting a theoretical framework is a crucial step in the research process, as it provides a foundation for understanding and

interpreting your study. A well-chosen theoretical framework helps to structure your research design, guide your methodology, and frame your analysis and discussion. Here are key aspects to consider when selecting a theoretical framework:

1. Relevance to the Research Problem

- **Alignment:** Ensure that the theoretical framework aligns with your research problem and questions. It should help explain the phenomena you are studying.
- **Contextual Fit:** The framework should be appropriate for the context of your research, whether it's in education, sociology, psychology, or another field.

2. Comprehensiveness

- **Coverage:** Choose a framework that comprehensively covers the variables and concepts relevant to your study.
- **Depth:** The framework should allow for an in-depth exploration of the research problem, providing detailed insights.

3. Consistency with Existing Literature

- **Literature Review:** Conduct a thorough review of existing literature to identify commonly used theoretical frameworks in your field.
- **Theoretical Contribution:** Consider how the chosen framework contributes to and builds upon existing theories.

4. Clarity and Coherence

- **Clear Constructs:** The theoretical framework should have clearly defined constructs and relationships between them.
- **Logical Flow:** Ensure that the framework logically supports the development of your hypotheses or research questions.

5. Feasibility

- **Practicality:** Ensure that the framework can be practically applied within the scope of your study, considering available resources and data.
- **Flexibility:** The framework should be adaptable to potential changes in your research direction.

6. Types of Theoretical Frameworks

- **Grand Theories:** Broad and abstract theories that provide general principles (e.g., Structural Functionalism).
- **Middle-Range Theories:** More specific and focused theories that explain particular phenomena (e.g., Social Learning Theory).
- **Practice Theories:** Theories that provide practical guidelines for specific contexts (e.g., Nursing Theories).

7. Formulating the Framework

- **Identify Constructs:** Define the key constructs and variables that are central to your study.
- **Develop Relationships:** Specify the relationships between these constructs and how they will be measured.
- **Integrate Framework:** Integrate the framework into your research design, ensuring it informs your data collection and analysis methods.

Example of a Good Theoretical Framework:

- Using Social Cognitive Theory to examine how self-efficacy influences students' academic performance, considering factors such as motivation, behavior, and environmental influences.

Activity 3: Selecting a Methodology

Selecting a methodology is a fundamental step in the research process, determining the approach and techniques you will use to collect and analyze data. A well-chosen methodology ensures that your study is systematic, rigorous, and suitable for addressing your research questions. Here are key aspects to consider when selecting a methodology:

1. Research Questions and Objectives

- **Alignment:** Ensure the methodology aligns with your research questions and objectives. It should be appropriate for the type of data needed to answer your questions.

- **Purpose:** Consider whether your study aims to explore, describe, explain, or predict phenomena, as this will influence your methodological choice.

2. Nature of Data

- **Qualitative vs. Quantitative:** Decide whether qualitative, quantitative, or mixed methods are most suitable based on the nature of the data and the depth of analysis required.
- **Data Sources:** Identify potential sources of data, such as surveys, interviews, experiments, or archival records, and ensure they are accessible and reliable.

3. Feasibility

- **Resources:** Assess the resources available, including time, budget, and equipment, to determine the feasibility of the chosen methodology.
- **Expertise:** Ensure you have or can acquire the necessary skills and knowledge to implement the methodology effectively.

4. Ethical Considerations

- **Ethical Approval:** Ensure the methodology complies with ethical standards and obtain necessary approvals from relevant bodies.
- **Participant Welfare:** Consider the potential impact on participants and ensure their confidentiality, consent, and well-being.

5. Validity and Reliability

- **Internal Validity:** Choose methods that accurately measure what they are intended to measure.
- **External Validity:** Ensure the results can be generalized to other contexts or populations.
- **Reliability:** Select techniques that provide consistent and repeatable results.

6. Data Collection and Analysis

- **Collection Methods:** Choose appropriate methods for data collection, such as surveys, interviews, observations, or experiments.
- **Analysis Techniques:** Select suitable techniques for analyzing the data, such as statistical analysis for quantitative data or thematic analysis for qualitative data.

7. Iterative Refinement

- **Pilot Studies:** Conduct pilot studies to test and refine your methodology.
- **Feedback:** Seek feedback from peers, advisors, or experts to ensure the methodology is robust and well-designed.

Example of a Good Methodology:

- Using a mixed-methods approach that combines quantitative surveys to measure the prevalence of a phenomenon with qualitative interviews to gain deeper insights into participants' experiences.

Activity 4: Analysis of Data

The analysis of data is a critical phase in the research process, where collected data is systematically examined to extract meaningful insights and answer research questions. A thorough and well-planned data analysis ensures the reliability and validity of the study's findings. Here are key aspects to consider when analyzing data:

1. Preparation of Data

- **Data Cleaning:** Remove any errors, duplicates, or inconsistencies in the data to ensure accuracy.
- **Data Organization:** Organize the data in a structured format, such as spreadsheets or databases, making it easier to analyze.

2. Selection of Analytical Methods

- **Qualitative vs. Quantitative:** Choose analytical methods that align with the nature of your data. Qualitative data might require thematic or content analysis, while quantitative data often involves statistical techniques.
- **Software Tools:** Utilize appropriate software tools, such as SPSS, R, NVivo, or Excel, to facilitate the analysis.

3. Descriptive Analysis

- **Summary Statistics:** Calculate measures such as mean, median, mode, and standard deviation to summarize the data.
- **Visualization:** Use charts, graphs, and tables to visually represent the data, making patterns and trends more apparent.

