



Graduate Handbook

PhD in Engineering, Specialization in Engineering Education Research

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Engineering Education Research: Graduate Student Handbook

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I. Handbook Objectives

This handbook serves as supplement to the UNL Graduate Studies Policies document <https://catalog.unl.edu/graduate-professional/> and the College of Engineering Graduate Student Handbook <https://engineering.unl.edu/graduate-programs/current-students/student-resources/>. This handbook only articulates the policies that are unique to the PhD in Engineering - Specialization in Engineering Education Research program. UNL Graduate Studies manages policies concerning timelines for establishing the Program of Studies and the Supervisory Committee and other Doctoral Degree Steps to Completion <https://www.unl.edu/gradstudies/academics/program-steps/doctoral-degree-steps-to-completion>.

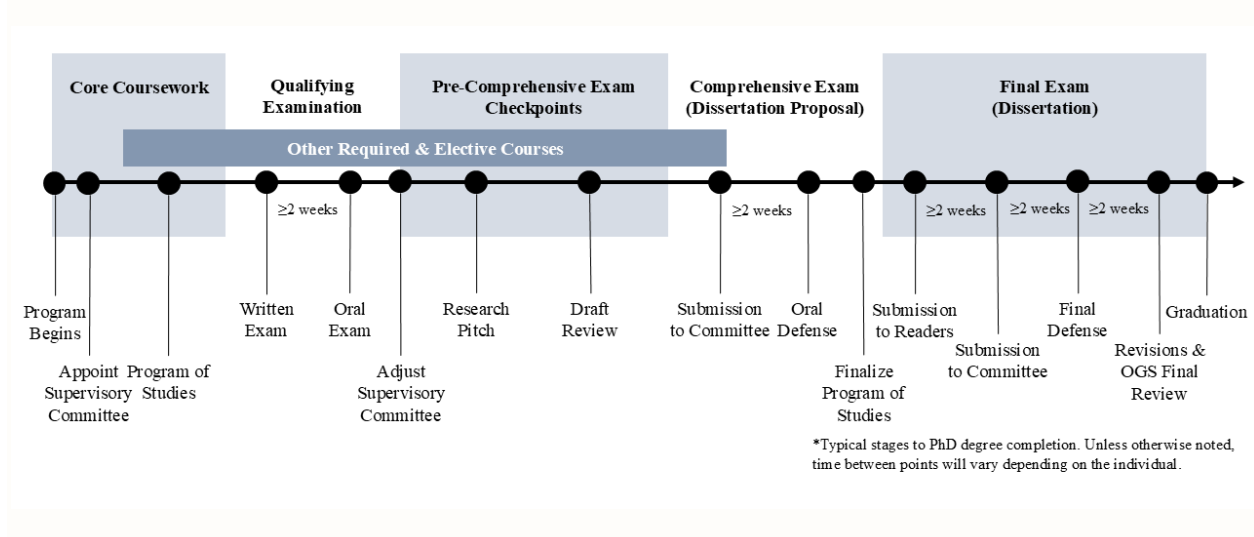
II. Doctoral Overview

The completion of requirements of the **PhD in Engineering - Specialization in Engineering Education Research** program confers the degree of Doctor of Philosophy (PhD).

Upon graduation, students will be able to:

- employ rigorous research skills to critique and make significant contributions to engineering education theory, practice, and policy within an engineering discipline
- design, implement, and assess research-based pedagogies, curricula, and assessment strategies within and across engineering disciplines and other STEM disciplines.
- lead, communicate, enact the creative spirit, and work in diverse teams to change education within and across engineering disciplines and other STEM disciplines.
- be an active member in the vibrant local (DBER Group), national (e.g., American Society for Engineering Education), and international (e.g., European Society for Engineering Education, Australasian Association for Engineering Education) community of engineering education researchers with a rich history (Engineering Education Pioneers)
- promote access to engineering and engineering education for all

An overview of the doctoral degree program is shown below. Details concerning each milestone are discussed in the sections that follow.



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III. Supervisory Committee

A chair is assigned as part of the admissions process. This assignment is based on mutual research interests and funding availability.

The PhD student's Supervisory Committee shall consist of at least four members (as per [UNL Graduate Studies Policies on the Supervisory Committee](#)). At least three members (i.e., the chair (or one co-chair) and two other members) must be classified as a College of Engineering Discipline-Based Education Research (DBER) faculty member (<https://dber-engr.unl.edu/about/faculty/>). At least one Graduate Faculty member external to the PhD in Engineering - Specialization in Engineering Education Research program, but within the University of Nebraska Graduate College, must be included on the committee to serve as the Outside Representative. In addition, a committee member external to UNL may be advisable to provide expertise that is lacking at UNL.

Each committee member should, at a minimum, be a resource for guidance and support during the whole dissertation process. Students are encouraged to select committee members who can offer expertise in different areas relevant to the dissertation (e.g., theory, methods, topic area). Students should meet with potential committee members prior to adding them to their committee. In this meeting, students should discuss their dissertation direction as well as committee members' availability, desired level of involvement, and expectations around providing feedback.

To initiate a change of chair, request a conversation with the EER Graduate Program Chair. The EER Graduate Program Chair will decide on the next appropriate steps to work with all parties. If all parties are in agreement, the Graduate Committee will endorse the change. If not, a neutral member of the Graduate Committee will be assigned to assist with negotiations. The COE Associate Dean of Graduate Education will be involved on an as-needed basis.

IV. Program of Studies

The minimum course requirements for the PhD in Engineering - Specialization in Engineering Education Research are listed in Table 1. The Program of Study requires a **minimum** of 90 credit hours.

Transfer credit hours may be added to the Program of Study. These must be graduate level courses with a grade of B or better. Seminar courses and research credits hours may not be transferred and included on the Program of Study. Refer to UNL Graduate Studies Policies document for additional details (<https://catalog.unl.edu/graduate-professional/>).

