

INTRODUCTION TO STUDENT LEARNING OUTCOMES ASSESSMENT

For Continuing Program Improvement



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

OFFICE of INSTITUTIONAL RESEARCH and ASSESSMENT

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INTRODUCTION TO STUDENT LEARNING OUTCOMES ASSESSMENT

INTRODUCTION

Assessing Student Learning at the Program Level

Determining whether students are achieving the educational outcomes faculty have established for graduates of their programs is a critical part of the teaching-learning process. UNC-Chapel Hill requires academic programs to develop student learning outcomes assessment plans and to report on how they have used assessment results to enhance their programs. Appendix A displays the policy adopted by the University to ensure that these processes take place regularly for purposes of continuous improvement as well as accountability.

There are a number of reasons for measuring and assessing student learning outcomes at the program level:

- **Curriculum Evaluation:** To confirm that the actual knowledge students acquire by completing the requirements of the major is consistent with the intended goals of the curriculum.
- **Student Success:** To monitor student success across the program, identify gaps, and suggest initiatives to enhance the educational experience for all students.
- **Evaluate Alumni Success:** To ensure that graduates demonstrate competencies such as critical thinking and communication skills that employers in all fields consistently identify as prerequisites for success in a rapidly changing economic environment.
- **Measure Effectiveness:** To gather and aggregate evidence across the program – not just in individual courses -- to measure effectiveness and guide efforts to continuously improve the quality of the program.
- **Accountability:** To respond to the increasing pressure from the public and our constituents to be accountable and to demonstrate the value students receive from participating in our programs and services.
- **Accreditation:** To meet regional and professional accreditation requirements. UNC-Chapel Hill's regional accreditor, the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), requires that:

"The institution identifies expected outcomes, assesses the extent to which it achieves these outcomes, and provides evidence of improvement based on analysis of the results in...educational programs, to include student learning outcomes." ¹

¹ Comprehensive Standard 3.3.1.1, Principles of Accreditation, [Principles of Accreditation: Foundation for Quality Enhancement](#), 2012.

- **Program Review:** To meet requirements of the comprehensive Program Review sponsored by the Provost's Office and The Graduate School. Student learning outcomes assessment reports must be submitted by the department as part of the self-study prepared every 7-8 years. ²

Purpose of this Guide

Assessment can generate rich information that can be used by program faculty to improve teaching and learning. But faculty and department chairs struggle to meet the many varied demands on their time and need feasible ways of carrying out assessments that will produce meaningful data.

Primarily designed for those who are new to student learning outcomes assessment at the program level, this manual offers practical advice on keeping the process simple and manageable and contacts for further information. These recommendations were compiled from experiences shared by colleagues at other institutions, public websites, conference presentations, and publications on best practices in assessing student learning outcomes.

Visit the [Office of Institutional Research & Assessment website](#) for more information and to download easy to complete templates and useful examples.

FREQUENTLY ASKED QUESTIONS

What is a “learning outcome”? How is an outcome different from a goal or objective?

While often these terms are used interchangeably, an outcome differs from a goal or objective in terms of specificity and focus. **Learning outcomes describe measurable knowledge, skills, and behaviors that students should be able to demonstrate as a result of completing the program.** Goals and objectives are typically broader statements of program purpose that are more difficult to measure, such as “providing a comprehensive liberal arts education,” “producing quality scientists for the twenty-first century,” etc.

Learning outcomes describe measurable knowledge, skills, and behaviors that students should be able to demonstrate as a result of completing the program.

What do you mean by “assessment”?

Don't we already assess individual students' performances in our classes, labs, internships, etc.?

