



L Lepley Laboratory | Guiding Principles

Guiding Principles.

Great laboratories aren't just about the metrics that define success (funding dollars, h-indexes, number of publications) – they are built on strong core values that live and breathe through its people. These values are our bedrock. In order to be a great laboratory, we require that all members stand and uphold these following core values in their work, interactions with each other, and in our community at U-M:

- 1) Hold yourself accountable. We grow as researchers and individuals when we take responsibility for our actions. With numerous components in the lab, maintaining a proactive atmosphere of accountability is crucial for smooth operations. Let's empower each other, take ownership of our work, and strive for excellence.
- 2) Seek out collaboration. Find fellow graduate students and faculty that can introduce you to different viewpoints and skillsets. U-M is intellectually dense. Make the most of what this environment has to offer.
- 3) Be actively engaged. Evolve into an independent and engaged learner, adept at problem-solving, strategic thinking, and contributing to solutions. The success of projects thrives on the varied skills and experiences of each team member. We encourage your active involvement and value your insights.
- 4) Be self-disciplined. To mature as an independent researcher, it is important to be show initiative, set short and long-term goals, and hold yourself to these deadlines.
- 5) Have integrity. As custodians of extensive data, your honesty and good intentions are paramount. Thoroughly reviewing (even double and triple checking) your work is vital, considering that unexpected issues and delays are part of the process. It's acceptable to invest extra time to ensure accuracy.
- 6) Managing data. In accordance with the University's Standard Practice Guideline ([303.6](#)), researchers in the Lepley Lab are stewards and custodians of data. All data (original, processed) must be kept pristine and stored on physical hard drives and the Lepley Lab drive. This includes all code, software processing schemes, and data collection instruments. Your personal computers are a secondary back-up source, and the original product must be stored on Lepley Lab drive in an accessible location by the PI at all times.
- 7) Assist others. Help each other out – and don't be afraid to ask for help - we are in this together.
- 8) Celebrate achievements. It's easy to get bogged down in the work. Have fun, support each other, celebrate individual and team achievements.

Steps to Independence.

- 1) Become a scholar. Show that you know and understand the literature.
- 2) Disseminate information. Publish and actively participate in scholarly meetings.
- 3) Take ownership. Don't rely on others to problem-solve, be an active part of the solution.
- 4) Write grants and pursue funding opportunities. This is a key skill.
- 5) Innovate. Don't be afraid to try something new.



L Lepley Lab | Project Framework

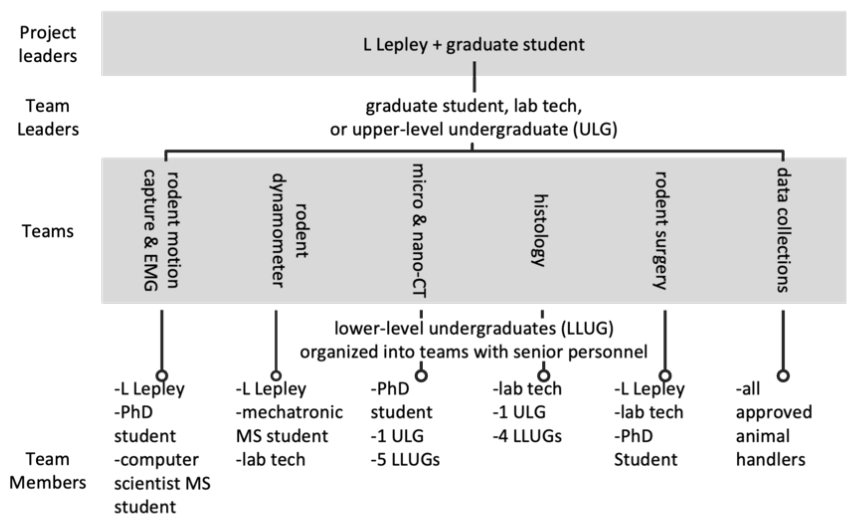
The Lepley Laboratory employs a vertically integrated project framework—a dynamic model that fosters research and education simultaneously. This model engages both undergraduate and graduate students in ambitious, long-term, large-scale, multidisciplinary projects. In practice, our lab is structured into teams comprising undergraduate students who collaborate with graduate students and myself on tasks such as incorporating novel technologies and managing extensive datasets (illustrated by an anonymized example in Figure 1).

