

FES GRADUATE PROGRAM LEARNING OUTCOMES

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I. OVERVIEW

Oregon State University requires every graduate degree program to have program-specific learning outcomes that:

- describe what a graduate of the program can **do** as a result of attaining their graduate degree, and
- distinguish their degree program from other graduate degree programs at OSU.

The FES Graduate Program is assessed based on trends in the proportion of graduates that meet or exceed program-specific learning outcomes. Data for this assessment are collected from assessments of individual students conducted during their preliminary (PhD) and final (MF, MS, PhD) exams, and are used only in aggregate to describe the performance of the FES Graduate Program as a whole. In the FES Graduate Program, whether a student passes or fails these exams is assessed independently of the assessment of the learning outcomes.

Prior to the end of the 2nd (MF, MS) or 5th (PhD) term of enrollment, a student is required to, with the help of their committee, produce a document that defines their specific learning outcome(s) in each of the following 7 categories and file the document with the FES Department office.

- Disciplinary skills and knowledge
- Interdisciplinary Collaborative Problem Solving
- Communication skills (and may include teaching)
- Critical thinking and critical awareness skills
- Research skills
- Research ethics and responsibilities
- Policy analysis and interpretation

At the preliminary (PhD) and final exam (MF, MS, PhD) the committee assesses whether a student has met each of the learning outcomes as defined by the student's learning outcomes document. The FES Learning Outcomes Assessment form, filled out at the examination by the student's committee, records the result and is filed in the FES Department office.

The FES Graduate Program Director will annually summarize the assessment information for the graduate faculty.

II. EXPLANATION OF EACH LEARNING OUTCOME CATEGORY

The explanations below are meant as general guidelines. Students and committees will interpret these and make specific recommendations for how students should prepare to meet them and demonstrate them to the committee in a manner suitable to their area of study and level of advancement.

1. **Disciplinary skills and knowledge**

- Knowledge of a student's chosen field of study, and closely related fields, including history and trends in major findings, concepts, theories, approaches, and context.

2. **Interdisciplinary Collaborative Problem Solving**

- Situate environmental issues into appropriate biophysical and social contexts and identify disciplines necessary to address the problem.
- Collaborate in interdisciplinary teams, e.g., listen to, give and receive constructive feedback, define divisions of labor, set goals and milestones, actively work to see problems from multiple perspectives, understand group dynamics including issues around providing and accepting leadership, member responsibilities and peer-to-peer communications.
- Provide disciplinary expertise to an interdisciplinary team.
- Articulate ideas that transcend contributing disciplines; identify commonalities and conflict among disciplines; to devise approaches that support commonalities and reduce conflicts.

3. **Communication skills (oral, written, professional)**

- Effectively interact (write, speak and listen) to diverse audiences in an organized and clear fashion about areas of expertise in oral, written or electronic formats.
- Explain information from one discipline to researchers in other relevant disciplines and communicate research to scientific and non-scientific audiences.
- **For students wishing to pursue careers in academia, the following learning outcomes for teaching may be applicable:**
 - i. Understand contemporary pedagogy, relevant STEM teaching methods and experience in their application in classroom, online, and technical/professional learning environments.
 - ii. Develop¹ a classroom and/or online course, including development of a syllabus which includes learning outcomes, classroom activities, assignments and assessment and evaluation methods.

¹ Development may include course delivery but that is not necessary.

4. **Critical thinking and critical awareness skills**
 - Discern between, and infer consequences of multiple perspectives.
 - Evaluate the quality, context, scale, and biases in information, and synthesize diverse types of information, in written and oral forms.
 - Effectively participate in real-time discussions of biophysical and social systems and their interactions.
 - Understand the application of methods and knowledge from one discipline to another.
5. **Research skills**
 - Demonstrate facility with the research methods appropriate for the area of study.
 - Understand the use of quantitative and qualitative summaries of data as evidence for conclusions and scientific inference. This can include skills and knowledge needed to plan, implement, analyze and interpret research.
6. **Research ethics and responsibilities**
 - Knowledge of processes and guidelines for assuring that research is conducted in socially and professionally acceptable and legal ways, while minimizing and managing conflicts of interest.
 - Topics of relevance may include responsible conduct of research, general ethics, peer review, bias during data analysis and presentation, plagiarism, animal welfare, treatment of human subjects, collaboration, and authorship.
7. **Policy analysis/interpretation**
 - Understand the role of laws, regulations, social institutions, and governance processes relevant to application of a student's disciplinary and/or inter/trans-disciplinary areas of study.