There are many different uses of the term “assessment.” In this context, we are using “assessment of student learning outcomes” to refer to the process of gathering and reviewing evidence to determine the extent to which graduates of the program are achieving the major educational outcomes intended by the faculty. The primary difference between assessment in this sense and the type of assessment that we do when we grade an individual

² “Self-Study Outline and Required Key Elements,” Program Review webpage on The Graduate School website: <http://gradschool.unc.edu/policies/faculty-staff/program-review/outline.html>

student's test or paper is **how the results are analyzed and used**. The unit of analysis in learning outcomes assessment is the program, not individual students. Data on student performance are gathered and reviewed in the **aggregate** for the purpose of evaluating how well the learning goals of the program are being accomplished and if specific improvements should be made. In contrast, assessment of individual student performance – typically in the form of course grades – is conducted to provide feedback to students about their progress.

In short, “*assessing learning outcomes*” is a form of program and curriculum evaluation. Individual student performance data can be aggregated for use as evidence for assessment/program evaluation purposes. To be useful in this context, however, the performance data would need to: (1) be rated using agreed-upon, standard criteria, and (2) be “rolled up” and analyzed at the program level. More on how to assess student performance so that it can be used to evaluate the program is contained in later sections of this document.

What is a “Program”?

For purposes of student learning outcomes assessment, the University of North Carolina at Chapel Hill has defined a **“program” as a credit-bearing course of study that results in a degree or a stand-alone professional certificate**³. The following guidance is provided to help determine what programs are required to submit assessment plans and reports:

- Include all undergraduate, master's, and doctoral degree major programs, and free-standing certificate programs. Exclude certificate programs consisting only of courses from existing degree programs offered to matriculated students.
- Within degree programs, the focus of learning outcomes assessment is the major. Minors, concentrations, program tracks, and certificates offered only to degree-seeking students may be assessed separately at the discretion of the dean or chair, but the results do not need to be reported outside of the department.
- A program with multiple degrees at the same level and a common core curriculum (e.g., BA and BS in Biology) may submit one report, but should include at least one unique measure for each degree.
- Graduate programs that only admit students to pursue a doctoral degree but are approved to award a master's degree as students progress toward the doctorate may prepare one report. The outcomes should reflect what students know or can do upon completion of the doctoral degree.
- Programs with residential and distance education versions of the same degree may submit joint or separate reports, but either way, need to present evidence that graduates demonstrate equivalent knowledge and skills, regardless of mode of delivery.

Assessing learning outcomes is a form of program and curriculum evaluation with the goal of continuous program improvement.

An academic program is a credit-bearing course of study that results in a degree or a professional or stand-alone certificate.

³ A professional certificate program is defined here as admits non-degree students whose objective is the development of a specialization in a specific field (for example, Dental Assisting).

What are Department and Program Faculty Required to Do?

Faculty in each program must develop and keep on file in the deans' office an assessment plan that documents their student learning outcomes and how they will be measured. Some programs measure and review all their outcomes each year. However, many academic programs have outcomes that are more complicated to measure and analyze, and their plans may include a tentative schedule for how they will stagger the assessments across multiple years.

An annual assessment report describes learning outcomes and how they have been used for program improvement.

According to the University's policy, each program will prepare and submit an annual assessment report that describes the learning outcomes conducted that year and how they have used the results for program improvement. Deans are responsible for ensuring that these processes take place, and will appoint Assessment Coordinators within the school to provide local advice and support for assessment activities. The assessment reports are submitted to the Provost on an annual basis where they are reviewed by teams consisting of faculty and staff with expertise in evaluation who offer feedback and assistance to help programs improve their assessment processes.

DEVELOPING ASSESSMENT PLANS

All assessment plans include:

1. a *mission statement*,
2. intended *learning outcomes*, and
3. a description of the *methods* that will be used to gather data to measure student achievement of each outcome.

Begin with a brief statement of the mission and general goals for the program

- A brief description of the purpose of the program (usually a paragraph)
- Can include statements about:
 - Educational values;
 - Major bodies of knowledge covered in the curriculum;
 - What the program prepares students for (e.g., graduate study, professional positions)
- An example taken from UNC-Chapel Hill websites:

Curriculum in Toxicology (Ph.D.)