Undergraduate students engaged in lab work have the opportunity to earn course credit or financial incentives. Through their involvement, they acquire proficiency in a range of laboratory techniques and establish consistent interactions with senior group members, including myself, graduate students, and lab technicians.

The longevity of student participation often spans years, during which they:

1. develop a profound understanding of the field,
2. contribute significantly to ongoing projects, and
3. transition into leadership roles as their peer's graduate.

Figure 1. Lepley Lab example of vertically integrated project





L Lepley Lab | Team Leader Expectations

Effective project management hinges on proficient team management. This implies that the success of the lab is contingent upon each member effectively executing their roles. As Team Leaders, we rely on your commitment to uphold the lab's guiding principles, proactively take charge, and ensure both yourself and your teams remain accountable. Our aim is to provide unwavering support and collaboratively devise actionable plans that your team can implement. While our objective is to yield top-tier results, we are equally invested in nurturing enduring skills such as adept communication, critical thinking, problem-solving, and effective team management.

Guidelines for Effective Team Management.

- 1) Lead by example. Embrace your role as a mentor and guide to your team. Your actions set the benchmark for others. Hold yourself accountable to the highest standards.
- 2) Training and meetings. During the training phase, schedule biweekly meetings; afterward, maintain weekly meetings. Publish these timings on the lab calendar for reference.
- 3) Assign action items. Allocate specific tasks to each team member in every meeting. This ensures consistent progress on data-related tasks and mastery of data sources.
- 4) Clear communication. Establish protocols for communication. Share your availability for texts/calls and define response expectations on platforms like Slack (acknowledgment is vital).
- 5) Uphold data quality. Maintain impeccable data quality. It's imperative that only high-quality data reaches Project Leaders. Educate your team on recognizing and delivering such data.
- 6) Pristine data storage. Oversee proper data storage practices among your team, as outlined. Ensure adherence to these practices and address any deviations.
- 7) Weekly updates to Project Leaders. Maintain open lines of communication with Project Leaders through weekly updates.
- 8) Constructive critique. Foster a culture of constructive criticism within the team. Challenge each other's work and be equally critical of your own. Strive to elevate the lab's standards collectively.

Interactions with Dr. Lepley and Project Leaders.

We're committed to aiding your growth, yet we anticipate you to engage in independent critical thinking and problem-solving. Your team is a resource for collaborative deliberation. Our lab embodies diversity in backgrounds and experiences to facilitate cross-learning. We anticipate that when you approach us, you and your team will have extensively analyzed the issue, identified knowledge gaps, explored a list of potential solutions, and concluded with the optimal one. This approach allows us to understand your thought process and reasoning before determining the solution's viability. This method empowers you to develop vital skills and minimizes the need for us to complete tasks on your behalf. Waiting for our direction impedes the development of your critical thinking. Our support remains steadfast, but embracing this approach will mold you into a more capable student, employee, and researcher!



L Lepley Lab | Independent Study

The Lepley Lab offers students the chance to receive course credit for the academic component of their work while they volunteer in the lab. This document's aim is to establish clear guidelines ensuring structured, purposeful, and University-aligned independent study experiences. Specifics regarding the School of Kinesiology's expectations can be found in each [student's bulletin](#).

Purpose.

The University of Michigan and the Lepley Laboratory acknowledge the value of self-directed learning and the unique prospects that independent studies present for academic exploration and skill development. The Lepley Lab's objective is to grant students the autonomy to delve into comprehensive laboratory research beyond traditional coursework. This program encourages students to actively engage in hands-on scientific inquiry under the guidance of experienced mentors from the Lepley Lab.

Action Based Learning Projects.