III. ROLES AND RESPONSIBILITIES FOR ASSESSMENT

PRIOR TO THE PRELIMINARY AND FINAL EXAM(S)

1. **By the end of their 2nd term (MS, MF) or 5th term (Ph.D) of enrollment** in the FES Graduate Program, the student must work with their graduate committee to develop their learning outcomes, culminating in a three-part LO Document filed with the FES Department. **Student responsibilities for this process include:**
 - a. Meeting with their committee and developing a list of specific learning outcomes associated with each category,
 - b. Writing a plan to achieve the specific learning outcomes that is acceptable to the student's graduate committee,
 - c. Obtaining required signatures on the coversheet indicating acceptance of the plan, and finally,

- d. Submitting the compiled document to the FES Department office for review, approval, and inclusion in the student's program file.

Please see 'Guidance for Creating the Learning Outcomes Document' below for complete instructions for completing and submitting the LO Document.

2. **In the week prior to the preliminary (PhD) and final (MF, MS, PhD) exam**, the student is responsible for making sure copies of the previously-completed and signed LO Document are provided to all committee members

DURING THE PRELIMINARY AND FINAL EXAM(S)

Learning outcomes are to be tested and assessed by the student's graduate committee at their preliminary (PhD) and final (MS, MF, PhD) exam(s). Learning outcomes are assessed independently of the thesis and overall student performance. That is, the failure to meet expectations for any learning outcome as documented on the LO Assessment form need not necessarily affect the vote to pass.

The FES Representative is responsible for leading the discussion during the assessment and for filing the completed LO Assessment form with the FES Department after the conclusion of the exam.

1. During the defense portion of the exam, all graduate committee members may ask questions in order to assess how well the student has met their learning outcomes.
 - a. The LO Document (previously completed by the student and approved by the committee) will define the specifics by which each category is assessed.
 - b. It is preferable that committee members rely on demonstrations during the defense to assess how well a student has met each learning outcome. However, committee members may use evidence of demonstrated ability outside of the exam when such demonstrations are not possible during the exam (e.g., teaching, ethical behavior during research).
 - c. All graduate committee members should participate fully in the roundtable assessment of the learning outcomes at the conclusion of the exam.
2. The FES Representative will lead the discussion concerning the LO Assessment during committee's deliberations on the student's performance and they will fill out the LO Assessment form based on input from the committee.
 - a. The FES Representative is a member of the graduate committee and regular member of the FES Department. 'Regular' means not courtesy, not adjunct, and regularly attends FES Department meetings. It is typical that the FES Representative is the student's major professor; however, when the major professor is not a regular member of the department, another qualified committee member will be the FES Representative.
 - b. Committee members will provide the FES Representative with input to assist in completing the form.

- c. Any required remedial action for the student and the time line for that action are to be recorded and attached to the LO Assessment form.
 - d. Learning outcomes are assessed independently of the thesis and overall student performance. That is, the failure to meet expectations for any learning outcome as documented on the LO Assessment form need not necessarily affect the vote to pass.
3. The student will sign the LO Assessment form acknowledging they understand the assessment.

AT THE CONCLUSION OF THE PRELIMINARY AND FINAL EXAM(S)

The FES Representative turns the LO Assessment form into the FES Department Office immediately after the exam. The form will be placed in the student's file. **The FES Department Head will not sign off on the ETD form (required for thesis submission) until the completed LO Assessment form is on file with the department.**

IV. COMPOSITION OF THE LEARNING OUTCOMES DOCUMENT

The learning outcomes document consists of 3 parts:

1. **The LO Coversheet:** A FES form requiring signatures from the student, the major professor(s), and the Graduate Program Director to indicate approval of the document.
2. **The LO List:** A 1-2 page list of student-specific learning outcomes for each LO category, described in single-sentence statements.
3. **The LO Plan:** A short narrative explaining how each learning outcome in the LO List will be achieved.

V. GUIDANCE FOR CREATING THE LEARNING OUTCOMES DOCUMENT

1. Develop specific learning outcomes for each of the 7 categories in consultation with your major professor and committee members.
 - a. **Seek input from your committee members, either individually or in a formal meeting.**
 - Discuss how the LOs you will write for each category will support your graduate work and career goals.
 - Consult committee members with first-hand experience with your desired career path about the skills and experiences that would make your resumé attractive to employers and prepare to write your LOs with that future resumé in mind.