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Table 1. Minimum Requirements

Courses	Credit Hours
EER Specialization: (9 credit hours)	
ENGR 824: Unique Concerns of Engineering Education	3*
ENGR 833: Evidence-Based STEM Teaching	3
ENGR 834: Framing STEM Education Research	3*
Research Methods Emphasis (see below)	12*
Other Core Courses: (5 credit hours)	
ENGR 801 & 802: EER Seminar I and II	2
ENGR 844: Theory in STEM Education Research	3
Electives (8XX and 9XX course numbers, not seminars)	6 minimum
Engineering Discipline Courses (non-thesis/dissertation credits)	12
Research/Dissertation (ENGR 999)	12 minimum
Transfer Credit Hours	As approved
TOTAL MINIMUM (with transfer credits)	90

* A grade of B or better is required for ENGR 824, ENGR 834, ENGR 844, and the entry level qualitative and quantitative methods courses counting towards the Research Methods Emphasis. A student failing to receive the minimum acceptable grade may not continue their EER program of study without permission of the EER Graduate Committee which may require a special examination to determine the student's qualifications to proceed. Failure to earn required grades will result in academic action to terminate the student's EER program as per [Graduate and Professional Catalog - Procedure for Academic Action](#)

A. EER (Engineering Education Research) Specialization Courses

The specialization in engineering education consists of 9 credits that are intended to introduce students to fundamental topics in engineering education. The specialization required courses, along with their descriptions are:

- **ENGR 824: Unique Concerns of Engineering Education (3 cr hr)**
The purposes and contexts of engineering education will be illuminated through readings and discussions of its historical roots, current expressions, and future directions. Discussions will delve into the history and trajectory of engineering education and concerns that are uniquely engineering (e.g., engineering design, diversity and inclusion).
- **ENGR 833: STEM Teaching (3 cr hr)**
This learning experience is designed to provide graduate level training on teaching at the postsecondary level. Evidence-based teaching methods applicable to Science, Technology, Engineering, and Mathematics (STEM) will be investigated and a learner-based pedagogy will be used to engage those in the course to experience STEM practices. The common element of problem solving is emphasized across all STEM disciplines allowing for discovery, exploration, and application of critical thinking skills. Primary tasks include developing a unit on Canvas that includes learning outcomes, lecture and activities, and assessments, a teaching philosophy, and engaging with technologies that support and enhance teaching and learning.

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- **ENGR 834: Framing STEM Education Research (3 cr hr)**

Introduction to the basic types of research study designs (quantitative, qualitative, and mixed methods) through examples in STEM education. Learn to identify an educational problem in STEM education, pose a research question, and support the need for a study through literature review. Become familiar with how theories of learning and thinking are used to predict or explain research findings. Become familiar with the protection of human subjects and gain certification for human subjects research.

B. Research Methods Emphasis

Research methods coursework must be taken to provide depth in a particular approach while providing exposure to the breadth of common approaches. The emphasis of coursework is to be selected to support dissertation work and career goals. The listed coursework for the emphases should be considered as minimums. Students are encouraged to take additional courses to support their dissertation work and career goals.

Quantitative Emphasis. For those seeking to build depth in quantitative research methods, 12 credit hours must be taken with 6 credit hours of statistical methods, 3 credit hours of measurement, and 3 credit hours of qualitative methods.

Qualitative Emphasis. For those seeking to build depth in qualitative research methods, 12 credit hours must be taken with 6 credit hours of qualitative methods, 3 credit hours of statistical methods, and 3 credit hours of measurement.

Mixed Methods. For those seeking to learn to effectively combine quantitative and qualitative research methods, 3 credit hours of statistical methods, 3 credit hours of measurement, 3 credit hours of qualitative methods, and 3 credit hours of mixed methods research. Refer to the Mixed Methods Research Certificate for relevant courses:

<https://www.unl.edu/gradstudies/academics/programs/MMRS-GCER>.

The entry level courses that can be used for both the quantitative, qualitative, and mixed-methods emphases are as follows:

- Statistical Methods: EDPS 859: Statistical Methods (3 cr hr)
- Qualitative Methods: EDPS 900K Qualitative Approaches to Educational Research 1
- Measurement: EDPS 870 Introduction to Educational and Psychological Measurement 1

C. Other Core Courses

- **ENGR 801: EER Graduate Seminar I (1 cr hr)**

Explore EER career paths; identify necessary knowledge, skills, and abilities; and plan an aligned graduate student experience. Become familiar with the professional norms and ethical principles and practices related to research. Build one's academic community networks (e.g., DBER, engineering discipline). Develop oral communication skills appropriate for EER. Develop reflexive ability to make meaning of graduate experiences.

- **ENGR 802: EER Graduate Seminar II (1 cr hr)**

Advance critical research reading and debate skills. Continue to build one's academic community networks (e.g., DBER, engineering discipline). Continue to develop oral communication skills appropriate for EER. Continue to develop reflexive ability to make meaning of graduate experiences.

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- **ENGR 844: Theory in STEM Education Research (3 cr hr)**

Introduction to theories relevant to STEM education research. Differentiate and connect the roles of theoretical and conceptual frameworks in STEM education research. Become familiar with how to read, discuss, synthesize, critique, communicate, and apply theory in the context of a STEM education research study.

D. Engineering Courses

Advanced coursework in an engineering discipline provides context for the research performed in engineering education. Twelve credit hours of 800 or 900 level coursework in engineering are required. These courses may be transferred as per the rules outlined in the UNL [Graduate and Professional Catalog - Transfer Credit](#).

E. Electives

A minimum of 6 additional credit hours of coursework should be selected to support completion of the dissertation and career goals. The electives should be discussed with student's advisor. Electives are intended to substantively support interests, career goals, and dissertation work; elective courses may not be seminar courses. Additional coursework may be necessary to build sufficient capacity for a particular dissertation topic, expertise development, or career path.

F. Research/Dissertation (ENGR 999)

A minimum of 12 credits of dissertation hours with the student's advisor are required. Students and their advisor must complete an ENGR 999 contract before the end of the second week of classes. A new ENGR 999 contract must be completed for each semester a student is enrolled in ENGR 999 credits. The advisor must keep a record of all ENGR 999 contracts.