The Lepley Lab employs Action-Based Learning Projects as a framework, providing an immersive experience. This educational approach underscores active engagement, experiential learning, and applying knowledge to experimental data. Through this, students learn by doing, fostering initiative, decision-making, and problem-solving.

Measurable Milestones.

Every Action-Based Learning Project will include measurable weekly and end-of-semester milestones to monitor progress and ensure the successful fulfillment of independent study projects. Each student's weekly and end-of-semester milestones will be tailored to suit the specific nature of their project. Lab hours will be recorded and submitted bi-weekly to Dr. Lepley through the provided [form](#).

Here are some examples of [weekly milestones](#), encompassing actions related to:

- Project initiation and planning
 - Defining research objectives and formulating research questions
 - Holding discussions with mentors to outline project scope and expectations
- Research design and methodology
 - Formulating a comprehensive research methodology, incorporating data collection methods and tools
- Data collection and analysis
 - Collecting and processing gathered data
 - Exploring preliminary data trends and patterns
 - Conducting data analysis and refining research focus, if necessary

The culmination of the independent study will be evident in an [end-of-semester](#) presentation, which will take place during the general weekly lab meeting. This presentation will effectively capture your scientific journey, emphasizing the contributions you've made towards advancing knowledge in the field. At the beginning of the semester, you will work with Dr. Lepley to determine a suitable date for presenting your materials.



How to Enroll.

The online submission form for an independent study can be accessed [here](#). Note, a maximum of 3 total credit hours from an independent study course (MOVESCI 439) can be taken and applied toward an upper-level course requirement. For instance, this could involve taking MVS 439 for 1-credit hour twice, taking MVS 439 for 1-credit hour and then for 2-credit hours, or taking MVS 439 for 3-credit hours once. Should students have already reached the 3-credit threshold, they have the option to register again to earn general credit. This would contribute towards fulfilling the minimum requirement of 120 credit hours needed for an undergraduate degree.

When completing the online submission form, students will need to be prepared to answer the following questions:

- Describe in detail the content and overall objective of your project.
- How are your objectives not covered by the current curriculum?
- How will this study strengthen, enhance, or enrich your academic goals?
- How much time do you estimate to be spent, per week, on this independent study experience?

Credit hours assigned to experiences correlate to the following expectations:

- 3-credit: 1-hour of student-faculty contact plus an additional 8 hours of independent work per week
- 2-credit: 1-hour of student-faculty contact plus an additional 5 hours of independent work per week
- 1-credit: 1-hour of student-faculty contact plus an additional 2 hours of independent work per week



L Lepley Lab | Onboarding Document

1. If you have not done so already, please activate your University dropbox account
 - a. <https://its.umich.edu/communication/collaboration/dropbox>
2. Complete PEERS Training (done in myLinc - <http://my.research.umich.edu/peerrs/>)
 - a. [Responsible Conduct of Research](#): RCRS Training
 - b. [Human Subject Research Protections](#): PEERRS_HUMS_T100
 - c. Upload completion certificates to Dropbox>Required Trainings>Your name>Human [dropbox](#)
3. Complete eLearning Course: Minors as research participants (done in myLinc – [UMOR_MRP101 – Minors as Research Participants](#))
 - a. Upload completion screenshot to Dropbox>Required Trainings>Your name>Human [dropbox](#)
4. If working with human subjects, you will need access to the main ORB lab which is located at MedSport (4008 Ave Maria Dr. Lobby B, Ann Arbor, MI 48105). To gain access:
 - a. Communicate with Luke Stoneback (lukeston@umich.edu), he will make appropriate connections to request security card access
 - i. Dr. Lindsey Lepley (llepley@umich.edu) to be cc'd on Email to Aries Haeflinger (ariesca@med.umich.edu) to request card access for individual
 - b. Complete paperwork for Aries Haeflinger and email to her. She will send you a final copy.
 - c. Deliver completed paperwork to the Dominos Farms Security team to get a badge (24 Frank Lloyd Wright Dr, Ann Arbor, MI 48105)
 - i. Luke Stoneback (lukeston@umich.edu) will direct you to this location
5. When working in the ORB lab at MedSport
 - a. Wear your MCard at all times
 - i. Extra lanyards and plastic sleeves are available in the grad student office
 - b. Dress in business casual attire
 - i. No jeans
 - ii. No open toed shoes



