Syllabus

Course Overview

National and state trends regarding accountability for student learning have placed tremendous emphasis on facilitation of standard proficiency through valid and consistent assessment measures. While traditional behaviorist approaches to didactic teaching and memorized content regurgitation may still be the norm in some classrooms, science reform initiatives (Minner, Levy, & Century, 2010; Rhoton, 2010) clearly call for demonstrative science literacy through authentic problem solving and critical thinking skills. Assessment is a means by which educators can determine if learning is taking place. It is through assessment that we diagnose learner needs and interests in order to find a way to help them connect with subject matter. It is also through assessment that we determine if learners are struggling (and if so, to what degree) with subject matter, or if they are ready for more challenging and enriching ways of extending and applying their understanding of the material.

Without accurate and valid forms of assessment, instruction is pretty much just a shot in the dark. Accurate assessments generate data regarding students' skill and knowledge development that help teachers plan engaging and meaningful instruction en route to achieving standard proficiency (Gischlar & Vesay, 2014). Instead of viewing assessments as a means to rank students, assessment should be used as a tool for informing instruction to facilitate learning growth among all students.

Assessment is an integral component to learning growth. Findings from several studies illustrate that while some assessments are better than others, testing and feedback (regardless of the quality) support student engagement and learning. In other words, administering assessments to monitor student learning is always better than not assessing students to monitor learning growth (Larsen, Butler, & Roediger, 2008; Roediger & Karpicke, 2006). However, the research also clearly indicates that assessment that is not aligned with learning goals—and feedback that is overly critical—drives down learning and discourages students from engaging in the new learning (Brookhart, 2013). Therefore, the best forms of assessment are those that directly measure standards and learning goals, build students' confidence in learning the material, and provide direction to students on where they are in the learning process.

In this course, you will develop multiple types of assessments with accompanying rubrics based on the Next Generation Science Standards (NGSS). While your state may not have adopted the NGSS, we will be basing our work on developing assessments around it for the purposes of establishing consistency with our conversations in this course. Creating assessments around the NGSS requires a clear understanding of the established dimensions and standards so that you can develop clear learning goals that will accurately measure learning growth and inform instruction. By examining the appropriate uses of traditional and performance-based assessments, you will understand how to better match assessments to learning goals. You will also gain skills with protocols for examining student work through the implementation of rubrics. In turn, you will gain insights into students' understanding of science content, as well as processes that are broader and deeper than those viewed through the lens of traditional forms of assessment.

In this course, you will also examine strategies for, as well as benefits and challenges of, designing assessments and evaluating student work as department- and grade-level teams for the improvement of classroom instruction and school-wide achievement. Therefore, this course is designed to help you answer the following essential questions:

- How can multiple assessment strategies (such as pre-assessments, self-assessments, and laboratory assessments) be utilized to improve instruction?
- How are rubrics developed to accompany assessments, distinguish levels of performance, and provide students with clear, measurable expectations?
- How are protocols used for examining student work—specifically within collegial groups—to determine progress toward meeting instructional goals?
- What assessment tools are most effective in evaluating the quality of tasks?
- How can technology be used to effectively assess student learning?
- How can assessments be tailored to meet the needs of diverse learners?

References

Brookhart, S. M. (2013). *How to create and use rubrics for formative assessment and grading*. Alexandria, VA: ASCD.

Gischlar, K. L., & Vesay, J. P. (2014). Literacy curricula and assessment: A survey of early childhood educators in two states. *Reading Improvement, 51*(3), 291–302.

Larsen, D. P., Butler, A. C., & Roediger, H. L. (2008). Test-enhanced learning in medical education. *Medical Education, 42*(10), 959–966.

Minner, D. D., Levy, A. J., & Century, J. (2010). Inquiry-based science instruction—What is it and does it matter? Results from a research synthesis years 1984–2002. *Journal of Research in Science Teaching, 47*(4), 474–496.

Roediger, H. L., & Karpicke, J. D. (2006). The power of testing memory: Basic research and implications for educational practice. *Perspectives on Psychological Science, 1*(3), 181–210.

Rhoton, J. (Ed.). (2010). *Science education leadership: Best practices for the new century.* Retrieved from http://www.project2061.org/publications/2061Connections/2010/media/SCI%20EDUC%20LEADERSHIP%20Ch%2017_NSTA.pdf

Course Competencies **(Read Only)**

To successfully complete this course, you will be expected to:

1. Create a comprehensive assessment plan that aligns with national science standards.
2. Create tools that inform all stakeholders about the expected quality of all tasks.
3. Analyze the importance of consistent common protocol for the examination of student work among colleagues within a school faculty.
4. Communicate in a professional and scholarly manner.

Course Prerequisites

There are no prerequisites for this course.

Syllabus >> Course Materials

Required

The materials listed below are required to complete the learning activities in this course.

Library

The following required readings are provided in the Capella University Library or linked directly in this course. To find specific readings by journal or book title, use Journal and Book Locator. Refer to the Journal and Book Locator library guide to learn how to use this tool.

- Chen, N. S., Wei, C. W., Huang, Y., & Kinshuk. (2012). The integration of print and digital content for providing learners with constructive feedback using smartphones. *British Journal of Educational Technology, 44*(5), 837–845.
- Childre, A., Sands, J. R., & Pope, S. T. (2009). Backward design: Targeting depth of understanding for all learners. *Teaching Exceptional Children, 41*(5), 6–14.
- Davis, D. S., & Neitzel, C. (2011). A self-regulated learning perspective on middle grades classroom assessment. *Journal of Educational Research, 104*(3), 202–215.
- DiMartino, J., & Miles, S. (2005). Reaching real equity in schools. *Education Digest, 70*(5), 9–13.
- Eddy, P. L., & Lawrence, A. (2013). Wikis as platforms for authentic assessment. *Innovative Higher Education, 38*(4), 253–265.
- Fluckiger, J. (2010). Single point rubric: A tool for responsible self-assessment. *Delta Kappa Gamma Bulletin, 76*(4), 18–25.
- Fluckiger, J., Tixier y Vigil, Y., Pasco, R. J., & Danielson, K. E. (2010). Formative feedback: Involving students as partners in assessment to enhance learning. *College Teaching, 58*(4), 136–140.
- Harlen, W. (2005). Teachers' summative practices and assessment for learning-tensions and synergies. *Curriculum Journal, 16*(2), 207–223.
- Hockett, J. A., & Doubet, K. J. (2013). Turning on the lights: What pre-assessments can do. *Educational Leadership, 71*(4), 50–54.
- Hosp, J. L. (2012). Formative evaluation: Developing a framework for using assessment data to plan instruction. *Focus on Exceptional Children, 44*(9), 1–10.
- Jonsson, A., & Svingby, G. (2007). The use of scoring rubrics: Reliability, validity, and educational consequences. *Educational Research Review, 2*(2), 130–144.
- Milner-Bolotin, M., Antimirova, T., & Petrov, A. (2010). Clickers beyond the first-year science classroom [PDF]. *Journal of College Science Teaching, 40*(2), 14–18.
- Parrish, P. R., & Stodden, R. A. (2009). Aligning assessment and instruction with state standards for children with significant disabilities. *Teaching Exceptional Children, 41*(4), 46–56.
- Pellegrino, J. W., Wilson, M. R., Koenig, J. A., & Beatty, A. S. (Eds.). (2014). *Developing assessments for the Next Generation Science Standards*. Washington, DC: National Academies Press.
- Perkins, K., Moore, E., Podolefsky, N., Lancaster, K., & Denison, C. (2011). Towards research-based strategies for using PhET simulations in middle school physical science classes. *AIP Conference Proceedings, 1413*(1), 295–298.
- Roskos, K., & Neuman, S. B. (2012). Formative assessment: Simply, no additives. *Reading Teacher, 65*(8), 534–538.
- Salend, S. J. (2009). Technology-based classroom assessments: Alternatives to testing. *Teaching Exceptional Children, 41*(6), 48–58.
- Stiggins, R., & DuFour, R. (2009). Maximizing the power of formative assessments. *Phi Delta Kappan, 90(*9), 640–644.
- van Garderen, D., Hanuscin, D., Lee, E., & Kohn, P. (2012). QUEST: A collaborative professional development model to meet the needs of diverse learners in K-6 science. *Psychology in the Schools, 49*(5), 429–443.