4. Inferential Analysis

- **Hypothesis Testing:** Conduct tests such as t-tests, chi-square tests, or ANOVA to determine if there are significant differences or relationships within the data.
- **Regression Analysis:** Use regression techniques to identify and quantify relationships between variables.

5. Qualitative Analysis

- **Coding:** Assign codes to segments of qualitative data to categorize and identify themes.
- **Thematic Analysis:** Identify recurring themes, patterns, and concepts within the qualitative data to provide deeper insights.

6. Ensuring Validity and Reliability

- **Triangulation:** Use multiple data sources or methods to cross-verify the findings and ensure robustness.
- **Inter-Rater Reliability:** In qualitative research, ensure consistency in coding by having multiple researchers code the same data and comparing results.

7. Interpretation of Results

- **Contextual Understanding:** Interpret the findings within the context of your research questions and theoretical framework.
- **Implications:** Discuss the implications of the findings for the field of study, policy, or practice.
- **Limitations:** Acknowledge any limitations of the analysis and suggest areas for future research.

8. Reporting and Presentation

- **Clear Presentation:** Present the findings in a clear, logical, and concise manner, using appropriate visual aids and narratives.
- **Link to Research Questions:** Ensure the results directly address the research questions and objectives outlined in the study.

Example of a Good Data Analysis:

- Conducting a mixed-methods analysis where quantitative survey results are statistically analyzed to identify trends, followed by qualitative interviews to explore underlying reasons for these trends.

Reflection Descriptions

Effective reflection on what you have learned to put it into practice involves a structured and intentional approach. Start by setting aside dedicated time to think critically about your experiences and the knowledge gained. Identify key takeaways and insights, considering how they align with your goals and objectives. Use reflective tools such as journals, mind maps, or discussions with

peers to organize your thoughts and deepen your understanding. Evaluate the practical applications of your new knowledge by considering real-world scenarios where it can be applied. Set specific, actionable goals for incorporating these insights into your practices, and develop a plan to monitor your progress. Regularly revisit and revise your reflections to ensure continuous improvement and adaptation. Engaging in this reflective process helps to transform theoretical knowledge into practical skills, enhancing both personal and professional development.

Additional Readings [for enrichment]

Week 1

- Wright, C. E. (2023). Methods Matter: Learning from Institutional Ethnography and Intersectionality to Inform Interview Research Methods for Social Justice in STEM Education. *Journal of Women and Minorities in Science and Engineering*, 29(4).
- Marsh, D., & Furlong, P. (2002). A skin not a sweater: Ontology and epistemology in political science. *Theory and methods in political science*, 2(1), 17-41.

Week 2

- Azizova, Z. T., & Felder, P. P. (2017). Understanding racial/ethnic meaning making: Narrative analysis of STE [A] M doctoral student experiences. *Studies in Graduate and Postdoctoral Education*, 8(2), 144-168.
- Bosman, L., Chelberg, K., & Duval-Couetil, N. (2019). Using photovoice to enhance mentoring for underrepresented pre-engineering students. *International Journal of Engineering Education*, 35(1), 323-332.

Week 3

- Tan, E., & Barton, A. C. (2017, October). Designing for rightful presence in STEM-rich making: Community ethnography as pedagogy. In *Proceedings of the 7th Annual Conference on Creativity and Fabrication in Education* (pp. 1-8).
- Lucht, P. (2016). De-Gendering STEM-Lessons Learned From an Ethnographic Study of a Physics Laboratory. *International Journal of Gender, Science and Technology*, 8(1), 67-81.

Week 4

- Strunk, K. K., & Simpfenderfer, A. D. (2024). Queer Quantitative Methodologies in Educational Studies: Introduction to the Special Issue. *Educational Studies*, 60(1), 1-4.
- Pearson, M. I., Castle, S. D., Matz, R. L., Koester, B. P., & Byrd, W. C. (2022). Integrating critical approaches into quantitative STEM equity work. *CBE—Life Sciences Education*, 21(1), es1.

Week 5

- Guan, N. H., Bunyamin, M. A. H., & Khamis, N. (2020). Perspectives of STEM education from physics teachers' points of view: A quantitative study. *Universal Journal of Educational Research*, 8(11).
- Ralph, V. R., Scharlott, L. J., Schafer, A. G., Deshayes, M. Y., Becker, N. M., & Stowe, R. L. (2022). Advancing equity in STEM: The impact assessment design has on who succeeds in undergraduate introductory chemistry. *JACS Au*, 2(8), 1869-1880.

Week 6

- Nasri, N., Rahimi, N. M., Nasri, N. M., & Talib, M. A. A. (2021). A comparison study between universal design for learning-multiple intelligence (Udl-mi) oriented stem program and traditional stem program for inclusive education. *Sustainability*, 13(2), 554.
- Hanssens, J., Langie, G., & Van Soom, C. (2023). Students' perceptions of low stakes positioning tests at the start of higher STEM education: A mixed methods approach. *International Journal of Education in Mathematics, Science and Technology*, 11(5), 1094-1112.

Week 7

- Morgan, A., Smaldone, D., Selin, S., Deng, J., & Holmes, M. (2022). Adding relevancy to STEM interest through adventure education: A mixed methods study. *Interdisciplinary Journal of Environmental and Science Education*, 18(4), e2294.
- Bieri Buschor, C., Berweger, S., Keck Frei, A., & Kappler, C. (2014). Majoring in STEM—What accounts for women's career decision making? A mixed methods study. *The Journal of Educational Research*, 107(3), 167-176.