6. When working with rodents in the Comparative Orthopaedic Rehabilitation Laboratory (CORL) at the School of Kinesiology (830 N University Ave, Ann Arbor, MI 48109)
 - a. Complete the following rodent trainings
 - i. When added to study protocol, you will receive an email from Unit for Laboratory Animal Management (ULAM) that will designate the necessary trainings that need to be completed
 1. ULAM Training to be completed through [Cornerstone Learning](#)
 - a. ULAM-10000 Orientation to Animal Care and Use at the University of Michigan
 - b. ULAM-10100 Introduction to the Laboratory Rat and Mouse
 - c. ULAM-10110 Laboratory Rat Workshop
 - d. ULAM-10120 Rodent Survival Surgery
 - e. ULAM-10131 Animal Room Procedures for Rodents Part 1 of 2
 - f. ULAM-10132 Animal Room Procedures for Rodents Part 2 of 2
 - b. Upload completed certificates to Dropbox>Required Trainings>Your name>Animal [dropbox](#)
 - c. Communicate with Luke Stoneback (lukeston@umich.edu) to gain proper access to the vivarium and the 4th floor wet labs.
 - d. Wear Proper CORL lab attire
 - i. No shorts
 - ii. No open toed shoes
 - iii. No long sleeves
 - iv. Long hair up
7. When working in the wet lab in the CORL at the School of Kinesiology
 - a. Complete the following safety training
 - i. [EHS BLS025W+TAB course](#)
 - b. Upload completed certificate to Dropbox>Required Trainings>Your name>Wet Lab Trainings [dropbox](#)
Wear Proper CORL lab attire
 - i. No shorts
 - ii. No open toed shoes
 - iii. No long sleeves
 - iv. Long hair up



L Lepley Laboratory | PhD Student Expectations

The PhD is the highest degree awarded by the School of Kinesiology at U-M. The Doctoral Program seeks to develop scholarly and research competence, and culminates in an original Doctoral dissertation that adds to the body of knowledge. This body of work shouldn't be the culmination of your research career, just the beginning. This program will provide you with an opportunity to choose from being someone who reads to someone who is read. Below is a general guidance plan of major academic milestones for trainees of my lab to follow.

term	year 1		year 2		year 3		year 4	
	fall	winter	fall	winter	fall	winter	fall	winter
research rotation	x							
guidance committee		x						
qualifying exams				x				
dissertation proposal						x		
dissertation defense								x

*tentative academic milestone plan

I am here to create an environment where you can do your best work. My standards are high, but reasonable. This will help you succeed in my laboratory, but it will serve you well as you move beyond this lab. I am your ally, and clear, open communication will build trust. Below is a set of logistics and expectations that guide the lab.

- 1) Regular one-on-one meetings. We will be communicating consistently. Each week you and I will also have protected time for a one-on-one meeting. To these meetings, it is expected that you will bring a result or issue. It may be helpful to bring a plot, be prepared to draw the scenario on the whiteboard, or bring a supporting article. Please prepare your main point in advance so that we can maximize our time. Together we will tackle problems, analyze data, interpret data, decide how to proceed etc.
- 2) Authorship policies. Contributions to projects and authorship order will be discussed in the project planning phase so that all parties are aware of their division of effort and responsibilities. At minimum it is expected that trainees will have 3 first author publications.
- 3) Compliance with institutional policies. It is expected that trainees comply with both the letter and spirit of all institutional research policies (e.g., safe laboratory practices and policies regarding animal-use and human-research).
- 4) Managing data. All data (original, processed) must be kept pristine and stored on physical hard drives and the Lepley Lab drive. This includes all code, software processing schemes, and data collection instruments. Your personal computers are a secondary back-up source, and the original product must be stored on Lepley Lab drive in an accessible location by the PI at all times.