External Resource

Please note that URLs change frequently. While the URLs were current when this course was designed, some may no longer be valid. If you cannot access a specific link, contact your instructor for an alternative URL. Permissions for the following links have been either granted or deemed appropriate for educational use at the time of course publication.

- Achieve, Inc. (n.d.). Next Generation Science Standards. Retrieved from http://www.nextgenscience.org/
- Looking at Student Work. (n.d.). The Collaborative Assessment Conference: Steps. Retrieved from http://www.schoolreforminitiative.org/download/collaborative-assessment-conference/
- Mertler, C. A. (2001). Designing scoring rubrics for your classroom. *Practical Assessment, Research & Evaluation, 7*(25). Retrieved from http://PAREonline.net/getvn.asp?v=7&n=25
- Moskal, B. M., & Leydens, J. A. (2000). Scoring rubric development: Validity and reliability. *Practical Assessment, Research & Evaluation, 7*(10). Retrieved from http://PAREonline.net/getvn.asp?v=7&n=10

- Oregon Department of Education. (n.d.). Scientific inquiry work samples. Retrieved from https://www.ode.state.or.us/teachlearn/subjects/science/assessment/sciscoringmaterials_gr3_final_052009.pdf
- Park University. (n.d.). Writing quality learning objectives. Retrieved from https://assessment.trinity.duke.edu/sites/assessment.trinity.duke.edu/files/page-attachments/learning_objectives_park.pdf
- SRI International. (n.d.). Performance assessment links (PALS). Retrieved from http://pals.sri.com/
- Teaching Excellence & Educational Innovation. (n.d.). Articulate your learning objectives. Retrieved from http://www.cmu.edu/teaching/designteach/design/learningobjectives.html
- Wayne County RESA. (n.d.). Lesson plans exploring NGSS. Retrieved from http://www.resa.net/curriculum/curriculum/science/professionaldevelopment/ngss-pd/lesson-plans-exploring-ngss/

Suggested

The following materials are recommended to provide you with a better understanding of the topics in this course. These materials are not required to complete the course, but they are aligned to course activities and assessments and are highly recommended for your use.

Optional

The following optional materials are offered to provide you with a better understanding of the topics in this course. These materials are not required to complete the course.

External Resource

Please note that URLs change frequently. While the URLs were current when this course was designed, some may no longer be valid. If you cannot access a specific link, contact your instructor for an alternative URL. Permissions for the following links have been either granted or deemed appropriate for educational use at the time of course publication.

- DePaul University. (n.d.). Types of rubrics. Retrieved from https://resources.depaul.edu/teaching-commons/teaching-guides/feedback-grading/rubrics/Pages/types-of-rubrics.aspx
- Reineke, M. (n.d.). Holistic and analytic rubrics. Retrieved from https://www.uni.edu/chfasoa/analyticholisticrubrics.pdf

Projects

Project ›› Student Assessment and Work Analysis in Science Education

Project Overview

For your course project, you will develop a complete student performance assessment plan for science. Assignments throughout this course will help to build the final project. The goal for this project is that you will create an engaging, instructionally sound assessment that you would actually use within your classroom to assess the knowledge and skills of your learners for at least one standard from each of the three dimensions of the NGSS. In addition, you will reflect on strategies that can be employed to work with colleagues in generating and implementing common classroom assessments in an effort to create consistency and meet the diverse needs of learners.

You should follow the steps below to complete the assessment plan:

1. In Unit 1, you will identify three standards, one from each dimension of the NGSS. You should choose one standard from Science and Engineering Practices, one from Disciplinary Core Ideas, and one from Crosscutting Concepts.
2. In Unit 3, you will create learning objectives and an assessment plan overview for the instructional unit you will design to help learners become proficient in the standards identified.
3. In Unit 3, you will create an instructional plan.
4. In Unit 4, you will create a pre-assessment.
5. In Unit 6, you will create a laboratory activity, a holistic rubric for formative assessment of student learning growth, and a holistic rubric for student self-assessment.
6. In Unit 8, you will create a plan for summative assessment and an analytic rubric to gauge students' proficiency in meeting learning objectives and standards.

After creating the assessment plan, you will compile all of the assignments you completed throughout the course into one Word document and post your draft for discussion and feedback from a peer. In Unit 10, you will submit your course project (in one Word document) to your instructor. Within the scope of your course project (which includes assignments from Units 3, 4, 6, and 8), you will also include a 4- to 6-page reflection in which you:

- Critically examine what you have developed and describe the strengths of your design as well as the areas where your plan could be improved.
- Critically reflect on the importance of consistent common protocol for the assessment of student work among colleagues within the science department.
- Explain and justify the alignment of pre-assessment and assessment strategies with expected outcomes.
- Explain and justify how the assessment plan accommodates diverse learner needs.
- Create and justify the student assessments with rubrics or checklists that clearly communicate the expected level of performance.
- Evaluate and justify the methods for aligning assessment to expected outcomes and standards.
- **Written communication:** Written communication is free of errors that detract from the overall message.
- **APA formatting:** Resources and citations are formatted according to current APA style and formatting. Be sure to write in third person to receive credit for APA writing.
- **Font and font size:** Times New Roman, 12 point.

Unit 1 >> Overview of Assessment in Science Education

Introduction

The NGSS were created in response to new developments in science and in research on the science of teaching and learning. In addition, the trend toward a national system of standards (such as the Common Core State Standards) has prompted a need to create a standardized set of expectations and goals in all subject areas, including science. As such, the NGSS were created with the vision of ensuring that all students receive an education in science and engineering and to establish a strong foundation of knowledge for those who will someday become scientists, engineers, technologists, and technicians. The framework for the NGSS is founded on the idea that learning is progressive. Therefore, the framework is comprised of a small number of core science and engineering concepts that are both interdisciplinary and transdisciplinary in nature. The goal is to provide for deep coverage of fewer topics and concepts. In addition, the framework stresses that learning about science and engineering should be centered on meshing knowledge and practical application of that knowledge through scientific inquiry (Pellegrino, Wilson, Koenig, & Beatty, 2014). In this unit, we will examine the framework, and you will create learning objectives that will serve as the foundation for a unit you will create for your assessment plan due in Unit 10.

Of course, quality and accurate assessment starts with a clear articulation of learning goals and objectives. We have to first determine what we want students to know and be able to do as a result of engaging in learning tasks. Once we establish those objectives, we can then move toward determining how we will know whether or not they have become proficient in meeting those objectives.

In this unit, you will:

- Examine the NGSS and discuss some challenges and strategies to overcome those challenges for implementing the standards within a science classroom.
- Identify at least one standard from the NGSS and create at least one learning objective that will guide instruction and assessment for the science unit you will create in this course.

Reference

Pellegrino, J. W., Wilson, M. R., Koenig, J. A., & Beatty, A. S. (Eds.). (2014). *Developing assessments for the Next Generation Science Standards*. Washington, DC: National Academies Press.

Learning Activities

u01s1 - Studies

Readings

Use the Capella University Library to complete the following:

- Pellegrino, J. W., Wilson, M. R., Koenig, J. A., & Beatty, A. S. (Eds.). (2014). *Developing assessments for the Next Generation Science Standards*. Washington, DC: National Academies Press.
    - Read Chapter 2, "Assessments to Meet the Goals of the Framework," pages 25–46.
        - This chapter describes the key components of the NGSS framework and introduces the three dimensions and the standards that are contained within each dimension. The chapter also describes assessment challenges posed by the framework.

Internet Resources

Use the Internet to complete the following:

- Read Articulate Your Learning Objectives, which describes how to create learning objectives that drive instruction and assessment.
- Read "Writing Quality Learning Objectives," which provides information about how to write effective performance objectives and specifically addresses how to use terms that represent the various levels of Bloom's hierarchy.
- Explore the Next Generation Science Standards website.

u01s2 - Course Project

Most of the work in this class will be in the development of your course project, which will be a comprehensive assessment plan for use in your own classroom. Review the course project information and post any questions you may have about this project in the Ask Your Instructor discussion.

u01d1 - Assessment Challenges

In Chapter 2 of *Developing Assessments for the Next Generation Science Standards*, the authors contend that teachers are confronted with multiple challenges when attempting to design assessments around the standards. For this discussion post, identify at least one of the challenges mentioned by the authors and at least one strategy that can be employed to successfully address the challenge. Cite at least one additional reputable source to support your answer.

Response Guidelines

Respond to two learners. Drawing from professional experiences and reputable sources, provide insights that either challenge or support your colleague's strategy to address the challenge identified in the post.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, as well as other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current edition APA format.