V. Supervisory Committee and Program of Studies

Program of Study and Supervisory Committee Forms as per the Office of Graduate Studies' Doctoral Degree Steps to Completion must be submitted prior to the Declaration of Intent to take the Qualifying Exam.

VI. Qualifying Examination

The purpose of the qualifying exam is to determine whether a student has acquired the foundational skills necessary to complete dissertation work. Through this exam, students will be expected to demonstrate:

- Basic research skills for independent research
- General knowledge of the engineering education field
- Written and oral communication skills appropriate for education research

Students are required to complete the qualifying exam following the completion of these required courses: ENGR 824, ENGR 834, ENGR 844, EDPS 859 (Statistical Methods), and EDPS 900K at the time of the first available Qualifying Exam offering. These courses must be completed with a grade of B or better to take the qualifying exam. Full-time students who start in a Summer or Fall semester must complete the qualifying exam by the end of their second Fall semester. Full-time students who start in the Spring semester must complete the qualifying exam by the end of their second Spring semester.

The Qualifying Exam will be written, administered, and evaluated by an Examining Committee. This committee will consist of three UNL DBER faculty members selected by the EER Graduate

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Committee. One member will serve as the chair and be the student's point of contact. The chair(s) of the student's Supervisory Committee will not serve on this committee.

A. Exam Timeline

Declaration of Intent & Required Documentation to Proceed	<p>The Qualifying Examination is offered twice a year, either prior to the start of classes in Fall or Spring. The written portion of the exam must start between July 20 and August 7 for a Fall exam or January 2 and January 15 for a Spring exam. Students intending to take the exam in August must submit their required documents to the EER Graduate Chair by April 15. Students intending to take the exam in January must submit their required documents to the EER Graduate Chair by October 1.</p> <p>Students must assemble, in consultation with the chair(s) of their Supervisory Committee, the following documents and submit them to the EER Graduate Chair.</p> <ol style="list-style-type: none">1. Unofficial transcripts that show the course requirements for the Qualifying Exam have been or will be met in the current semester2. Program of Study Form and Supervisory Committee Form as per the Office of Graduate Studies' Doctoral Degree Steps to Completion. These forms must be approved by the EER Graduate Chair and submitted to the Office of Graduate Studies prior to the start of the Qualifying Exam.3. One written document that includes these items:<ul style="list-style-type: none">• Desired start date of the written portion of the Qualifying Exam• List of three distinct areas of research interest, each with a paragraph summarizing:<ul style="list-style-type: none">○ The problem○ Your interest in this area○ Any work you have done in this areaThese topics will be considered by the Examining Committee when formulating the student's exam. Areas should be new to the student and should not overlap with their paid research assistantship, coursework projects, or research completed prior to entering the program.• Written response to the following question: What are your career plans upon degree completion?• List of papers written for coursework, nature of the work with your advisor, and topics explored prior to entering the program.
Written Exam	Students will be given a 2-week window to complete the written portion of the qualifying exam. Details below.
Oral Exam	Following the submission of the written exam, students will engage in the oral portion of the exam. The time/date will be set as agreed upon by the student and their Examining Committee but must be completed at least two weeks but no more than four weeks after the written portion is submitted. Details below.
Exam Results	The outcome of the exam will be delivered to the student at the conclusion of the oral exam.

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B. Written Exam

The written exam consists of two tasks: a research proposal and a research paper critique. These tasks will be emailed to you at the beginning of the exam period via the student's husker email address.

For further details see the Appendix.

C. Oral Exam

The oral exam will be scheduled for 2 hours. This is a closed-door examination attended by the student and the Examination Committee. The student will deliver a 15-minute presentation overview of their proposal and paper critique. The presentation will be followed by a 105-minute question-and-answer session and discussion of exam results.

For further details see the Appendix.

D. Expected Behavior During the Exam

This exam is an individual exam. During the exam, the student may ask clarifying questions of the Examining Committee chair. The use of other resources is described in the Appendix.

Once the qualifying exam is released to the student, the student, at a minimum, must submit a completed Paper Critique and an outline for each of the three sections of the research study proposal. Failure to do so will result in academic action to terminate the student's EER program as per [Graduate and Professional Catalog - Procedure for Academic Action](#).

E. Outcomes

The Examining Committee will use a rubric (see Appendix) to evaluate the written and oral portions of the exam. The exam result is either pass, partial pass, or fail. The result will be shared with the student at the end of the Oral Exam and in a letter from the Examining Committee Chair. Committee feedback will be shared with the chair(s) of the student's Supervisory Committee.

A student who passes is able to continue in the EER program.

A **partial pass** outcome indicates that the student demonstrated weaknesses in some critical areas. A student whose exam result is a partial pass will be offered an opportunity to revise their original written exam submission for the critique or proposal. The reprise of the first attempt at the Qualifying Exam must be completed prior to the end of the second semester following the first attempt. All EER Graduate Handbook rules regarding Declaration of Intent, Required Documentation to Proceed, and the Written Exam apply. The Oral Exam will be 1 hour. The student will deliver a 15-minute presentation overview of their revisions and learning since the first exam attempt. The presentation will be followed by a 45-minute question-and-answer session and discussion of exam results. The exam result is either pass or fail.

A student that fails may take the exam a second time. The student must take the exam a second time no later than one year later. All EER Graduate Handbook rules regarding Declaration of Intent & Required Documentation to Proceed, Written Exam, and Oral Exam apply. *Two new and distinct areas of research interest* must be submitted with the Required Documentation to Proceed. The exam result is either pass or fail. If the second exam result is a fail to pass, the EER

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Graduate Chair will issue a recommendation of termination of the degree program. Procedures outlined here will be followed: <https://catalog.unl.edu/graduate-professional/policies/academic-program-requirements/#text>

VII. Pre-Comprehensive Exam Checkpoints

The purpose of the pre-comprehensive exam checkpoints is to provide the student with an opportunity to get feedback relative to the proposed dissertation topic including scope, feasibility, and alignment. The Research Pitch can be scheduled after the student completes the qualifying exam. Students are encouraged to schedule the Research Pitch before significantly developing their dissertation proposal.