The Curriculum in Toxicology is an interdisciplinary program dedicated to the development of future scientists who are knowledgeable in the basic principles of toxicology and environmental health sciences with in-depth experience in the design, execution and publication of research relevant to toxicology and human health.

Identify the intended student learning outcomes of the program

- The faculty should clearly define learning outcomes for each major in terms of **what a student should know, think, do, or value as a result of completing the program.** Note that the focus is on measuring what students actually learn, not what the faculty intend to deliver.
- Learning outcomes must be **stated in measurable terms.** Producing “educated persons” or an “ethical individuals” or a “good citizens” might be worthy goals, but such terms need to be operationalized in order to be measured if the results are going to be useful in guiding decisions about improving programs. It helps to start the statement with an action verb to describe how the outcomes will be demonstrated (see examples in Appendix B).
- **Focus on selecting 3 - 6 of the most important learning outcomes.** More are acceptable, but the practical ability of program faculty to adequately measure, analyze, and reflect upon the results becomes compromised when there are too many. For example, many doctoral programs identify four major outcomes that, with some variations, describe: (1) advanced knowledge of the discipline, (2) research skills, (3) college teaching skills, and (4) professional development such as presentation skills, ethics, grant writing, etc.
- **Discipline-based societies and professional associations** can be good sources for identifying learning outcomes for specific majors. Many of these organizations have already articulated outcomes and competencies at each degree level. Below is an example from the American Psychological Association.

Student learning outcomes are measurable statements about what students should know or be able to do upon completion of the program.

An Example of Learning Outcomes

Developed by the American Psychological Association

The following learning outcomes were summarized for illustrative purposes from the much more detailed list of goals and outcomes listed in the American Psychological Association’s *Guidelines for the Undergraduate Psychology Major, Version 2.0*, August 2013 (

- **Knowledge Base of Psychology:** Students will demonstrate knowledge and comprehension of the major concepts, theoretical perspectives, historical trends, and empirical findings and the ability to discuss how psychological principles apply to behavioral problems.
- **Scientific Inquiry and Critical Thinking:** Students will demonstrate scientific reasoning and problem-solving skills, focusing on the use of theory use in the design and execution of research plans to address psychological questions that employ appropriate research methods, data analysis, and interpretation.
- **Ethical and Social Responsibility in a Diverse World:** Students will demonstrate adherence to professional values to optimize their contributions and work effectively, even with those who do not share their heritage and traditions, as well as the adoption of personal and professional values that can strengthen community relationships.
- **Communication:** Students will demonstrate competence in writing and in oral and interpersonal communication skills by producing a research study or other psychological project, explaining scientific results, and presenting information to a professional audience.
- **Professional Development:** Students will demonstrate psychology-specific content and skills, effective self-reflection, project-management skills, teamwork skills, and career preparation.

Describe how data will be collected and analyzed to measure student learning outcomes

Map your department's student learning outcomes to useful and feasible program assessment approaches. Consider how you can demonstrate that your major are producing high quality work that is consistent with the learning objectives of the program.

Methods describe **how you measured achievement of the student learning outcome.**

- Using **multiple methods** of assessing outcomes is highly recommended. For example, administering a subject area test along with observing performance in a simulated situation provides feedback on both knowledge and application of content information.
- **Direct assessments** examine student work products straight from the source — the student. Focus on student work as the primary source for assessing outcomes — what your majors are actually producing as part of your department's curriculum on their way to graduation.