Course Resources
Graduate Discussion Participation Scoring Guide
Developing Assessments for the Next Generation Science Standards

u01d2 - Learning Objectives

In this unit's studies, you reviewed Internet resources that address how to create effective learning objectives. For this discussion, present one standard from the NGSS that you plan to use in the science unit for your assessment plan and write one learning objective that aligns with the standard. In your post, be sure to also do the following:

- Explain how the learning objective aligns with the standard.
- Explain how new learning will be measured.
- Identify where the objective falls within Bloom's hierarchy and explain why you chose to address that level of learning versus other tiers on the hierarchy.

Response Guidelines

Respond to two learners, providing feedback on the degree to which the learning objective aligns with the standard, how the new learning will be measured, and whether the objective could be revised to enhance clarity and usability in creating assessments.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, as well as other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current edition APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

Unit 2 >> Common Formative Science Assessments

Introduction

In Unit 2, you will evaluate the importance of creating common formative assessments within a science team or department. Regular and timely feedback is essential to learning growth (Jang, Reeve, & Deci, 2010; Patall, Cooper, & Robinson, 2008). Therefore, designing common assessments can help your science department diagnose learner needs and learning acquisition in a more consistent and accurate manner. Working collaboratively to design assessments provides us with a greater degree of intellectual input (two heads are better than one) and helps us to design more dynamic measures for assessing students.

Common assessments and protocols also provide us with opportunities to differentiate assessments to a greater extent. This is because we can design a myriad of assessment types to monitor the same goals. We can also choose to assign different teachers within the department specific assignment grading tasks so that we can spread the work of assessment and give those with more expertise and experience in a given area the opportunity to provide students with a greater depth of feedback on their work and performance. Furthermore, common assessments provide teachers with more time and resources to test the degree to which the assessments they plan to administer are valid and reliable. For example, when creating a test, a science department can pilot the test on a small, random sample of students and gain a better perspective of the degree to which criteria on the test measure what they intend to measure and to what extent results are consistent. In addition, teachers can discuss findings from the test, after it is administered, to identify flaws and areas of inconsistency or concern and hence remedy those issues to ensure the test is accurately measuring proficiency in meeting learning targets. We can then use the results of the assessment to adjust or enhance instruction as needed.

In addition, common assessments generate more consistent expectations throughout the department with regard to standards, what and how content is to be taught, and what it means to achieve standard proficiency. This can be extremely beneficial to teachers when preparing students for state standardized tests.

In this unit, you will:

- Describe the benefits of designing common formative assessments.
- Analyze protocols for designing assessments and for analyzing student work in a science department's design initiative.
- Explore the notion of student involvement in creating assessments.

References

Jang, H., Reeve, J., & Deci, E. L. (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology, 102*(3), 588–600.

Patall, E. A., Cooper, H., & Robinson, C. (2008). The effects of choice on intrinsic motivation and related outcomes: A meta-analysis of research findings. *Psychological Bulletin, 134*(2), 270–300.

Learning Activities

u02s1 - Studies

Interactive Matching

Transcript

Readings

Use the Capella library to complete the following:

- Read Stiggins and DuFour's 2009 article, "Maximizing the Power of Formative Assessments," from *Phi Delta Kappan*, volume 90, issue 9, pages 640–644. This article provides strong support for creating assessments as a team and offers suggestions for creating and administering effective common formative assessments.
- Read Parrish and Stodden's 2009 article, "Aligning Assessment and Instruction With State Standards for Children With Significant Disabilities," from *Teaching Exceptional Children*, volume 41, issue 4, pages 46–56. This article provides strategies for ensuring alignment between assessment and instruction. These strategies can be used by both regular education and special education teachers to design an assessment plan.
- Read Childre, Sands, and Pope's 2009 article, "Backward Design: Targeting Depth of Understanding for All Learners," from *Teaching Exceptional Children*, volume 41, issue 5, pages 6–14. This article describes the process of designing instruction or an assessment plan using the Backward Design model.

Internet Resources

Use the Internet to review the following Web pages for a discussion in this unit:

- Scientific Inquiry Work Samples.
- The Collaborative Assessment Conference: Steps.

Multimedia

Click **Interactive Matching** to practice matching learning objectives to assessment procedures.

Course Resources

Interactive Matching

u02s2 - Assessment Plan Overview Preparation

For Unit 3, you are asked to create an assessment plan overview. In this unit, you should read the requirements for completing that assignment. The assessment plan overview will serve as a blueprint for the creation of your course project, due in Unit 10.

When creating the overview, make sure that you pay attention to alignment of all elements of the plan to ensure that assessments are in direct alignment with standards and learning objectives. You will also want to incorporate elements of best practice in instructional and assessment design within your plan overview. Consider the techniques and tools you will use to monitor learning growth. Also, consider protocols that can be employed within a science department to create common assessments to ensure consistency and fairness in assessment design and delivery.

Begin thinking about this assignment as you complete the reading in this unit.

APA Style and Formatting

As you complete this course, please keep in mind that all posts and assignments should be in APA format and should include complete citations. You may want to review the Writing Center's APA Style and Format information and resources. It is also recommended that you have the current edition of the APA manual for reference throughout your program.

u02d1 - Common Formative Assessment

After reading the article "Maximizing the Power of Formative Assessments" in this unit's studies, address the following:

- Describe the benefits of designing common formative assessments.
- Explain what measures you would put in place to facilitate the implementation of protocols to ensure the four essential conditions for the structural foundation of productive assessment are followed within your science department's common assessment design initiatives.
- State your position regarding student involvement in creating assessments.

Response Guidelines

Respond to two learners and discuss the similarities and differences in your posts. You may also ask a clarifying question, add additional insights, or suggest resources they may use to implement and facilitate common assessment in their science departments.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current edition APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

u02d2 - Collaborative Assessment

Collaborative grading can be a highly effective and efficient means to ensure that students are getting appropriate feedback that helps them become proficient in the standards set forth for each science unit. Collaborative grading does not necessarily entail going through every piece of student work as a team; rather, collaborative teams usually set up systems and guidelines for what it means for a student to demonstrate proficiency. In order to determine these systems and guidelines, teachers need to establish protocols for their conversations about assessments. They can do so by engaging in conversations about specific student work in order to then establish proficiency criteria, feedback mechanisms, and even remediation and enrichment activities and recommendations to ensure that all students will eventually meet (or exceed) proficiency standards set by the team.

For this discussion, use the Web pages linked in the Resources to complete the following:

1. Go to the Scientific Inquiry Work Samples page.
2. Choose a student work sample.
3. Go to the Collaborative Assessment Conference: Steps page.
4. Use the Collaborative Assessment Conference protocol in the table to evaluate the student work sample you selected.
5. Post your results to the discussion area for others to view.

Response Guidelines

Respond to two learners and discuss the similarities and differences in your posts. You can also ask a clarifying question, add additional insights, or suggest resources they may use to implement and facilitate collaborative assessment in their science departments.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, as well as other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

Scientific Inquiry Work Samples

The Collaborative Assessment Conference: Steps

Unit 3 >> Planning for Assessment

Introduction

As discussed in Unit 2, to connect with learners to help them become proficient in targeted skills and knowledge, we have to create a plan. In so doing, we first must identify the standards that students need to meet and then create objectives that facilitate instruction and assessment en route to achieving standard proficiency. In this unit, you will be asked to create an assessment plan overview, wherein you will identify NGSS (one from each domain), create learning objectives, an instructional plan overview (how you will deliver instruction to teach the standards and objectives), an outline of a laboratory activity you will use in your instructional design plan, and formative and summative assessments and tools to monitor learning growth.

We typically start the instructional design process by creating an overall sketch of how we plan to deliver subject matter. However, to tweak our design to meet diverse learner needs, we should conduct a pre-assessment to determine where students are in the learning process. Gathering data regarding learners' prior knowledge, experiences, and interests is a vital component to designing instruction that is engaging and supports learning in the respective subject matter. We have to gain some perspective on where students are on the learning continuum before we can administer instruction that helps them to connect with what we want them to know or do. Pre-assessments can range from an "entry ticket" that asks learners to explain what they know—and want to know—about the topic that will be explored to a KWL (what I know, what I want to know, what I learned) matrix and even a pretest, or interest inventory (Levy, 2008).