- 5) Professional meeting attendance. It is expected that the trainee will actively participate in scholarly meetings yearly. Meetings of potential interest include International Society of Biomechanics, Osteoarthritis Research Society, ACL research retreat, American College of Sports Medicine, National Athletic Trainers' Association Annual Meeting, and the Combined Section of Physical Therapy Annual Meeting.
- 6) Vacations, absences, and time away from campus. Schedule and routine are keys to consistent success. I expect that you will vacation and take time away from the lab. My request is that you inform me of your intentions at least two weeks ahead of time and make proper arrangements for your experiments. Absences should be noted – If you are out of the lab for sickness, or other reasons please let me know. Writing and data processing time away from the lab is absolutely fine as long as progress is being made.

Interactions with Dr. Lepley.

Each individual has different needs, experiences, and capacities. There is not one way to be a graduate student and there is not one way to mentor. I take my role as your Advisor very seriously and I will do everything in my power to provide you with the optimal graduate school experience. I do not consider myself to be the gatekeeper of knowledge, but rather your academic guide. I am here to help you every step of the way (and to grow as a mentor). I will be in the trenches with you and treat you as a colleague. In return I expect that we have a symbiotic relationship – we both help each other.

*The emotional toll of graduate school is not something I take lightly. Most graduate students experience periods of intellectual insecurity and battles with mental health. This is a normal part of the journey. If you are feeling overwhelmed, just ASK for help, I am here to support you! We all experience failure, moments of doubt. My job is to create an environment where you can do your best work. I am your ally. Asking for help shows that you see your situation clearly, it is not a sign of weakness, it will not erode my confidence in you.



L Lepley Laboratory | PhD Student Evaluations

Student's Name			
Current Academic Year		Credits completed so far	
How many years in the program?		Year started in the program	

This instrument is designed to provide the trainee and Dr. Lepley with a foundation for assessing the student's progress in the Ph.D. Program. It is to be completed at the end of the Fall and Winter terms every year.

Evaluation instrument domains are:

- 1) Student project agreement for the upcoming academic year
- 2) Rating of scholarly and professional independence
- 3) Summary of performance described by the student and advisor
- 4) Student's current CV

Student Project/Product/Goal Agreement

Product	Expected Completion Date	Potential Barriers
Fall Term		
Winter Term		
Spring/Summer		

Examples of products: techniques student is planning to learn, IRB/IACUC submission, abstract, manuscript, grant, data collection on X subjects, preparing presentation, presentation



Evaluation of Scholarly and Professional Independence

		N/A	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
1. Student takes the initiative to appropriately develop and adequately express individual thoughts and ideas.	student						
	advisor						
2. Student takes the initiative to move his/her research agenda forward.	student						
	advisor						
3. Student is confident in expressing alternate points of view in scholarly and professional settings.	student						
	advisor						
4. Student is able to accept constructive criticism in scholarly and professional settings.	student						
	advisor						
5. Student is able to appropriately extend theory through his/her own research activities.	student						
	advisor						
6. Student initiates and develops high quality collaborative professional relationships to enhance scholarship.	student						
	advisor						
7. Student is independent in the critical assessment of insights and ideas from diverse areas of research and scholarship.	student						
	advisor						
8. Student is able to incorporate different style of teaching when developing and implementing college level courses.	student						
	advisor						
9. Student demonstrates independence in his/her area of specialization.	student						
	advisor						



Student Comments

Areas of strength

Areas of Weakness/ Areas that Need Work

Advisor Comments

Areas of strength

Areas of weakness/ areas that need work

.....
Recommendations/ action plan (to be completed after the in-person meeting)



Action plan

I agree with this plan and assessment:

Impression

Advisor

- exceeds expectations
- meets expectations
- below expectations

signature / date

printed name

Student signature / date

Advisor signature / date



L Lepley Laboratory | Qualifying Exam

Each candidate for the PhD degree must satisfactorily complete a Qualifying Exam. The purpose of the Qualifying Exam is to ensure that the student has a sufficient background of knowledge needed to proceed towards the PhD degree. Successful completion of the Qualifying Exam marks a student's transition to the independent research phase of their graduate training. The exam will consist of both a written document and an oral exam. This document serves as an outline of the Lab's Qualifying Exam procedures. Specifics relative to the School of Kinesiology's expectations are outlined in each PhD student's [graduate student bulletin](#) (i.e., role of the faculty advisor, composition of the exam committee, and the ensurer of equity and fairness etc.).