- b. **Create your LO List.** This is the heart of your LO Document. For each category, write a few (1 to 3 is typical) single-sentence LOs based on graduate-level verbs that describe specific actions you will be able to do as a result of your graduate program. The completed LO List should fit on 1–2 pages.
- **Developing the LO List is a significant part (if not the majority) of the work associated with creating the LO Document. Students and committees should thoroughly consider each LO developed for the LO List.**
 - Consult the Blooms Taxonomy Verbs (provided at the end of this section) for lists of verbs that describe actions indicative of graduate-level learning. The verbs you select to write your LOs should emphasize skills in the analysis, synthesis, and/or evaluation areas as opposed to, or in addition to, skills in the knowledge, comprehension and application areas, which are more characteristic of undergraduate-level learning.
 - **Please note that every LO developed for the LO List...**
 - Should be a single sentence
 - Should include graduate-level verbs from or similar to Bloom’s Taxonomy
 - Must be ‘demonstrable’, i.e. your committee must be able to ask you to perform the action or see direct evidence that you have successfully performed the action.
 - Can include actions that you can already perform as a result of prior learning, experiences, and life skills.
 - Should describe actions you can continue to do after you graduate, not something you did while developing the ability. Saying, “I lived in the field for two weeks,” only describes an experience, whereas “I will be able to develop protocols for obtaining quality data while under primitive field conditions,” explains what you can do as a result of that experience.
 - **Example:** *I will be able to synthesize information about requirements and assumptions of common statistical methods for survey data, and identify the most effective method for a given situation. I will be able to explain why the selected method is preferable to other options, and describe how that method would be applied.*
- c. **Create your LO Plan.** Write a short plan (1-2 paragraphs per category) describing how you will develop the skills and knowledge to support each specific LO. You may include experience and activities undertaken as part of your coursework, research, professional development, department service, previous education or previous life experience.
- The purpose of the LO Plan is to make clear to the committee and the student how learning activities support the learning outcomes. There is no penalty if you develop your skills/knowledge in a different way than you described in your plan.
 - **Example:** *I will pass FES 523: Quantitative Analysis in Social Science and complete coursework with an emphasis on statistical analysis, focusing on understanding data, selecting appropriate statistics for theoretical and managerial problems, using statistical software for analyses, and interpreting findings.*

2. **Sign the LO Coversheet and obtain your major professor's signature.** Other committee members should review and approve your completed LO List and LO Plan, but are not required to sign the LO Coversheet.
3. **Create your LO Document.** After completing the steps above, compile the resulting products in the following order:
 - a. Your LO Coversheet
 - b. Your LO List
 - c. Your LO Plan
4. **Submit your LO Document to the Grad Coordinator by the appropriate deadline.** Once received, the Grad Coordinator will review your LO Document and submit it to the Graduate Program Director for review and approval.
 - a. If the Graduate Program Director approves, they will sign it and return it to the Grad Coordinator. If your specific learning outcomes are unclear or do not reflect graduate level learning, you may be asked to complete and submit a revised version.
 - b. After the Graduate Program Director approves your LO Document, the Graduate Coordinator will provide you with a digital copy and retain a copy in your program file.
5. **Prior to your preliminary (PhD) and final (MF, MS, PhD) exam(s), resend your LO Document to all the members of your committee, including the Graduate Council Representative.**

VI. BLOOM'S TAXONOMY VERBS

Definitions	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Bloom's Definition	Remember previously learned information.	Demonstrate an understanding of the facts.	Apply knowledge to actual situations.	Break down objects or ideas into simpler parts and find evidence to support generalizations.	Compile component ideas into a new whole or propose alternative solutions.	Make and defend judgments based on internal evidence or external criteria.
Verbs	<ul style="list-style-type: none"> • Arrange • Define • Describe • Duplicate • Identify • Label • List • Match • Memorize • Name • Order • Outline • Recognize • Relate • Recall • Repeat • Reproduce • Select • State 	<ul style="list-style-type: none"> • Classify • Convert • Defend • Describe • Discuss • Distinguish • Estimate • Explain • Express • Extend • Generalized • Give example(s) • Identify • Indicate • Infer • Locate • Paraphrase • Predict • Recognize • Rewrite • Review • Select • Summarize • Translate 	<ul style="list-style-type: none"> • Apply • Change • Choose • Compute • Demonstrate • Discover • Dramatize • Employ • Illustrate • Interpret • Manipulate • Modify • Operate • Practice • Predict • Prepare • Produce • Relate • Schedule • Show • Sketch • Solve • Use • Write 	<ul style="list-style-type: none"> • Analyze • Appraise • Breakdown • Calculate • Categorize • Compare • Contrast • Criticize • Diagram • Differentiate • Discriminate • Distinguish • Examine • Experiment • Identify • Illustrate • Infer • Model • Outline • Point out • Question • Relate • Select • Separate • Subdivide • Test 	<ul style="list-style-type: none"> • Arrange • Assemble • Categorize • Collect • Combine • Comply • Compose • Construct • Create • Design • Develop • Devise • Explain • Formulate • Generate • Plan • Prepare • Rearrange • Reconstruct • Reorganize • Revise • Rewrite • Set up • Summarize • Synthesize • Tell • Write 	<ul style="list-style-type: none"> • Appraise • Argue • Assess • Attach • Choose • Compare • Conclude • Contrast • Defend • Describe • Discriminate • Estimate • Evaluate • Explain • Judge • Justify • Interpret • Relate • Predict • Rate • Select • Summarize • Support • Value