The most impactful pre-assessments are those that garner student interest in the upcoming learning endeavor. Pre-assessments should be presented as an invitation to the new learning, as opposed to an obstacle to overcome in order to be admitted to engage in the new learning. Pre-assessments should allow for multiple opportunities for students to demonstrate current knowledge, appeal to students of all backgrounds and developmental levels, seek to uncover what students do know—as opposed to affirm what they do not know, and identify possible links between learners and the content to be covered (Hockett & Doubet, 2013).

In this unit, you will:

- Create an assessment plan overview.
- Explore the tenets of pre-assessment.

References

Hockett, J. A., & Doubet, K. J. (2013). Turning on the lights: What pre-assessments can do. *Educational Leadership, 71*(4), 50–54.

Levy, H. M. (2008). Meeting the needs of all students through differentiated instruction: Helping every child reach and exceed standards. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 81*(4), 161–164.

Learning Activities

u03s1 - Studies

Pre-assessment Analysis

Transcript

Readings

Use the Capella library complete the following:

- Read Hockett and Doubet's 2013 article, "Turning On the Lights: What Pre-assessments Can Do," from *Educational Leadership*, volume 71, issue 4, pages 50–54. This article establishes the importance and value of pre-assessment. It also provides solid guidance for designing effective pre-assessments.
- Read van Garderen, Hanuscin, Lee, and Kohn's 2012 article, "QUEST: A Collaborative Professional Development Model to Meet the Needs of Diverse Learners in K-6 Science," from *Psychology in the Schools*, volume 49, issue 5, pages 429–443. This article describes how science and special needs teachers collaboratively designed a professional development program in order to implement inquiry-based instruction, formative assessments, and Universal Design for Learning for K–6 science students.

Multimedia

A concept interview is one approach to the pre-assessment of student knowledge and skill. Click **Pre-assessment Analysis** to launch an example showing how one teacher uses a concept interview as a pre-assessment for teaching and learning concepts related to dominant and recessive traits.

Course Resources

Pre-assessment Analysis

u03a1 - Assessment Plan Overview

The first deliverable for your course project is due in this unit. You are asked to provide a high-level overview of your assessment plan. This is an important first step in establishing what standards will be covered for the plan and in creating learning objectives that directly align with what you want students to know and do as a result of engaging in topics you will cover in the learning unit. It is also important to consider how you will directly assess those learning objectives within the scope of the assessments you plan to create for the unit. Actively monitoring learning growth, or lack thereof, is essential to ensure that all students are mastering key standards that will prepare them for the next stages in their learning pursuits.

For your assessment plan overview, complete the following:

1. Identify three standards (one from each dimension) of the NGSS.
2. Create and justify at least one learning objective for the assessment plan.
3. Explain and justify how the learning objectives of the assessment align with the three standards from the NGSS that you chose to cover in this assessment plan.
4. Draft an outline of a plan for how you will create instruction to bring students to standard proficiency. Support the plan with the literature. Within the outline, be sure to include the following:
    - Direct alignment between learning tasks and the objectives and standards set forth for the unit.
    - Elements of best practice in instructional design (such as guided practice, gradual release of responsibility, differentiated instruction, cooperative and collaborative learning, or project-based learning).
    - Opportunities for both remediation for struggling learners and enrichment for students who have already mastered the basic tenets of the objectives and standards.
5. Provide an outline of the laboratory activity that will be employed in the assessment plan. Explain how it will help students master the selected standards and learning objectives.
6. Explain and justify at least one method you will use to design a pre-assessment, teacher and student (self-assessment) checklists, and summative scoring rubric that will clearly define the expected quality of the assessed tasks in an effort to determine mastery of the learning objectives.
7. Identify and justify several protocols a science department could employ to create consistency in assessment design and implementation. Explain the benefits and challenges of creating and implementing common assessments.
8. Cite at least two reputable resources in support of the elements contained within your assessment plan overview as noted in the Written Communication Guidelines below.

Written Communication Guidelines

- **Written communication:** Written communication is free of errors that detract from the overall message.
- **APA formatting:** Resources and citations are formatted according to current APA style and formatting. Be sure to write in third person to receive credit for APA writing.
- **Number of resources:** Minimum of two reputable resources (one must be from the Capella University Library or other reputable sources).
- **Length of paper:** 2–4 pages (not including the cover page or the reference list).

- **Font and font size:** Times New Roman, 12 point.

u03d1 - Pre-assessment

After reading the article "Turning On the Lights: What Pre-assessments Can Do" in this unit's studies, explain how you will design a pre-assessment that will guide your instructional decisions for the unit you intend to design for the course project.

Attend to the following in your post:

1. Describe the protocols you will follow to design the pre-assessment.
2. Identify criteria you will include in the pre-assessment and explain why those criteria are important to cover in the pre-assessment.
3. Describe how you will administer the pre-assessment (paper and pencil, verbally, et cetera) and provide a rationale for the method of delivery.
4. Explain how your pre-assessment will serve to guide your instructional design and formative and summative assessments in the learning unit.

Response Guidelines

Respond to two learners. Provide each colleague with at least one suggestion for improving the pre-assessment or the pre-assessment protocol.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

Unit 4 >> Pre-assessment Design

Introduction

In Unit 3, you explored some of the tenets of pre-assessment design. In this unit, you will design a pre-assessment and explain how it will be used to inform your overall learning unit and assessment plan. In this unit, you will also explore aspects of self-assessment, which can be used to help students more deeply engage in and monitor their own learning and connect with subject matter. Involving students in answering questions such as *What do I want to learn?*, *What do I know now?*, and *How can I achieve my goals?* facilitates ownership of their own learning and helps them to connect with the subject matter to a much greater extent (Fluckiger, 2010).

For the self-assessment, you are asked to create a holistic rubric or checklist. In your reading for this week, Fluckiger (2010) recommends that teachers create single-point rubrics instead of checklists to enhance engagement in the self-assessment process. According to Fluckiger, a single-point rubric provides learners with more descriptive and formative feedback that directs them to recognize their own strengths and areas where improvement is needed. Checklists, on the other hand, tend to be one dimensional and less specific. When designing a single-point rubric, the teacher pinpoints only the level of performance deemed to be proficient. This allows students to author what they still need to do to achieve proficiency, set new learning goals (first empty column of the rubric), list evidence of proficiency (second empty column of the rubric), and provide evidence of surpassing proficiency and goals (third empty column of the rubric). Therefore, single-point rubrics help students own their work and make plans for going beyond minimum expectations for proficiency.

In this unit, you will:

- Design a pre-assessment for your assessment plan.
- Create a self-assessment rubric for your assessment plan and discuss how it will serve to engage learners in the learning process at a deeper level.

Reference

Fluckiger, J. (2010). Single point rubric: A tool for responsible self-assessment. *Delta Kappa Gamma Bulletin, 76*(4), 18–25.

Learning Activities

u04s1 - Studies

Readings

Use the Capella library to complete the following:

- Read Fluckiger's 2010 article, "Single Point Rubric: A Tool for Responsible Self-Assessment," from *Delta Kappa Gamma Bulletin*, volume 76, issue 4, pages 18–25.

u04a1 - Pre-assessment Strategies

The Pre-assessment Strategies deliverable for your course project is due this unit. You are asked to design at least one pre-assessment you could use to determine your students' needs in relation to facilitating mastery of the learning objectives established for the assessment plan. This should include a checklist or rubric that clearly defines the expected quality of the assessed task or tasks.

You may model your pre-assessment after one found in the text or other course reading materials, or you may create your own. As with all these deliverables, this pre-assessment should be something you would actually use with your students in your classroom.

For this assignment, you should complete the following:

- Design a pre-assessment.
- Explain how the pre-assessment measures prior knowledge, student interest, and student developmental needs around the subject matter you will be covering.
- Explain how the pre-assessment aligns with the learning outcomes and standards for the learning unit.
- Explain how the pre-assessment will serve to inform future instruction around the objectives set forth for the learning unit.

Written Communication Guidelines

- **Written communication:** Written communication is free of errors that detract from the overall message.
- **APA formatting:** Resources and citations are formatted according to current APA style and formatting. Be sure to write in third person to receive credit for APA writing.
- **Number of resources:** Minimum of two reputable resources.
- **Length of paper:** 2–3 pages (not including the cover page or the reference list).
- **Font and font size:** Times New Roman, 12 point.