Format of the Written Document.

Each student will submit a clear and well-written NIH-style grant proposal based on their developing PhD project. The proposal should clearly outline the project, focusing on testing specific hypotheses through 2 or 3 experimental Aims.

The written proposal must be the independent work of the student. 1 page is allocated for the Specific Aims and 6 pages are dedicated to the Research Strategy. At the outline stage, before the writing starts, it is expected that the PhD student engages in discussion with their mentors about the overarching hypotheses, and the likely directions and outcomes of the proposed research.

Specific Aims (1-pg limit):

- The grant proposal must test specific hypotheses through 2 or 3 experimental Specific Aims.
- It is expected that the mentor team assists with the development of the 1st experimental Aim.
- All subsequent Aim(s) must be independently developed without the influence of the mentor. The primary objective of these independent Aim(s) is for the student to develop their own research program capable of addressing a critical gap in our knowledge that uniquely incorporates their own ideas. These Aim(s) should still test the overarching hypothesis. Note that, independent Aim(s) must be denoted by (*) in the proposal.

Research Strategy (6-page limit):

- Background and Significance section must critically evaluate existing knowledge and specifically identify the gaps that the project is intended to fill. It should also emphasize the importance and relevance of the research described in this application by relating the specific aims to broad, long-term objectives.
- Preliminary Data section (if applicable). No preliminary data are required. If available, use this section to provide an account of preliminary studies that are pertinent to this proposal.
- Innovation section must clearly emphasize how the project introduces new concepts, methods, or approaches to address the problem. This section should explicitly state how the approach taken is distinct and promising.
- Experimental Design and Methods section must outline the detailed plan for conducting the research and provide a clear roadmap for achieving the proposed objectives. Details on how the data will be collected, statistically analyzed, and interpreted are expected. Students are also expected to discuss the potential difficulties and limitations of the proposed procedures and suggest alternative approaches to achieve the Aims. As part of this section, provide a tentative sequence or timetable for the project.



References cited (no-page limit):

- The format for the references included in the bibliography should follow that of a AMA format.
- The reference list should be limited to relevant and current literature. While there isn't a page limitation, it is important to be concise and to select only those literature references pertinent to the proposed research.

General Formatting Instructions for the Written Proposal:

- Arial or Times New Roman font that must be 11 points or larger. Smaller text in figures, graphs, diagrams, and charts is acceptable, as long as it is legible when the page is viewed at 100%.
- Type density must be no more than 15 characters per linear inch (including characters and spaces).
- Line spacing must be no more than six lines per vertical inch.
- Provide at least one-half inch margins (1/2") – top, bottom, left, right for all pages.
- The title page is to list the title of the written proposal, the student's full name, and the student's U-M ID.

Format of the Oral Exam.

The committee will review the written document over a 1-week period. Subsequently, an oral exam will be held by the committee to further evaluate the student's depth of understanding of the research area.

The "budding" research project will serve as a scaffold for the oral exam, but the exam itself will focus on determining whether the student has incorporated the fundamental knowledge needed to proceed towards dissertation research. The student must demonstrate a broad understanding of the underlying the research question(s). In addition to knowledge obtained from coursework and relevant literature, students will be tested for their knowledge of experimental strategies and their ability to think on their feet and address potential challenges (e.g., controls, alternative approaches).

The exam will be free-flowing and at the discretion of the committee. It is expected to run approximately 90 minutes, with breaks provided for the student if needed.

Note.

The format of this exam may change slightly based on the individual needs of students and the desires of each students qualifying exam committee.