Research Pitch – The student will write a 3-page single spaced full sentence outline proposal plus references (not included in the 3-page limit). This proposal must include an introduction (big picture), background, possible theories, gap, research questions, and methods (participants and data collection) section on the students proposed dissertation project. The Research Pitch should be written using the claim, evidence, warrant model (see template in Appendix). After being approved by the supervisory committee chair, the pitch should be emailed to the Supervisory Committee and should include a scheduling poll link for a 50-minute meeting with the entire committee for dates two to three weeks after submission.

Draft Review – Following the successful completion of the Research Pitch and pending approval of the Supervisory Committee Chair, the student must submit a draft of Chapters 1-3 (see VIII.B Written Exam) for feedback and discussion to the Supervisory Committee. Committee members should be allowed 2 weeks to review the draft prior to the first scheduled meeting. The draft review consists of the following steps:

- Student arranges a 30-minute meeting with each committee member to get feedback
- Student writes a summary of major revisions discussed with committee members and discusses with their Chair
- The Chair sends the revised list to all committee members for email approval
- The Chair returns the final approved list to student

The Comprehensive Exam can be scheduled upon successful completion of the draft review, pending approval of the Supervisory Committee Chair.

VIII. Comprehensive Examination & Candidacy

For the Comprehensive Examination, the student will be required to write and orally defend a research proposal describing their dissertation research. Research proposals consist of the first three chapters of the students' dissertation (see VIII.B Written Exam). There is no page limit for this document – students are encouraged to be concise but thorough.

This exam should be completed prior to significant data collection. However, the student is encouraged to pilot their data collection protocol, collect validity evidence (quantitative study), and/or draft any intervention(s) (as appropriate) prior to submitting the proposal. The Supervisory Committee must be given sufficient time to provide input on or redirect the dissertation work before significant data collection occurs.

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A. Exam Timeline

Declaration of Intent & Required Documents to Proceed	<p>The student will notify the EER Graduate Chair of their intent to complete the Comprehensive Exam and send the required documents. The Supervisory Committee Chair should be copied on the email. Students must assemble, in consultation with the chair(s) of their Supervisory Committee, the following documents and submit them to the EER Graduate Chair four weeks prior to the exam.</p> <ul style="list-style-type: none">• Unofficial transcripts• CV• Draft of Application for Admission to Candidacy form
Written Exam	<p>The Supervisory Committee Chair must approve the proposal document prior to notifying the Committee and scheduling a date for the exam. The date must be scheduled at least four weeks in advance.</p> <p>The written proposal must be submitted to the Supervisory Committee Chair at least two weeks prior to the date of the oral defense of the proposal. The Chair will then distribute the proposal to the Supervisory Committee if the proposal is acceptable.</p>
Oral Exam	<p>Following the submission of the written exam, the student will engage in the oral portion of the exam. The time/date will be set as agreed upon by the student and their Supervisory Committee but must be completed at least two weeks after the written portion is submitted.</p>
Exam Results	<p>The outcome of the exam will be delivered to the student at the conclusion of the oral exam.</p>

B. Written Exam

The written exam will consist of at least the first three chapters of the dissertation. At a minimum, the these chapters should included:

1. Chapter 1: Introduction
 - a. Problem Statement | Motivation | Significance
 - b. Research Questions and/or Hypotheses
2. Chapter 2: Literature Review
 - a. Literature Review
 - b. Theoretical and Conceptual Frameworks
3. Chapter 3: Methods
 - a. Methodology (if qualitative study) or Study Design Justification (Quant)
 - b. Setting and Participants
 - c. Intervention (if applicable)
 - d. Data Collection
 - e. Data Analysis
 - f. Quality Measures as appropriate for methods
 - g. Timeline and Contingency plans

C. Oral Exam

The oral exam will be scheduled for 2 hours. This is a closed-door examination attended by the student and their Supervisory Committee. The student will deliver a 20-minute presentation overviewing their proposal and how they responded to feedback in the Draft Review stage. The presentation will be followed by a question-and-answer session. During this period, the Supervisory Committee will first meet without the student to discuss the student's proposal and

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oral presentation. The student will then be invited back to into the room for a discussion with the Supervisory Committee. Once the discussion has ended, the student will be asked to leave the room, and the Supervisory Committee will determine the outcome. The student will be invited back into the room for their exam result.

D. Outcomes

The Supervisory Committee will evaluate the written and oral portions of the exam. The exam result is either pass or major revisions needed.

If the student passes, the student may submit the “Application for Admission to Candidacy” for the doctoral degree, noting the dates of completion for the comprehensive examination(s).

If major revisions are requested (revisions necessary to collect and analyze data), the student will receive a letter outlining revisions necessary. The student will be asked to revise their proposal and provide a response back to their Supervisory Committee about how they addressed each revision request (a similar format to manuscript revisions). The “Application for Admission to Candidacy” will be signed by the committee once satisfactory revisions have been made.

IX. Dissertation and Final Oral Examination

In the semester prior to defending the dissertation, the Candidate should become familiar with the timeline and details of requirements laid out by the Office of Graduate Studies.

In the semester prior to defending the dissertation, the Candidate must update their Program of Study to reflect coursework actually completed. A list of changes to the approved Program of Study must be sent in an email the EER Graduate Chair who will review the changes and forward them to the Office of Graduate Studies.

For the dissertation defense, the Candidate will be required to prepare a written dissertation and orally defend the dissertation. The contents of the dissertation will be determined by the Supervisory Chair(s) and confirmed by the Supervisory Committee. When considering the defense timeline, the Candidate should plan on a minimum of two weeks to make revisions to the dissertation after the oral exam.

Four weeks prior to the intended dissertation defense date, the candidate must submit their written dissertation to the two readers on the supervisory committee.