Course Resources

APA Style and Format

u04d1 - Self-Assessment Design

Holistic rubrics can be designed to guide self-assessment. Holistic rubrics come in many forms. The most popular are single-point rubrics and checklists. After reading the article "Single Point Rubric: A Tool for Responsible Self-Assessment" in this unit's studies, create a holistic rubric that students can use to assess their own performance on a learning outcome and activity you designed for the unit you selected to cover for your course project. Your self-assessment rubric may be for the laboratory self-assessment, or it may cover other unit deliverables.

Post your rubric for the class to review. In your post, be sure to explain which knowledge or skills the rubric is designed to measure and how the rubric criteria provide a formative self-evaluation of the learning objectives set forth for the respective learning activity.

Response Guidelines

Respond to two learners. Provide your colleague with at least one suggestion or resource for improving the self-assessment posted for this discussion.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources
Graduate Discussion Participation Scoring Guide
Single Point Rubric: A Tool for Responsible Self-Assessment
APA Style and Format

Unit 5 >> Design and Analysis of Performance Assessment

Introduction

In this unit, you will have time to develop a performance assessment for your course project. You will examine many examples from your text, which are separated by grade levels and some by subject area. In developing your assessment, you will reflect on the degree to which the assessment measures targeted the NGSS. You will also see how the National Science Education Standards (NSES) can be incorporated into your classroom and how students can be assessed on their knowledge of those standards. The assessment under development will incorporate content knowledge and scientific skills.

In this unit, you will also engage in critiquing a performance assessment. In so doing, you will consider the degree to which the assessment measures the learning target, whether students can relate to the assessment in a meaningful way, and the degree to which the assessment allows for multiple levels of performance. Ideally, this exercise will help you gain additional perspective on the elements necessary for designing assessments that monitor student learning growth and guide instructional design.

In this unit, you will:

- Create an assessment task that covers one standard from the NGSS and discuss how the assessment is a valid measure for the standard.
- Conduct an assessment critique.

Learning Activities

u05s1 - Studies

Readings

Use the Capella library to complete the following:

- Pellegrino, J. W., Wilson, M. R., Koenig, J. A., & Beatty, A. S. (Eds.). (2014). *Developing assessments for the Next Generation Science Standards*. Washington, DC: National Academies Press.
    - Read Chapter 3, "Assessment Design and Validation," pages 47–82.
        - This chapter describes two strategies for designing assessments (evidence-centered design and construct modeling) to evaluate student proficiency of the NGSS. In addition, the chapter covers strategies for ensuring assessments evaluate what they are intended to evaluate—that they are valid measures of the standards.

Read the Alternative Assessments resource.

Internet Resources

In preparation for this unit's discussion, use the Internet to review Performance Assessment Links in Science (PALS). This site provides science performance assessment tasks indexed by the National Science Education Standards (NSES) and other standards frameworks.

u05d1 - Assessment Tasks

After reading Chapter 3 in *Developing Assessments for the Next Generation Science Standards*, identify one standard you intend to cover and at least one learning objective. Then, identify one assessment strategy (evidence-centered design or construct modeling), and create an assessment task that represents that strategy.

In your post, explain how the assessment task represents the strategy chosen and provide 1–2 protocols for ensuring that the assessment task is a valid assessment of the NGSS standard and learning objective or objectives.

Response Guidelines

Respond to two learners. Provide an evaluation of the degree to which:

- The assessment task represents the strategy selected.
- The assessment task measures the identified NGSS standard and learning objective or objectives.
- Protocols for establishing assessment validity are sound and feasible.

Offer suggestions for improving the assessment if necessary.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources
Graduate Discussion Participation Scoring Guide
APA Style and Format
Developing Assessments for the Next Generation Science Standards
Next Generation Science Standards

u05d2 - Assessment Critique

You have had an opportunity to learn about various types of performance assessment. You also have been looking at a variety of examples. You now are going to be asked to critique an assessment. To complete this activity, follow these steps:

1. Go to the Performance Assessment Links in Science (PALS) site, linked in the Resources.
2. In the **About the tasks** section, click the **sources** hyperlink.
3. On the **Tasks** page, click on your grade range (K–4, 5–8, or 9–12).
4. Scroll down and choose a task to critique.
5. For the selected task, view the **Administration Procedures** and the **Task with Student Directions** areas.

In your initial post, provide a brief description (2–3 sentences) of the assessment task you selected as well as a direct link (URL) to it. Then evaluate the assessment task. Be sure to address at least three of the following questions in your evaluation:

- Is the prompt clear and focused? Why or why not?
- In what ways is the prompt engaging to the students?

- Will students be able to relate to the task and assessment in a meaningful way? Why or why not?
- How does the outcome reflect clarity?
- How developmentally appropriate is the assessment?
- To what extent does the assessment encourage higher-order thinking skills?
- Does the assessment allow for multiple levels of performance?
- Can the project be modified for students with special needs? Why or why not?
- What changes would you make to the assessment?
- Is this an assessment you would actually use in your classroom? Why or why not?

Response Guidelines

In your response to at least one other learner, ask clarifying questions about the response posted and provide additional insights or relay experiences you have had in designing assessment tasks around the concept covered in this post.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

Performance Assessment Links (PALS)

APA Style and Format

Unit 6 >> Designing the Lab Experience and Assessment

Introduction

Throughout the world, there is growing emphasis in education on enhancing scientific literacy. *Scientific literacy* refers to an awareness of the natural world, an understanding of some integral science concepts, the ability to think scientifically, an appreciation for science, and the ability to apply scientific knowledge to personal and societal issues (Dogan, Cakiroglu, Bilican, & Cavus, 2013). To attain scientific literacy, it is imperative that students engage in activities that help them become more aware of the natural world. Laboratory activities are one way that we can help them do this. In fact, it is through engaging in laboratory activities that students can gain perspective on what science attempts to explain (Jenkins, 1999). An integral component to successful participation in laboratory activities is frequent and specific guidance and feedback between the teacher and students about what is being experienced, how to navigate and analyze outcomes, and how to ask questions that encourage further inquiry. In fact, it is through exploratory conversations and formative feedback mechanisms that students can deeply engage in exploring the natural environment and enhance their proficiency in elements of science (Löfgren, Schoultz, Hultman, & Björklund, 2013). As such, in this unit, you will begin examining laboratory experiences and develop an experience appropriate for your classroom. The laboratory experience is the staple activity of science education. Through engaging in labs, students can practice inquiry skills, the application of knowledge to new areas, the scientific method, and cooperative learning.

In this unit, you will:

- Develop a laboratory experience that aligns with the NGSS and the learning objectives you created for your course project.
- Develop both teacher and student formative rubric assessments for a laboratory experience.
- Examine strategies for modifying lessons to accommodate the diverse needs of learners in a science classroom.

References

Dogan, N., Cakiroglu, J., Bilican, K., & Cavus, S. (2013). What NOS teaching practices tell us: A case of two science teachers. *Journal of Baltic Science Education, 12*(4), 424–439.

Jenkins, E. W. (1999). Practical work in school science—some questions to be answered. In J. Leach & A. C. Paulsen (Eds.), *Practical work in science education: Recent research Studies* (pp. 19–32). Frederiksberg, Denmark: Roskilde University Press.

Löfgren, R., Schoultz, J., Hultman, G., & Björklund, L. (2013). Exploratory talk in science education: Inquiry-based learning and communicative approach in primary school. *Journal of Baltic Science Education, 12*(4), 482–496.

Learning Activities

u06s1 - Studies

Readings

Use the Capella library to complete the following:

- Pellegrino, J. W., Wilson, M. R., Koenig, J. A., & Beatty, A. S. (Eds.). (2014). *Developing assessments for the Next Generation Science Standards*. Washington, DC: National Academies Press.
    - Read Chapter 4, "Classroom Assessment," pages 83–132.
        - This chapter provides numerous examples of assessment tasks that can be used to help students master the NGSS.
- Read Roskos and Neuman's 2012 article, "Formative Assessment: Simply, No Additives," from *Reading Teacher*, volume 65, issue 8, pages 534–538. This article discusses the tenets of formative assessment including self-assessment, the importance of the feedback loop, and using assessment to close the gap between the current state of student knowledge and skills and what they are expected to know and do. Suggestions for designing and implementing effective formative assessment are offered.
- Read Fluckiger, Tixier y Vigil, Pasco, and Danielson's 2010 article, "Formative Feedback: Involving Students as Partners in Assessment to Enhance Learning," from *College Teaching*, volume 58, issue 4, pages 136–140.