L Lepley Laboratory | Dissertation Proposal

The Dissertation Proposal, a formal document outlining the research projects for a doctoral degree, aims to provide the PhD candidate with feedback on the uniqueness, achievability, and potential of their developing project to address critical gaps in knowledge. It should function as a roadmap for the research, offering an opportunity for students to present their ideas and plans to their mentors. This document serves as an outline of the Lab's Dissertation Proposal Expectations. Specifics relative to the School of Kinesiology's expectations are outlined in each PhD student's [graduate student bulletin](#). Furthermore, each PhD student is expected to adhere to the Rackham Graduate School formatting guidelines, which can be accessed [here](#) along with a copy of a correctly formatted [document](#). It is **strongly recommended** that student's follow these formatting guidelines for the proposal as this will ultimately save you time at the time of your dissertation defense.

Required sections:

- 1) Introduction. The introduction section of the dissertation proposal serves as a compelling opening, setting the stage for the research to follow. It should provide context for the study, highlight the research problem, and emphasize its significance. A clear and concise introduction is vital to capture the reader's attention and establish the rationale for the proposed research. In this section, the following components are anticipated:
 - succinct overview of the broader field and the specific research domain addressed by your study
 - clearly articulated research problem or gap within the literature that your dissertation aims to tackle
 - an elucidation of your research's significance, highlighting its potential contribution to the field and its implications
 - and a seamless transition leading into the specific aim section, delineating the core objective.
- 2) Specific Aims. The specific aim section articulates the primary objective of the research. This section should be focused and direct, outlining the central goal that the dissertation aims to achieve. If your proposal indicates directional hypotheses, express them accordingly. This section will serve as a guiding beacon for the entire dissertation, ensuring that all subsequent research components align with this overarching purpose.
- 3) Literature Review. The literature review is a written analysis that substantiates your chosen topic and your approach to addressing it. It should commence with the broader aspects of your subject and gradually focus on your research questions or hypotheses. Your writing should critically assess the existing research within the field, offering specific reasons why your proposed dissertation will yield a significant contribution. It's essential to pinpoint where gaps exist in the literature, such as weaknesses in previously utilized methodologies and how your work builds upon or extends prior research.

You will need to detail how your approach will differ to enhance the body of knowledge. This could involve refining instruments, adopting more representative sampling, eliminating alternative explanations, and so forth. These particulars will establish a clear foundation for the significance of your work. The ultimate objective is to demonstrate how your dissertation will pioneer new theoretical or practical knowledge, advancing the realm of science.



Towards the conclusion of your review, explicitly re-incorporate your Specific Aims and hypotheses. A useful litmus test for gauging the effectiveness of your review is whether your reader can anticipate your hypotheses based on this section.

- 4) **Methodology.** The methodology sections of the dissertation proposal outline the approach you will employ to address the research problem and achieve the Specific Aims. It encompasses the strategies, techniques, and procedures you intend to utilize in gathering and analyzing data. The chosen methodologies should align with the research problem and Specific Aims, ensuring a coherent and focused series of studies. These section(s) will be stand-alone papers and include the following elements:

- succinct overview of the field and the specific research problem addressed by this study,
- clear reiteration of the Specific Aims, outlining the fundamental objectives of the study,
- identification of the research design most suited to the nature of your research problem,
- details on the data collection methods,
- sampling strategy with justified sample size calculations,
- outline of the statistical techniques you will employ to process and interpret the collected data,
- and discussion of steps taken to ensure the validity and reliability of your data, including addressing potential sources of bias and strategies for mitigation.

- 5) **References.** Include a bibliography or reference list of all the sources you've cited in your proposal. Follow the appropriate citation style of AMA format.