Two weeks prior to the date scheduled for the final oral examination, an announcement must be prepared by the Candidate. This announcement should include: the dissertation title; the name of the Candidate and the Chair/Co-Chair of the Candidate’s committee; a short (approximately 250 word) abstract; and the time, date, and location of the oral examination. This announcement must be sent to the EER Graduate Chair for dissemination.

The final oral examination for the doctoral degree is two hours in length. The first hour is open to members of both the University community and the public. During the dissertation presentation and general questioning, all persons may be present. The second hour is closed with only the Candidate and Supervisory Committee present. During this period, the Supervisory Committee will first meet without the Candidate to discuss the Candidate’s dissertation and oral presentation. The Candidate will then be invited back into the room to participate in a discussion with the Supervisory Committee. Once the discussion has ended, the Candidate will be asked to leave the room, and the Supervisory Committee will determine the outcome. Then, the Candidate will be invited back into the room for their exam result.

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A. Outcomes

The Supervisory Committee will evaluate the dissertation and oral presentation. For possible outcomes, candidates should refer to the UNL Graduate Studies Policies document: <https://catalog.unl.edu/graduate-professional/graduate/>

If minor or major revisions requested for the dissertation, the Candidate will be asked to revise their dissertation and provide a response back to their supervisory committee about how they addressed each revision request (a similar format to manuscript revisions).

IX. EER Annual Evaluation

Students must complete an EER Annual Evaluation package, due to their Supervisor Committee Chair(s) one week before the start of the Spring semester. Students and their Supervisor Committee Chair(s) should discuss the Annual Evaluation by January 31st. The Supervisor Committee Chair(s) should submit the package to the EER Graduate Chair by February 1st.

The Annual Evaluation package consists of these elements:

- EER Graduate Student Progress Report. (see template) <https://dber-engr.unl.edu/graduate-resources/>
- Individual Development Plan <https://www.unl.edu/gradstudies/professional-development/individual-development-plan> (Select either Online IDP tool STEM or Humanities & Arts). A (revised) skills, interest, values assessment should be conducted each year and SMART goals updated to reflect goals for the coming year.
- CV (see template <https://dber-engr.unl.edu/graduate-resources/>)
- Unofficial transcript from MYRED <https://myred.nebraska.edu/>

X. Vacation Policy for Students on Assistantships

All vacations and leaves must be planned in advance and approval obtained from the student from their Chair. There are many times when a student's presence is absolutely necessary for the proper conduct of research. Conflicts can be avoided by careful and advanced planning. **School breaks such as Christmas, Thanksgiving, and Spring Break are work periods**, except for days declared as official University holidays (<https://nebraska.edu/faculty-and-staff/resources/holidays>). Beyond the official University holidays, students are allowed up to 10 workdays of vacation. When going on vacation or leave, a telephone number and/or address should always be left with the student's Chair.

Appendices For EER Qualifying Examination

EER Qualifying Examination - Template

WRITTEN EXAM PERIOD (2 weeks):

- Start: Day, Date, 12 pm.
- End: Day, Date, 12 pm.
- Format: 12-point font Times New Roman, 1-inch margins, double spaced
- **UPON COMPLETION:** Email your exam to your Examining Committee chair

ORAL EXAM (120 minutes): Day, Date, Time

Examining Committee: X (chair), Y, and Z

Summary

The Engineering Education Research (EER) qualifying exam consists of two parts: a written portion that is completed over the course of 2 weeks and an oral exam that is completed 2-4 weeks after the written exam has been submitted.

Written Exam

The written exam consists of two tasks: a research proposal and a research paper critique. These tasks will be emailed to you at the beginning of the exam period via your husker email address.

(1) Research Proposal

The research proposal topic below is provided by the EER Examination Committee. **Your research proposal must not exceed 15 double-spaced pages in length (without references).**

TOPIC: Propose a focused study on the topic of XXX.

Scope – a researcher should be able to complete the study in 12-18 months.

DO NOT include IRB information. A full interview protocol or survey instrument are not required; rather *sample* questions/items with indications of how these might be generated and deemed appropriate are preferred.

(2) Paper Critique

Prepare a full paper critique on a published study that you identify while conducting your literature review for the research proposal. The selected study must use the opposite research method of your research proposal (for example: if your research proposal is a quantitative study, you must find a qualitative study for the critique). High-tier journals (e.g., JEE) and high-quality conference papers will not be accepted. **You must submit the paper you want to critique to the Examining Committee Chair within the first week of your written exam.**

Your written critique must not exceed 10 double-spaced pages in length (without references).

Allowable Resources

You may use any course materials, course papers, journal papers, books, or other written resources you like in the completion of this exam. As appropriate, you may include materials written previously by you for classes, publications, etc. If you re-use your own material, make sure it is properly cited.

You may not discuss your ideas and thoughts with your Examining Committee Members, Supervisory Committee Members, and any graduate students enrolled in the PhD in Engineering

EER Qualifying Examination - Template

– *Specialization in EER program.* Discussions with others are allowed but keep in mind that this exam is intended to reflect your own thinking; therefore, you must cite appropriately any conversations that have affected your thinking. When you have conversations about this exam with others, you must disclose that this is related to your EER Qualifying Exam and share a copy of the exam with them. Document all of your formal conversations on a separate page and include this list as an appendix to the exam. The document should include the date of your conversation, the name and department of the person you talked with, and your main topics of conversation.

You may use the writing center to help with your writing organization and style. If you do use this resource, please provide a copy of your appointment confirmation in an appendix to your final submission.

Questions

If you have any questions about the exam or other concerns, please direct them to your Qualifying Examining Committee Chair via email, who will relay them to the other committee members for discussion as needed. Questions will be responded to within 24 hours on business days and by noon on Monday for any questions received Friday through Sunday.