Use the Internet to complete the following:

- Read Mertler's 2001 article, "Designing Scoring Rubrics for Your Classroom," from *Practical Assessment, Research & Evaluation*, volume 7, issue 25. This article provides a step-by-step process for designing holistic and analytic rubrics.

Optional Internet Resources

For more information on rubric types, review the following resources:

- Types of Rubrics.
- Holistic and Analytic Rubrics.

u06a1 - Lab Activity and Formative Rubrics

Lab activities are essential for supporting inquiry in the science classroom. It is through active testing of theories that students can better understand how the world around them operates. Lab activities also help teachers determine the degree to which students can apply the concepts and skills being covered within a given unit. As such, for part of this assignment, you are asked to create a laboratory activity that you would use within your classroom to facilitate inquiry.

In addition to creating a lab activity, you will create teacher and student assessments. Formative assessments and self-assessments are vital elements in monitoring learning growth. When teachers conduct formative assessments, they can identify areas where students need extra support or enrichment and can provide those opportunities immediately—and thus better maintain student engagement. Likewise, having students monitor their own learning growth and identify areas they have mastered, areas where they struggle, and areas of interest and disinterest helps students take ownership of their own learning and remain engaged in the learning process.

Your lab activity should include the following:

- An outline and justification of the composition and purpose of the lab.
- An explanation of how the lab facilitates inquiry and application of concepts and skills that students are asked to know and do per the learning objectives created (based on the standards selected) for this unit.
- An explanation of how you will differentiate elements of the lab activity to provide remediation and enrichment to accommodate the needs of all learners. (For example, you might create different lab centers or stations, scaffold the activity, or offer students a choice of certain materials, procedures, assessment types, and so on.)
- A teacher checklist or holistic rubric to provide formative assessment of student learning growth for stated learning objectives. Be sure to justify what you are using by citing the literature from the field.
- A student self-assessment checklist or holistic rubric to provide students with insight into areas of strength, limitations, interests, and disinterests in the process of engaging in the laboratory activity.
- An explanation of how the teacher assessment and the student self-assessment align directly with the stated learning outcomes.

When creating your lab activity, consult your textbook for lab activity ideas. For an example of well-designed lab activity instructions, review the Water Changes States Lab Instructions Example (linked in the Resources).

When creating your teacher and student assessments, see Checklist Examples (in the Resources) for two examples of approaches to checklist development. Also, review the article "Turning On the Lights: What Pre-assessments Can Do" regarding pre-assessments and the article "Single Point Rubric: A Tool for Responsible Self-Assessment" for information about creating self-assessments.

Prior to submitting your paper, read the Lab Activity and Formative Rubrics Scoring Guide to ensure you have met the criteria for this assignment.

Written Communication Guidelines

- **Written communication:** Written communication is free of errors that detract from the overall message.
- **APA formatting:** Resources and citations are formatted according to current APA style and formatting. Be sure to write in third person to receive credit for APA writing.
- **Length of paper:** 2–3 pages (not including the cover page or the reference list).
- **Font and font size:** Times New Roman, 12 point.

Course Resources
Water Changes States Lab Instructions Example
Checklist Examples
Turning on the Lights: What Pre-Assessments Can Do
Single Point Rubric: A Tool for Responsible Self-Assessment

u06d1 - Meeting Diverse Learning Needs

After reading through the examples presented in Chapter 4 of *Developing Assessments for the Next Generation Science Standards*, identify one example assessment task that you might use in your unit and describe at least one modification you would make to ensure that the instruction and assessment accommodate the diverse learning needs of all students in your classroom. Review the "Differentiation for Science" article (from this unit's studies) for ideas on how to enhance and modify the lesson.

Response Guidelines

In your response to at least one other learner, provide at least one suggestion or resource that can be used to enhance or modify the lesson to meet the diverse needs of learners.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources
Graduate Discussion Participation Scoring Guide
APA Style and Format
Developing Assessments for the Next Generation Science Standards

Unit 7 >> Rubric Development

Introduction

Assessment should be designed to identify learning issues, to determine if students have the necessary skills to engage in new learning, to monitor learning progress, to reinforce, redirect, or correct learning gaps, and to determine if proficiency has been met in a given area (Orlich, Harder, Callahan, Trevisan, & Brown, 2010). Rubrics are tools that can be used to assess students. However, when designing rubrics, it is important that the rubric be learning centered versus grade centered. In other words, when designing a rubric, it is important to avoid using evaluative rating scales (for example, *excellent*, *good*, *poor*, *fair*) and point ranges, listing features of a task, or describing a certain number of elements that need to be evident in the task (for example, "5 sources were cited" equals proficient) and to focus more on performance-based descriptions of what students should know and be able to do as a result of completing the assessment task (for example, proficient for a life-cycle project would be described as "An illustration is included with each stage that depicts what happens to the animal"). Essentially, the rubric descriptors should serve as a link between what you observe (evidence of student work) and the determination as to whether learning has taken place (Brookhart, 2013). In addition, a well-formulated rubric will make grading easier and eliminate some of the subjectivity associated with performance assessments. In this unit, you will analyze the use and value of rubrics and determine how they can be used to effectively guide learning growth.

In this unit, you will:

- Discover lesson plans that adhere to the NGSS.
- Examine the validity and reliability of rubrics.
- Create an analytic rubric that measures learning growth.

References

Brookhart, S. M. (2013). *How to create and use rubrics for formative assessment and grading*. Alexandria, VA: ASCD.

Orlich, D. C., Harder, R. J., Callahan, R. C., Trevisan, M. S., & Brown, A. H. (2010). *Teaching strategies: A guide to effective instruction*. Boston, MA: Cengage.

Learning Activities

u07s1 - Studies

Readings

Use the Capella library to complete the following:

- Read Jonsson and Svingby's 2007 article, "The Use of Scoring Rubrics: Reliability, Validity, and Educational Consequences," from *Educational Research Review*, volume 2, issue 2, pages 130–144. This article describes the importance of establishing validity and reliability in scoring rubrics and provides tips for doing so.

Use the Internet to complete the following:

- Read Moskal and Leydens's 2010 article, "Scoring Rubric Development: Validity and Reliability," from *Practical Assessment, Research & Evaluation*, volume 7, issue 10. This article provides background on how to establish reliability and validity within a scoring rubric.
- Review Mertler's 2001 article, "Designing Scoring Rubrics for Your Classroom," from *Practical Assessment, Research & Evaluation*, volume 7, issue 25. This article provides a step-by-step process for designing holistic and analytic rubrics.
- Read Checklists and Grading Rubrics.

Internet Resources

Use the Internet to review Lesson Plans Exploring NGSS. This site provides numerous lesson plans for K–12 science teachers. Choose a lesson plan for this unit's second discussion.

Multimedia

Complete Interactive Grading Rubric, a brief interactive tutorial that walks you through the concepts, structure, and design processes behind rubric development.

u07d1 - Using Rubrics

For this discussion, imagine that you have conducted a lab on animal behavior and have returned several reports to the students regarding the lab activity. These reports were graded using a rubric the students did not see until you returned their reports.

- How might the rubric help your students understand their grades and evaluate their own work?
- How could the rubric and student grades be used to evaluate your instruction of material and presentation of the report?
- Would you expect results to differ if the students had been given the rubric before turning in their reports?

Response Guidelines

Respond to at least one other learner. In your response, discuss if there is ever a circumstance when providing a rubric to your students would not be appropriate.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

APA Style and Format

u07d2 - Developing Rubrics

For this discussion, use the lesson plan you chose from the Lesson Plans Exploring NGSS site in this unit's studies to create an analytic rubric that does the following:

- Measures learning growth per the lesson objectives and stated assessment task.
- Delineates levels of performance.
- Includes performance-based descriptions.

Post your analytic rubric as an attachment to this discussion. Be sure to include a direct link (URL) to the lesson plan you selected in your post.

Response Guidelines

Respond to two learners. Provide feedback on the degree to which the analytic rubric measures the stated objectives and aligns with the assessment task articulated in the lesson plan the learner selected. You may consider providing tips on how to improve the rubric or additional resources for enhancing the clarity of the rubric.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

Lesson Plans Exploring NGSS

APA Style and Format

Unit 8 >> Summative Evaluations

Introduction

Summative assessment is an important part of instruction because it is through this form of assessment that we can determine if students have met key standards and learning objectives. The best summative assessments are authentic and allow students to demonstrate their accumulated and consolidated knowledge and skills in various ways, often in the form of a project, a portfolio, a presentation, or even through a report.