L Lepley Laboratory | Dissertation Defense

The PhD is the highest degree conferred by the School of Kinesiology at U-M, and your Written and Oral Dissertation Defense products should stand as a compelling reflection of your research journey and your preparedness to make substantial contributions to the field. Your defense committee will evaluate not only the clarity of your objectives but also the rigor of your experiments, ensuring that your research possesses both theoretical and empirical significance. This document serves as an outline of the Lab's Dissertation Defense Expectations. Specifics relative to the School of Kinesiology's expectations are outlined in each PhD student's [graduate student bulletin](#). Furthermore, each PhD student is expected to adhere to the Rackham Graduate School formatting guidelines, which can be accessed [here](#) along with a copy of a correctly formatted [document](#).

Written Document.

The Written Defense Document is a comprehensive expansion of your Dissertation Proposal materials, encompassing a thorough delineation of your research analysis, findings, and conclusions. The primary goal of this document is to present a comprehensive, well-documented, and coherent representation of your research, subject to evaluation by your committee members and other experts in the field.

Elements that should be consistently evident throughout the Written Document include:

- Clear Research Objectives and Experimental Aims. The presence of clearly defined research objectives tightly interwoven with meticulously planned experimental aims and studies is of utmost importance. This blend showcases your methodical approach to inquiry, your grasp of research design, and your adeptness in translating theoretical inquiries into practical investigations.
- Measurable Milestones that Test Your Experimental Aims. To breathe life into these objectives, experimental aims and studies act as the vehicles through which you validate and substantiate your claims. These aims break down your broader objectives into discrete, measurable milestones. They represent the tangible steps you took to unlock the answers you seek. Each experimental study within these aims represents a purposeful endeavor to dissect, analyze, and interpret specific elements of your research question. These studies need to be presented as individual dissertation chapters, crafted in a journal-ready format. Collectively, each chapter's construction forms the foundational building blocks that contribute to the overarching structure of your dissertation's narrative.
- Evidence Based Arguments Your experimental aims and studies serve as the empirical backbone underpinning your research. They provide substance to your arguments and furnish evidence that your objectives are more than mere conjecture; they are hypotheses rigorously tested within controlled conditions. The outcomes yielded by these studies form your research narrative, either bolstering or challenging your initial hypotheses. It is expected that your conclusions are well-supported by empirical evidence, data, and appropriate references. Your claims should be substantiated by credible sources and scholarly literature.

The Written Document will capitalize on the requisite Dissertation Proposal Materials (outlined on pages 11-12). It will also encompass the conversion of the methodology sections into individual dissertation chapters, including the standard format of abstract, introduction, methods, results, discussion, and conclusion—rendering them ready for journal submission. Other required supportive materials essential for submission are delineated below:



- 1) **Abstract.** An abstract of up to 550 words is required as part of the dissertation. The abstract provides an overview of the purpose and focus of the dissertation—the problem, research questions—and a presentation of methods used and key findings.
- 2) **Limitations.** Within this section, your objective is to confront the constraints, challenges, and weaknesses inherent in your research. This contextualization is pivotal for precise interpretation of your findings. You may also consider delineating elements such as scope/generalizability, data quality, methodology constraints, and potential resource limitations to effectively characterize your data.
- 3) **Summary and Future Directions.** This section forms a crucial link between the culmination of your research findings and potential avenues for future exploration. Begin by succinctly highlighting outcomes that directly address your research questions and their significance within the field. Subsequently, identify areas open for further investigation, building upon the foundational work outlined in the dissertation. The goal is to showcase a nuanced comprehension of the broader research implications and to chart courses for future research endeavors.
- 4) **Appendix.** The appendix content should encompass copies of all Institutional Review Board (IRB) and Institutional Animal Care and Use Committee (IACUC) approval letters, along with questionnaires, experimental protocols (including comprehensive step-by-step instructions and materials), and data collection instruments.

Format of the Oral Defense.

The oral defense represents not just an evaluation, but also a chance to actively participate in scholarly discourse and showcase your ability to make a meaningful contribution to the field. This presentation, typically lasting 40–45 minutes, serves as an avenue to highlight the key themes of your dissertation, demonstrate your expertise, your ability to think on their feet and actively engage in scholarly discussions. PhD candidates should expect that the Oral Defense will be a thorough interrogation of your methods, theories, and findings.