Consider the following:

- *They take tests or comprehensive exams in certain content domains required for majors.*
 - *They write papers for key content courses in the major.*
 - *They conduct independent research projects.*
 - *They give presentations and performances as part of final projects.*
 - *They participate in certain experiences that are valued by your department, such as capstone experiences or field or service learning work.*
 - *They prepare portfolios to summarize their work at the end of the year.*
 - *They write thought papers where they reflect on what, how, and why they learned.*
- **Indirect assessments** examine secondary information about what students have learned (e.g., student opinions about what they learned or course-taking patterns within a department. Often, indirect assessments provide feedback that is useful in interpreting results of direct assessments or suggesting how processes might be improved to enhance learning. For example, if direct methods revealed that students were not achieving the desired outcomes in a specific area of the curriculum, perhaps a surveys or focus groups with students might provide clues for improving learning conditions.
 - Some commonly used evaluation techniques **do not** measure student learning.
 - **Student Ratings of Instruction** — End-of-term course evaluations typically focus on students' perceptions of the quality of instruction received — i.e., the teaching is being rated and not the learning. These instruments sometimes include items that might be used as indirect methods of assessing learning, such as student self-assessments of their gains in knowledge or skills intended as a result of taking the course.
 - **Graduation Rates** — Completing the program is not a measure of what students learned. However, completions might be another type of goal that the program sets for itself.

- **Cumulative GPA** — A minimum GPA might be a requirement for graduation, it is not a measure of what students have learned in the program.
- **Course Grades** — Course grades are poor measures of learning outcomes for several reasons:

1. *Since grading criteria and standards are matters decided by the individual instructor, the grades in one course cannot be assumed to be equivalent to grades in other courses. (There is no “gold standard” to which all teachers adhere.)*
2. *The tests, assignments, projects, and papers in a course may not measure the program outcomes of interest to the department. However, it is possible with careful planning to map specific course assignments to program-level learning outcomes and to develop standard measures of performance that allow the results to be aggregated and reviewed as outcomes data. For example, final papers in capstone courses can be graded using a common rubric that anchors the ratings to specific performances on certain dimensions, such as critical thinking.*
3. *Some instructors’ grading schemes include a variety of factors such as class participation, adherence to deadlines, and attendance. Therefore, the final grade represents a range of student performance other than the strict achievement of learning goals or program outcomes.*

We recommend that you attempt to use mostly direct assessment techniques, but encourage you to supplement those with indirect assessment methods to the extent that you find the data useful in improving learning in your discipline.

Make decisions about the logistics for each assessment

- How often will the assessment be conducted?
- Which learning experiences will be included in the assessment?
- If a sample of work or papers will be evaluated, what size sample will be drawn, and how will it be drawn?
- Who will develop the scoring rubric for each assessment?
- What steps will be taken to protect the identity of students whose work will be judged?
- Who will conduct the assessment? How many judges will there be, and how will these judges be selected?
- Who will ensure that the assessments will take place in a timely way?
- Who will store and analyze the data once the assessments have been made?
- How will the data be reported?

If you choose to have judges rate student work, develop a clear rubric for these evaluations.

- What 5-10 common dimensions or attributes should be present in the student work?
- What skills (consistent with the learning goals) should students have demonstrated by completing the assignment, project, or course?

- Rubrics for rating student work have much in common with rubrics used by grant review panels. A sample rubric used by NIH reviewers is provided in Appendix C.

Develop a tentative schedule for assessing all outcomes, either annually or in multi-year cycles

This plan can and should be revised by faculty as often as needed. With experience, faculty sometimes recognize that certain methods they had planned to use to collect data on student outcomes just aren't feasible or did not generate the information they needed to make improvements to the program.

If you make significant changes to your assessment plan, send a copy of the revised version to the dean's office.