Tests can also be used to assess whether standard proficiency has been achieved. However, tests must be evaluated for validity (that they measure what they intend to measure) and reliability (that they are consistent measurements of standard proficiency despite any extraneous circumstance) if they are to be deemed accurate measures of learning growth. Test validity and reliability requires piloting tests in order to determine whether there are questions that are consistently being missed because of potential misunderstandings. Likewise, it is important to determine if a test, given at different times, to different students, under varying circumstances, would yield the same results. Determining the validity and reliability of a test takes time and skill in analyzing results for misunderstandings and inconsistencies (Popham, 2003). Another method for determining whether test questions are clear and measure what they are intended to measure is to ask teachers within the department to provide feedback on the clarity and alignment of the questions to learning goals. This is another reason why common assessment design is so valuable, as this procedure is most certainly built into the design and administration process. Likewise, when creating rubrics for summative assessments, we must take similar measures to ensure that they are indeed conveying what we expect of students as they present their work in a more authentic manner.

In this unit, you will also take a look at technology tools that can be used for designing and administering assessments. You will examine the advantages and disadvantages of a technological assessment tool and discuss and how you can successfully use the tool to monitor learning growth. In your discussions, consider technology-based active responding systems such as clickers and clicker apps, which can assist teachers in actively monitoring learning and provide students with immediate (and even discreet) feedback. Digital diaries and technology-based games and simulations are additional tools teachers can use to monitor learning and provide feedback and redirection to students in the classroom (Salend, 2009).

In this unit, you will:

- Create a summative assessment plan with an analytic rubric.
- Identify a technology tool you plan to use to design and/or administer assessment in the classroom and discuss how it will be used and why.
- Post a draft of your assessment plan for the course project and prepare feedback for one other learner on his or her plan.

References

Cornelius, K. E. (2013). Formative assessment made easy: Templates for collecting daily data in inclusive classrooms. *Teaching Exceptional Children, 45*(5), 14–21.

Gischlar, K. L., & Vesay, J. P. (2014). Literacy curricula and assessment: A survey of early childhood educators in two states. *Reading Improvement, 51*(3), 291–302.

Popham, W. J. (2003). *Test better, teach better: The instructional role of assessment.* Alexandria, VA: ASCD.

Salend, S. J. (2009). Technology-based classroom assessments: Alternatives to testing. *Teaching Exceptional Children, 41*(6), 48–58.

Learning Activities

u08s1 - Studies

Readings

Use the Capella library to complete the following:

- Pellegrino, J. W., Wilson, M. R., Koenig, J. A., & Beatty, A. S. (Eds.). (2014). *Developing assessments for the Next Generation Science Standards*. Washington, DC: National Academies Press.
  - Read Chapter 5, "Assessment Monitoring," pages 133–192.
    - This section provides recommendations and examples for using technology to generate more evidence of student learning growth and engagement.
- Read Eddy and Lawrence's 2013 article, "Wikis As Platforms for Authentic Assessment," from *Innovative Higher Education*, volume 38, issue 4, pages 253–265. This article describes how wikis can be used to evaluate learning by engaging students in tasks that have real-world application.
- Read Milner-Bolotin, Antimirova, and Petrov's 2010 article, "Clickers Beyond the First-Year Science Classroom [PDF]," from *Journal of College Science Teaching*, volume 40, issue 2, pages 14–18. This article relays research on the effectiveness of clickers in facilitating learning growth. It also provides tips for implementing clicker technology effectively in the science classroom.
- Read Perkins, Moore, Podolefsky, Lancaster, and Denison's 2011 article, "Towards Research-Based Strategies for Using PhET Simulations in Middle School Physical Science Classes," from *AIP Conference Proceedings*, volume 1413, issue 1, pages 295–298. This article provides the results of interviews with students who engaged in classroom implementations of PhET simulation. The article also provides strategies and examples that can be used to create and administer simulation activities in the science classroom.

- Read Chen, Wei, Huang, and Kinshuk's 2012 article, "The Integration of Print and Digital Content for Providing Learners With Constructive Feedback Using Smartphones," from *British Journal of Educational Technology*, volume 44, issue 5, pages 837–845. This article relays the findings of a study conducted on using smartphone technology to provide formative feedback to students. Suggestions for using smartphone technology in formative assessment are also offered.
- Read Salend's 2009 article, "Technology-Based Classroom Assessments: Alternatives to Testing," from *Teaching Exceptional Children*, volume 41, issue 6, pages 48–58. This article provides an overview of a myriad of technological tools for administering assessments.

u08a1 - Summative Assessment Plan With Rubric

The Summative Assessment Plan With Rubric deliverable of your course project is due in this unit. You are to create a culminating assessment that will give students an opportunity to show what they have learned. The assessment should allow for higher-level thinking and multiple performance levels. The assessment plan should include possible modifications for students with special needs, such as gifted or special-education students. You should explain how technology will be used to design the assessment, to facilitate or deliver the assessment, or both. You should also create an analytic rubric that aligns with the competencies your assessment is designed to evaluate.

Finally, you should explain how you will ensure the validity and reliability of the summative assessment—that it is assessing what it is intended to assess. This can be done by having fellow science teachers review the assessment and rubric to ensure that the language is clear and adheres to stated learning objectives; it can also be done by having students provide feedback on the rubric and assessment to ensure they understand what is being asked.

Design a summative assessment that allows students to demonstrate proficiency of identified standards. The summative assessment plan should include the following:

- A clear explanation of how learning objectives (and standards) in the unit will be assessed and an explanation of the alignment between them.
- An analytic rubric that directly measures student learning objectives.
- An explanation of how technology will be used to design the assessment and/or to facilitate or deliver it.
- An explanation of how the assessment will accommodate diverse learner needs (modifications, scaffolding, or enrichment).
- An explanation of how to ensure the validity and reliability of the summary assessment.

Written Communication Guidelines

- **Written communication:** Written communication is free of errors that detract from the overall message.
- **APA formatting:** Resources and citations are formatted according to current APA style and formatting. Be sure to write in third person to receive credit for APA writing.
- **Length of paper:** 2–5 pages (not including the cover page or the reference list).
- **Font and font size:** Times New Roman, 12 point.

Course Resources

APA Style and Format

u08d1 - Assessment Technology

After reading pages 175–178 in *Developing Assessments for the Next Generation Science Standards* and the articles listed in this unit's studies, identify one technology you will use to design or administer an assessment in your science unit. In your discussion, be sure to include the following:

- Describe the technology you plan to use and explain how it will help you evaluate learning.
- Describe why the technology is most appropriate and feasible for assessing students on the learning objectives set forth for the unit.
- Describe why you chose this technology over other options.
- Cite at least one reputable source in support of your selection.

Response Guidelines

In your response to at least one other learner, identify at least one benefit and one challenge that might be encountered as a result of using the selected technology to design or administer an assessment in your colleague's science classroom.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

APA Style and Format

Developing Assessments for the Next Generation Science Standards

u08d2 - Peer Review

At this point, you will have completed at least a draft of each component of your course project. Assemble all the project components you have submitted into a draft of your comprehensive assessment plan. Post that assessment plan as an attachment to this discussion for peer review.

Response Guidelines

Agree to review another learner's draft by posting a message to him or her that you will address the questions below in the Peer Review Feedback discussion in Unit 9. You have one week to read your peer's work and put together your feedback using the questions below. Your feedback is crucial for your peer to improve his or her work for submission of the final assignment in Unit 10.

- How realistic is the plan?
- Are there any parts of this plan that you could use in your own classroom?
- What areas raise additional questions for you? What are those questions?
- Are the criteria by which the students will be evaluated aligned with the stated learning objectives and the NGSS? Why or why not?
- What are the biggest strengths in the plan?
- Where are the opportunities for improvement?

Course Resources

Graduate Discussion Participation Scoring Guide

Unit 9 >> Fairness and Equity in Assessment

Introduction

In this unit, you will explore aspects of equity and fairness in student assessment. Assessment bias occurs when criteria or tools for administering assessments insult or unfairly punish students for reasons connected to characteristics students cannot help, such as their ethnic background, race, gender, religion, or family's income level. For example, an assessment that requires students to include Christian religious scripture could be considered biased. Likewise, an assessment task that revolves around asking students to make specific sports calculations (such as football statistics) could be viewed as gender specific and thus biased. Therefore, careful review of verbiage used to convey directions, the types of assessment tasks offered, and criteria relayed on rubrics and tests, and so on, can reduce instances of assessment bias (Popham, 2003).