Oral Exam

The oral exam will be scheduled for 2 hours. This is a closed-door examination attended by the student and the Examination Committee. You will deliver a 15-minute presentation overview of their proposal and paper critique. *Briefly* present the following without presenting your entire written work:

- Paper Critique – Overall strengths and weaknesses as if presenting to an editorial board (2 slides max)
- Research Proposal – Gap in literature, overview of research plan, and alignment across proposal components (3 slides max)
- Process and Decision Making – Discuss your process and decision points that you encountered during your exam (3 slides max)

The presentation will be followed by a 105-minute question-and-answer session. During this session, the Supervisory Committee will first meet without you to discuss your proposal and oral presentation. You will then be invited back into the room for a discussion with the Supervisory Committee. Once the discussion has ended, you will be asked to leave the room and the Supervisory Committee will determine the outcome. You will be invited back into the room for your exam result.

Assessment

The paper critique and research proposal will be assessed using standard rubrics (see the EER Graduate Student Handbook Appendix). Please ensure all points are addressed within your exam. Citations must be in APA 7 format.

EER Qualifying Examination – Research Proposal Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
Write a quantitative or qualitative research paper title appropriate for the research method	There is considerable confusion about what belongs in a paper title OR There is no title	1 of the title elements is not sufficiently provided	Provide a paper title that: <i>Quantitative Study</i> <ul style="list-style-type: none"> reflects the major independent and dependent variables reflects a comparison among groups or a relationship among variables (as appropriate for the study) conveys the participants and/or site of the study <i>Qualitative Study</i> <ul style="list-style-type: none"> reflects the central phenomenon being studied conveys the participants and/or site of the study, as appropriate
Write a clear argument for the knowledge gap your study will address (problem statement)	There is considerable confusion about what belongs in a knowledge gap OR There is no knowledge gap	1 of the knowledge gap elements is not sufficiently provided	Knowledge Gap / Problem Statement includes: <ul style="list-style-type: none"> identifies an educational issue/problem to study provides sufficient motivation for study with evidence (with citations) that this issue is important (to whom and why) establishes a compelling need for the study uses a claim-evidence-warrant structure when claims are made (This should be multiple paragraphs.)
Write clear quantitative or qualitative research purpose	There is considerable confusion about what belongs in a research purpose OR there are no research purpose	1 of the research purpose elements is not sufficiently provided	Research purpose (typically 1 - 3 sentences) includes: <i>Quantitative Study</i> <ul style="list-style-type: none"> presents the point of the study with reference to the central phenomena presents a clear research purpose that includes the variables, their relationship, participants, and site of the study <i>Qualitative Study</i> <ul style="list-style-type: none"> presents the point of the study with reference to the central phenomena presents a clear research purpose that includes the participants and site of the study <i>Both</i> <ul style="list-style-type: none"> conveys who the audience(s) are and what the audience(s) should or could do with the results of this study Is well-aligned with the purpose, need for the study, conceptual framework, theoretical framework, and methods

EER Qualifying Examination – Research Proposal Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
Write a clear literature review	There is considerable confusion about what belongs in a literature review OR There is no literature review	1 of the literature review elements is not sufficiently provided OR literature described on a per study basis and not thematically	Literature review: <ul style="list-style-type: none"> provides necessary background for the research study while being selective synthesizes literature (does not simply provide review of other studies but makes meaning of them in the context of the proposed study; organized by themes, not authors) justifies how the literature informs the present research study
Link appropriate theory or theoretical framework to study	There is considerable confusion about what constitutes a theory or theoretical framework OR There is no theory or theoretical framework	1 of the theory or theoretical framework elements is not sufficiently provided	The theory or theoretical framework includes: <ul style="list-style-type: none"> a description of one or more theories that explains the relationships between the study concepts definitions based on the literature of terms and key concepts or theories, as necessary for readability Is well-justified and well-aligned with conceptual framework, need for study, research purpose, research questions, and methods
Write a clear conceptual framework	There is considerable confusion about how to piece together a conceptual framework OR There is no conceptual framework	1 of the conceptual framework elements is not sufficiently provided	The conceptual framework includes: <ul style="list-style-type: none"> an image of the conceptual framework that highlights study concepts, relationships between the concepts, and theories that explain those relationships a complementary narrative that draws on expertise from the literature justification and alignment to the need for the study, theory or theoretical framework, research purpose, research questions, and methods
Write clear research question(s) and/or hypotheses as appropriate for the research method	There is considerable confusion about how quantitative or qualitative research questions are posed OR There are no research questions	1 of the research question elements is not sufficiently provided	Research questions: <ul style="list-style-type: none"> Are well-aligned with research purpose, need for study, theory or theoretical framework, conceptual framework, and methods Uses language appropriate for the method selected <p><i>Quantitative Study</i></p> <ul style="list-style-type: none"> presents either hypotheses or research question(s) the hypotheses or research questions indicate the major variables, their relationship (as appropriate) and the participants in the study the hypotheses or research questions are consistent with a quantitative study <p><i>Qualitative Study</i></p> <ul style="list-style-type: none"> presents a central research question provides sub questions written to narrow the central question to topic areas or foreshadow the steps in the data analysis the research questions are consistent with a qualitative study