SUMMARY:

RECOMMENDATIONS FOR DEVELOPING AN ASSESSMENT PLAN

- Develop (or pull from existing catalog or website materials) a brief mission statement for the program – a paragraph is sufficient.
- Choose 3-6 of the most important learning outcomes for each degree program.
- Design at least one direct assessment of student learning for each learning outcome. Multiple methods are most informative, but keep time constraints in mind. The plan does not have to include complete methodological details on each assessment, but should include a basic description of where in the curriculum the outcome will be assessed (e.g., capstone course, internship, etc.), what work products will be assessed (papers, presentations, performances, etc.), how the work will be evaluated (e.g., with a rubric, by a team of external reviewers, etc.), and any known criteria that would define success or signal the need for action. The first year of assessing outcomes might be used to gather baseline data that would then be used to set criteria for later administrations or chart improvement.
- Indirect assessment methods can be included in your plan along with direct methods. The [Office of Institutional Research and Assessment](#) can help you in taking advantage of existing survey data collected on your majors, or help you design and administer other types of data collection such as alumni surveys, student interviews, etc.
- Determine roughly when you plan to conduct each of the assessments and over what period of time. The goal should be to assess at least one of your major learning outcomes per year, so that you are collecting and reflecting upon manageable portions of feedback about program quality on an ongoing basis.

Summary Steps:

1. Mission Statement
2. Define Learning Outcomes
3. Design Methods
4. Determine Schedule

FOR MORE INFORMATION OR ASSISTANCE

Instructions, Reporting Templates, and Examples of Assessment Plans and Reports:

<https://oira.unc.edu/assessment/academic-program-assessment/>

Assessment Resources, including Rubrics:

<https://oira.unc.edu/assessment/academic-program-assessment/resources-for-assessing-student-learning/>

Questions or assistance with completing assessment plans and reports, please contact:

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Appendix A

*UNC-Chapel Hill's Policy on Outcomes Assessment of
Academic Programs and Non-Instructional Unit Outcomes*



Issuing Office(s)

Office of the Executive Vice Chancellor
and Provost

Responsible University Officer(s)

Office of the Executive Vice Chancellor
and Provost

UNIVERSITY POLICY

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL POLICY ON ASSESSMENT OF ACADEMIC PROGRAMS AND NON-INSTRUCTIONAL UNIT OUTCOMES

Introduction

PURPOSE

Consistent with its mission statement, UNC-Chapel Hill embraces "...an unwavering commitment to excellence" and as such is committed to continuous improvement informed by assessment of institutional effectiveness across all areas and levels. In addition to institution-level planning and evaluation, assessment of the outcomes of academic programs and non-instructional units is required by the University's regional accreditor, the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC).

The purpose of this policy is to articulate requirements for assessment of outcomes and use of results for improvement purposes in academic and non-academic units and to specify the roles and responsibilities for implementing and overseeing assessment processes to ensure compliance with this policy and with the requirements of SACSCOC.

This policy replaces "UNC-Chapel Hill Guidelines for Student Learning Outcomes Assessment" approved by the Executive Vice Chancellor and Provost in 2004 and last revised and approved in 2007, and codifies existing practices for assessment in non-instructional units.

SCOPE OF APPLICABILITY

This policy applies to the following types of programs and units at UNC-Chapel Hill:

- Academic degree major and stand-alone certificate programs (undergraduate, graduate, and professional);
- Administrative units that deliver institutional services;
- Academic and student support units that deliver institutional services;
- Units with a primary focus on conducting or supporting research;
- Units with a primary focus on delivering or supporting public service/engagement;
- Schools, for assessment of internal support services and school-wide research and public service/engagement outcomes.



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Policy

Policy Requirements

UNC-Chapel Hill's outcomes assessment process requires programs or units to articulate expected outcomes that should occur as a result of their primary work – whether that involves enhancing student learning and educational program quality, research, public engagement, academic and student support services, or administrative operations – and then to measure their success and make improvements based on the results.

The University requires academic programs and non-academic units defined above to prepare and submit the following to the Executive Vice Chancellor and Provost, through their respective deans or vice chancellors:

- An assessment plan that contains a mission statement; expected outcomes (that include student learning outcomes for educational programs); appropriate evaluation methods or metrics to assess these outcomes; and performance targets.
- An annual assessment report describing assessments conducted, findings, analysis of results, and a description of how the results have been used to make improvements in the program or unit.