EER Qualifying Examination – Research Proposal Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
Write a clear description of the quantitative or qualitative methods (<i>Participants & Setting, Intervention</i>)	There is considerable confusion about the details regarding participants & setting and the intervention OR There are no research methods concerning participants & setting and the intervention	1 of the methods elements is not sufficiently provided	The following are described in sufficient detail to enable meaning interpretation of results <ul style="list-style-type: none"> • Participants (e.g., number of, academic year, and other demographics as appropriate) • The setting (e.g., course) • The intervention (if present) • Justification of participants, setting, and intervention (if present) ensures research questions and purpose can be achieved. • Scope and feasibility of the study is considered.
Write a clear description of the quantitative or qualitative methods (<i>Data Collection, Validity / Trustworthiness</i>)	There is considerable confusion about how to align the research questions and data collection for a quantitative or qualitative study OR There are no research methods concerning data collection and data analysis	1 of the methods elements is not sufficiently provided	<p><i>Quantitative Study</i></p> <ul style="list-style-type: none"> • approach is appropriate for the research questions • clearly specifies the data collection (e.g., participants, setting, measurement instruments, variables...) • discusses the five types of evidence of validity when measurement instruments are used to collect data (use the Contemporary Validity Framework) • methods are well-justified and well-aligned with research questions, purpose, theoretical framework, and conceptual framework <p><i>Qualitative Study</i></p> <ul style="list-style-type: none"> • takes a clear methodological stance declaring the type of qualitative study (e.g., case, ethnography,) and justifies this selection • selects an approach that is appropriate for the research questions • clearly specifies the data collection (e.g., participants, setting, protocols...) • clearly specifies and justifies the sampling strategy • establishes trustworthiness • methods are well-justified and well-aligned with research questions, purpose, theoretical framework, and conceptual framework
Employ an intentional strategy for conducting a literature search	Minimal or no use of logs OR the potential of documentation within logs provides little help for subsequent tasks	Logs are well maintained but search strategies could be more robust	<ul style="list-style-type: none"> • Maintains a Literature Search Tracking Log • Selects appropriate databases for STEM education research and your topic (including but not limited to: Academic Search Premier, IEEE Explore, ASEE Peer) • Employs a thoughtful selection of search terms • Maintains a Citation Log with useful annotations for future tasks

EER Qualifying Examination – Research Proposal Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
Write proper in-text APA citations	4+ errors	2 errors	<ul style="list-style-type: none">• In-text citations are (Author1 et al., year) the first time cited for three or more authors and (Author1 & Author2, year) every time for two co-authors• Authors names woven into the text are denoted as Author 1 et al. (year) the first time cited for three or more authors and every time for two co-authors
Write a proper APA citation list	7+ errors	4 errors	<ul style="list-style-type: none">• Citations are complete• Format is APA for each citation (including all punctuation, font styles, capitalization)• Citations are alphabetically ordered (on list)

EER Qualifying Examination – Qualitative Paper Critique Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
Write a clear and thoughtful critique of a qualitative research paper's title	There is considerable confusion about what belongs in a qualitative title OR There is no discussion of the title	<ul style="list-style-type: none"> 1 of the title elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the title text) whether or not the article title: <ul style="list-style-type: none"> reflects the central phenomenon being studied conveys the participants and/or site of the study (or provides an argument for why this is not necessary or appropriate) Provides recommendations to improve the title along the lines of the two above bullets
Write a clear and thoughtful critique of a qualitative paper's problem statement	There is considerable confusion about what belongs in a problem statement OR there is no discussion of the problem statement	<ul style="list-style-type: none"> 1 of the problem statement elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> indicates an educational issue to study provides evidence (through reference to literature) that this issue is important and the need for this study is compelling indicates of whether this issue was identified through the literature or through person experience Provides recommendations to improve the problem statement along the lines of the three above bullets
Write a clear and thoughtful critique of a qualitative paper's research purpose	There is considerable confusion about what belongs in a qualitative research purpose OR there is no discussion of the research purpose	<ul style="list-style-type: none"> 1 of the research purpose elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not necessarily with only quoted material) whether or not the paper: <ul style="list-style-type: none"> presents the point of the study with reference to the central phenomena presents a clear research purpose that includes the participants and site of the study conveys who the audience(s) are and what the audience(s) should or could do with the results of this study Provides recommendations to improve the research questions along the lines of the three above bullets

EER Qualifying Examination – Qualitative Paper Critique Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
Write a clear and thoughtful critique of a qualitative paper's research questions	There is considerable confusion about how qualitative research questions should be posed OR there is no discussion of the research questions	<ul style="list-style-type: none"> 1 of the research question elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> presents a central research question provides subquestions written to narrow the central question to topic areas or foreshadow the steps in the data analysis poses research questions that are consistent with a qualitative study Provides recommendations to improve the research questions along the lines of the three above bullets
Write a clear and thoughtful critique of a qualitative paper's use of literature to support the study	There is considerable confusion about how literature should be used to support a qualitative study OR there is no discussion of the literature review	<ul style="list-style-type: none"> 1 of the literature review elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> uses the literature sparingly to allow for interpretation of the results of this study (i.e. The literature should not be used to foreshadow the results of the study or establish hypotheses. It should indicate a tentativeness or paucity in the existing literature) uses literature to support a flow from the general problem of interest to the intended audience to the specific problem being addressed by this study uses literature to define terms and key concepts or theories, as necessary for the intended audience and readability ends the literature review with how the author will extend and expand the current body of literature Provides recommendations to improve the literature review along the lines of the four above bullets
Write a clear and thoughtful critique of a qualitative paper's theoretical framework	There is considerable confusion about what constitutes a theoretical framework	1 of the theoretical framework elements is not sufficiently discussed	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> includes one or more learning theories that explain the relationships between the study concepts uses literature to define terms and key concepts or theories, as necessary for readability Provides recommendations to improve the theoretical framework along the lines of the two above bullets

EER Qualifying Examination – Qualitative Paper Critique Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
Write a clear and thoughtful critique of a qualitative paper's conceptual framework	There is considerable confusion about what is considered a conceptual framework	1 of the conceptual framework elements is not sufficiently provided	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> uses an image of the conceptual framework that highlights study concepts, relationships between the concepts, and learning theories that explain those relationships includes a complementary narrative that draws on expertise from the literature (at least 3 citations beyond that provided in the original work) Provides recommendations to improve the conceptual framework along the lines of the two above bullets
Write a clear and thoughtful critique of a qualitative paper's research methods	There is considerable confusion about how alignment of research questions and methods and data collection for a qualitative study OR there is no discussion of the methods	<ul style="list-style-type: none"> 1 of the methods elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> takes a clear methodological stance declaring the type of qualitative study (e.g., case, ethnography,) and justifying this selection selects an approach that is appropriate for the research questions clearly specifies the data collection (e.g., participants, setting, protocols...) clearly specifies and justifies the sampling strategy establishes trustworthiness Provides recommendations to improve the methods along the lines of the five above bullets. If a methodological stance was not taken, suggest a stance and argument.