These assessment plans and annual reports are required in addition to any other evaluation-related reporting obligations, such as those for Program Review, specialized accreditation, administrator reviews, five-year reviews of centers and institutes, and sponsored research.

Standards and Procedures for Outcomes Assessment

Each plan and report must meet standards that address required elements and appropriate assessment methodology developed from best practices for assessment of institutional effectiveness in higher education. These standards, as well as procedures for reporting, submission timelines, and review and approval processes, are described in the “Standards and Procedures Related to the Policy on Assessment of Academic and Non-Academic Units” document available on the website of the Office of Institutional Research and Assessment (<http://oir.unc.edu/institutional-effectiveness/>).

Roles and Responsibilities

The Executive Vice Chancellor and Provost has overall responsibility and oversight for outcomes assessment processes for academic program and non-instructional units.

Deans and vice chancellors are responsible for ensuring that all of the academic programs and non-instructional units within their respective organizations have assessment plans, carry out assessments that meet prescribed standards, and submit annual reports that document improvements made based on assessment results.



Issuing Office(s) Office of the Executive Vice Chancellor and Provost
Responsible University Officer(s) Office of the Executive Vice Chancellor and Provost

Each dean and vice chancellor will appoint one or more Assessment Coordinators to manage internal assessment process and to serve as liaisons to the Office of Institutional Research and Assessment. Coordinators of academic program assessment must be full-time faculty members. Assessment Coordinators will be responsible for collecting and reviewing assessment plans and reports, providing feedback to faculty and staff to improve the quality of their assessments, and providing the plans and reports to the dean or vice chancellor for approval prior to submission to the Executive Vice Chancellor and Provost. Assessment Coordinators must participate in periodic training and professional development activities sponsored by the Office of the Executive Vice Chancellor.

The Office of Institutional Research and Assessment will offer training and consultation to Assessment Coordinators and program faculty about effective assessment practices. They will publish the annual calendar of due dates for plans and reports and provide templates and other assessment resources through their website. In addition to maintaining a central repository for assessment plans and reports, they will also review these documents for compliance with standards, provide feedback to Assessment Coordinators on necessary changes, and report to the Executive Vice Chancellor and Provost concerning policy compliance and opportunities for process improvement.

Definitions

Academic Program: A formal course of study that leads to a degree or a stand-alone certificate.

Non-Instructional Unit: An organization with a mission that does not include offering credit-bearing courses that lead to a degree or certificate but instead provides services and operational support in fulfillment of the University's mission.

Outcomes: Statements that describe what should occur as a result of a program or unit's work. Outcomes are often synonymous with goals and objectives; however, they are typically focused on the quality and impact of the unit's work as opposed to completion of tasks.

Student Learning Outcomes: Statements that describe what students should know, think and be able to do upon completion of an academic program.

Assessment Plan: A document that articulates the program or unit's mission, the intended outcomes of its work, methods to be used to measure these outcomes, and targets for determining success.

Assessment Report: An annual report from a program or unit that describes the outcomes measured during the past year, the findings from those assessments, and how the results were used to make decisions and improvements.



Issuing Office(s)

Office of the Executive Vice Chancellor
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Related Requirements

EXTERNAL REGULATIONS AND CONSEQUENCES

This policy was developed to ensure UNC-Chapel Hill's continued compliance with the Southern Association of Colleges and Schools Commission on Colleges *Principles of Accreditation*, Comprehensive Standard 3.3.1, Institutional Effectiveness, page 27.

<http://www.sacscoc.org/pdf/2012PrinciplesOfAccreditation.pdf> . The consequences of failure to comply with SACSCOC requirements include sanctions and possible loss of accreditation.

UNIVERSITY STANDARDS AND PROCEDURES

See "Standards and Procedures Related to the Policy on Assessment of Academic and Non-Academic Units" on the website of the Office of Institutional Research and Assessment (<http://oira.unc.edu/institutional-effectiveness/>).

Contact Information

POLICY CONTACTS

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Important Dates

- Effective Date and title of Approver: March 1, 2017. Approved by Executive Vice Chancellor and Provost.
- Replaces "UNC-Chapel Hill Guidelines for Student Learning Outcomes Assessment" approved by the Executive Vice Chancellor and Provost in 2004 and last revised and approved in 2007.



Issuing Office(s)

Office of the Executive Vice Chancellor
and Provost

Responsible University Officer(s)

Office of the Executive Vice Chancellor
and Provost

Approved by:

[Name of Issuing Officer Signing the Policy]

Date

[Title of Issuing Office]

Appendix B

Action Verbs That Can Be Used in Writing Learning Outcomes Statements

From Bloom's Taxonomy (Revised)*

Definitions	I. Remembering	II. Understanding	III. Applying	IV. Analyzing	V Evaluating	VI. Creating
Bloom's Definition	Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Demonstrate Understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and starting main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Verbs	<ul style="list-style-type: none"> • Define • Find • Label • List • Match • Name • Relate • Select • Show 	<ul style="list-style-type: none"> • Classify • Compare • Contrast • Demonstrate • Explain • Extend • Illustrate • Infer • Interpret • Outline • Relate • Summarize • Translate 	<ul style="list-style-type: none"> • Apply • Build • Choose • Construct • Develop • Experiment with • Identify • Interview • Model • Organize • Plan • Solve • Utilize 	<ul style="list-style-type: none"> • Analyze • Categorize • Conclude • Discover • Dissect • Distinguish • Examine • Function • Inspect • Survey • Test for 	<ul style="list-style-type: none"> • Appraise • Assess • Criticize • Defend • Determine • Estimate • Evaluate • Explain • Interpret • Judge • Justify • Measure • Prioritize • Prove • Rate • Recommend • Support 	<ul style="list-style-type: none"> • Adapt • Build • Change • Compose • Construct • Create • Design • Develop • Discuss • Estimate • Formulate • Improve • Invent • Maximize • Minimize • Modify • Originate • Plan • Predict • Propose • Solve • Test

*Source: Anderson, L. W., & Krathwohl, D. R. (2001). A taxonomy for learning, teaching and assessing, Abridged edition, Boston, MA, Allyn and Bacon.

Note: Avoid vague terms such as “become familiar with,” “learn about,” and “appreciate,” which are difficult to measure.

Appendix C

Rubric Used by Grant Review Panels at the National Institutes of Health to Evaluate Research Proposals					
	1	2	3	4	5
	Outstanding	Excellent	Good	Fair	Poor
<p>1. Significance. Does this study address an important problem? If the aims of the application are achieved, how will scientific knowledge be advanced? What will be the effect of these studies on the concepts or methods that drive this field?</p>					
<p>2. Approach. Are the conceptual framework, design (including composition of study population), methods, and analyses adequately developed, well-integrated, and appropriate to the aims of the project? Does the applicant acknowledge potential problem areas and consider alternative tactics?</p>					
<p>3. Innovation. Does the project employ novel concepts, approaches or methods? Are the aims original and innovative? Does the project challenge existing paradigms or develop new methodologies or technologies?</p>					
<p>4. Investigator. Is the investigator appropriately trained and well suited to carry out this work? Is the work proposed appropriate to the experience level of the principal investigator and other researchers (if any)?</p>					
<p>5. Environment. Does the scientific environment in which the work will be done contribute to the probability of success? Do the proposed experiments take advantage of unique features of the scientific environment or employ useful collaborative arrangements? Is there evidence of institutional support?</p>					
<p>6. Overall Evaluation. Score the proposal to reflect the overall impact of the project on the field, weighting the review criteria, as you feel appropriate for each application. An application does not need to be strong in all categories to be judged likely to have a major scientific impact and, thus, deserve a high merit rating. For example, an investigator may propose to carry out important work that by its nature is not innovative, but is essential to move a field forward.</p>					

Appendix D

Helpful References

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