EER Qualifying Examination – Quantitative Paper Critique Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
Write a clear and thoughtful critique of a quantitative research paper's title	There is considerable confusion about what belongs in a quantitative title OR There is no discussion of the title	<ul style="list-style-type: none"> 1 of the title elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the title text) whether or not the article title: <ul style="list-style-type: none"> reflects the major independent and dependent variables reflects a comparison among groups or a relationship among variables (as appropriate for the study) conveys the participants and/or site of the study (or provides an argument for why this is not necessary or appropriate) Provides recommendations to improve the title along the lines of the three above bullets
Write a clear and thoughtful critique of a quantitative paper's problem statement	There is considerable confusion about what belongs in a problem statement OR there is no discussion of the problem statement	<ul style="list-style-type: none"> 1 of the problem statement elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> indicates an educational issue to study provides evidence (through reference to literature) that this issue is important and the need for this study is compelling indicates of whether this issue was identified through the literature or through person experience Provides recommendations to improve the problem statement along the lines of the three above bullets
Write a clear and thoughtful critique of a quantitative paper's research purpose	There is considerable confusion about what belongs in a quantitative research purpose OR there is no discussion of the research purpose	<ul style="list-style-type: none"> 1 of the research purpose elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> presents the point of the study with reference to the central phenomena presents a clear research purpose that includes the variables, their relationship, participants, and site of the study conveys who the audience(s) are and what the audience(s) should or could do with the results of this study Provides recommendations to improve the research questions along the lines of the three above bullets
Write a clear and thoughtful critique of a quantitative paper's research questions	There is considerable confusion about how quantitative research questions should be posed OR	<ul style="list-style-type: none"> 1 of the research question elements is not sufficiently discussed A complete recommendation is provided, when 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not: <ul style="list-style-type: none"> the paper has either hypotheses or research questions the hypotheses or research questions indicate the major variables and the participants in the study the hypotheses or research questions are consistent with a quantitative study

EER Qualifying Examination – Quantitative Paper Critique Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
	there is no discussion of the research questions	necessary based on critique	<ul style="list-style-type: none"> Provides recommendations to improve the research questions along the lines of the three above bullets
Write a clear and thoughtful critique of a quantitative paper's use of literature to support the study	<p>There is considerable confusion about how literature should be used to support a quantitative study</p> <p>OR</p> <p>there is no discussion of the literature review</p>	<ul style="list-style-type: none"> 1 of the literature review elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> uses literature to support a flow from the general problem of interest to the intended audience to the specific problem being addressed by this study sufficiently and clearly reviews studies about the variables (independent and dependent) being studied uses literature to define terms and key concepts or theories, as necessary for the intended audience and readability ends the literature review with how the author will extend and expand the current body of literature Provides recommendations to improve the literature review along the lines of the three above bullets
Write a clear and thoughtful critique of a quantitative paper's conceptual framework	There is considerable confusion about what is considered a conceptual framework	1 of the conceptual framework elements is not sufficiently provided	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> uses an image of the conceptual framework that highlights study concepts, relationships between the concepts, and learning theories that explain those relationships includes a complementary narrative that draws on expertise from the literature (at least 3 citations beyond that provided in the original work) Provides recommendations to improve the conceptual framework along the lines of the two above bullets
Write a clear and thoughtful critique of a quantitative paper's theoretical framework	There is considerable confusion about what constitutes a theoretical framework	1 of the theoretical framework elements is not sufficiently discussed	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> includes one or more learning theories that explain the relationships between the study concepts uses literature to define terms and key concepts or theories, as necessary for readability

EER Qualifying Examination – Quantitative Paper Critique Rubric

Criteria	No or Insufficient Evidence	Developing	Proficient
			<ul style="list-style-type: none"> Provides recommendations to improve the theoretical framework along the lines of the two above bullets
Write a clear and thoughtful critique of a quantitative paper's research methods	<p>There is considerable confusion about how alignment of research questions and methods and data collection for a quantitative study</p> <p>OR</p> <p>there is no discussion of the methods</p>	<ul style="list-style-type: none"> 1 of the methods elements is not sufficiently discussed A complete recommendation is provided, when necessary based on critique 	<ul style="list-style-type: none"> Clearly and thoughtfully discusses (with claims supported by evidence from the paper text and not only quoted material) whether or not the paper: <ul style="list-style-type: none"> selects an approach that is appropriate for the research questions clearly specifies the data collection (e.g., participants, setting, measurement instruments...) provides or discusses the five types of evidence of validity when measurement instruments are used to collect data (use the Contemporary Validity Framework) Provides recommendations to improve the methods along the lines of the three above bullets

EER Qualifying Examination - Written and Oral Communication Rubrics

Written Communication:

Criteria	Insufficient Evidence	Developing	Proficient
Organization	Information requires significant restructuring	Information is comprehensible but may benefit from some reorganization	Information is presented in a logical and interesting sequence
Clarity	Argument lacks cohesion and is not convincing	Argument is mostly clear but has gaps	Argument is clear and well-constructed
Spelling & Grammar	Prose is unclear due to poor spelling or grammar	Some spelling and grammatical errors are present	Prose is mostly free of spelling and grammatical errors

Oral Communication:

Criteria	Insufficient Evidence	Developing	Proficient
Organization	Presentation requires significant restructuring	Presentation is comprehensible but may benefit from some reorganization	Information is presented in a logical and interesting sequence.
Clarity	Explanations are not coherent and are difficult to understand	Explanations are not thorough or have gaps	Explanations are clear and well-constructed
Slide Content & Layout	Slides were incoherent or unhelpful with regard to the presentation	Slides had too much information or were poorly organized	Slides are organized neatly and include an appropriate amount of information
Delivery	Presentation is not clear	Presentation length is too long or short and is not completely clear	Presentation is an appropriate length and delivered in a clear and interesting manner
Spelling & Grammar	Slides are unclear due to poor spelling or grammar	Some spelling and grammatical errors are present	Slides are mostly free of spelling and grammatical errors