Research shows that there is a direct correlation between the degree to which students feel cared for, valued, and confident in learning the material and their engagement in the new learning (Bempechat, Ronfard, Mirny, Li, & Holloway, 2013). Given these findings, it is clear that equity and fairness in assessment are vital components to engaging learners and promoting learning growth. Therefore, in this unit, we will explore strategies for ensuring that classroom assessments provide fair and equitable opportunities for demonstrating learning growth among all students.

In this unit, you will:

- Examine equity and fairness as well as ways to avoid bias in assessment design.
- Identify two or more strategies to implement that ensure assessment measures in the classroom are responsive to the needs of diverse learners.
- Use peer-review feedback to assemble your final assignment for Unit 10.

References

Bempechat, J., Ronfard, S., Mirny, A., Li, J., & Holloway, S. D. (2013). "She always gives grades lower than one deserves": A qualitative study of Russian adolescent perceptions of fairness in the classroom. *Journal of Ethnographic & Qualitative Research, 7*(4), 169–187.

Popham, W. J. (2003). *Test better, teach better: The instructional role of assessment.* Alexandria, VA: ASCD.

Learning Activities

u09s1 - Studies

Readings

Use the Capella library to complete the following:

- Pellegrino, J. W., Wilson, M. R., Koenig, J. A., & Beatty, A. S. (Eds.). (2014). *Developing assessments for the Next Generation Science Standards*. Washington, DC: National Academies Press.
    - Read Chapter 7, "Implementing a Science Assessment System," pages 217–234.
        - This section describes the importance of designing assessments that are unbiased and accurate measures of learning growth for all students and that help all students meet the learning goals imparted via the NGSS.
- Read Davis and Neitzel's 2011 article, "A Self-Regulated Learning Perspective on Middle Grades Classroom Assessment," from *Journal of Educational Research*, volume 104, issue 3, pages 202–215. This article conveys research on teachers' beliefs on aspects of assessment. The findings of this article provide strategies for avoiding bias in assessment design. Strategies include having students ask their own questions about subject matter and building self-assessment into lesson plans.
- Read DiMartino and Miles's 2005 article, "Reaching Real Equity in Schools," from *Education Digest*, volume 70, issue 5, pages 9–13. This article provides strategies for educators to ensure that all students receive an equitable education.
- Read Harlen's 2005 article, "Teachers' Summative Practices and Assessment for Learning-Tensions and Synergies," from *Curriculum Journal*, volume 16, issue 2, pages 207–223. This article describes the underlying cause of bias in teachers' assessment practices and offers strategies for overcoming such bias.

u09d1 - Equity and Fairness

On pages 221–225 of *Developing Assessments for the Next Generation Science Standards*, the authors discuss the importance of maintaining equity and fairness in assessing students. They stress that the goal of assessment should be to inform instruction, and measures should be taken to eliminate bias and differentiate assessments to accommodate the diverse needs of all learners. If the goal is to get all learners to proficiency of the NGSS, then teachers must employ practices that serve to support learning growth among all learners.

After reading that excerpt from the course textbook, as well as the articles in your required readings for this unit, identify two or more strategies you can implement to ensure that assessment measures in your science classroom are respectful of, and responsive to, the needs of diverse learners, are free of bias, and provide equitable opportunities for all students to demonstrate their skills and knowledge en route to standard proficiency. Then describe how you would effectively implement those strategies in the classroom as well as how you could weave those strategies into your assessment plan.

Response Guidelines

Respond to two learners. In your response, provide additional insights or suggestions on how the identified strategies might be improved. You may also ask clarifying questions or recommend additional resources for implementing the strategies presented in the post.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive in nature. Reference your own experience, the assigned readings, as well as other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current APA format.

Course Resources

Graduate Discussion Participation Scoring Guide

APA Style and Format

Developing Assessments for the Next Generation Science Standards

u09d2 - Peer-Review Feedback

In Unit 8, you and your peers assembled drafts of your assessment plans and posted them for peer review. In this discussion, you will provide and receive feedback that can be used to revise the final assignment for Unit 10.

Post your feedback to your peer, putting his or her name in the subject line so he or she can easily identify which post to read. In your feedback, be sure you have considered and addressed the following:

- How realistic is the plan?
- Are there any parts of this plan that you could use in your own classroom?
- What areas raise additional questions for you? What are those questions?
- Are the criteria by which the students will be evaluated aligned with the stated learning objectives and the NGSS? Why or why not?
- What are the biggest strengths in the plan?
- Where are the opportunities for improvement?

Response Guidelines

Respond to questions your peer has about your feedback. Then post any questions you have for your reviewer about his or her feedback on your plan. Use the feedback you receive to make revisions to your plan, and submit your final assignment in Unit 10.

Course Resources

Graduate Discussion Participation Scoring Guide

Unit 10 >> Assessment Project Completion and Reflection

Introduction

In this unit, you will reflect on the nature of decision making in everyday instructional and assessment planning. You will also complete your course project and reflect on the strengths of your unit assessment design as well as areas where your plan could be improved. In addition, you will reflect upon the importance of consistent, common protocols for assessment of student work among colleagues within a science department. When compiling your project for submission, be sure that you submit *one Word document* (not separate documents) and include all required elements of the plan (see the project explanation for details).

Ideally, by completing the unit assessment, you will not only have gained additional knowledge and skills in designing accurate and informative assessments, but you will have something that you can actually use in your own science classroom.

Learning Activities

u10s1 - Studies

Readings

Use the Capella library to complete the following:

- Hosp's 2012 article, "Formative Evaluation: Developing a Framework for Using Assessment Data to Plan Instruction," from *Focus on Exceptional Children*, volume 44, issue 9, pages 1–10. This article provides a reflection on the importance of aligning assessment and instructional design and delivery to enhance student learning.

u10a1 - Student Assessment and Work Analysis in Science Education

Your course project is due in this unit. As you read at the beginning of the course, the goal for this project is for you to create an engaging, instructionally sound assessment that you would use in your classroom to assess the knowledge and skills of your students for at least one standard from each of the three dimensions of the NGSS.

For this assignment, use the feedback you received from your instructor on each submitted project deliverable, as well as the feedback you received from a fellow learner in Unit 9, to complete the final component:

- Make any necessary revisions to *each component* and assemble all of them into your course project.
- Within your course project, you also should include a 4–6-page reflection section that addresses the following:
  - Critically examine what you have developed and describe the strengths of your design as well as the areas where your plan could be improved.
  - Critically reflect on the importance of consistent common protocol for the assessment of student work among colleagues within the science department.
  - Explain and justify the alignment of pre-assessment and assessment strategies with expected outcomes.
  - Explain and justify how the assessment plan accommodates diverse learner needs.
  - Create and justify the student assessments with rubrics or checklists that clearly communicate the expected level of performance.
  - Evaluate and justify the methods for aligning assessment to expected outcomes and standards.

Remember that for this final assignment you should submit *one Word document that includes all required elements of the plan*. See the project explanation for details.

Written Communication Guidelines

- **Written communication:** Written communication is free of errors that detract from the overall message.
- **APA formatting:** Resources and citations are formatted according to current APA style and formatting. Be sure to write in third person to receive credit for APA writing.
- **Length of paper:** The reflection section should be 4–6 pages.
- **Font and font size:** Times New Roman, 12 point.

Course Resources

Next Generation Science Standards

APA Style and Format

u10d1 - Decision Fatigue

In the article "Formative Evaluation: Developing a Framework for Using Assessment Data to Plan Instruction" from this unit's studies (linked in Resources), the author offers several tips for avoiding decision fatigue. In the article, this term refers to the overwhelming feeling teachers may experience as a result of having to make multiple complex decisions based on analysis of collected data in addition to decisions pertaining to classroom management and how to design and deliver assessments and instruction.

After reading the article, reflect on strategies you might employ in your daily practice to reduce decision fatigue when making instruction and assessment choices.

Response Guidelines

Respond to at least one learner and discuss the similarities and differences in your posts. You may also ask a clarifying question, add additional insights, or suggest resources to enhance your fellow learner's decision-making capacity in the science classroom.

Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current edition APA format.

Course Resources
Graduate Discussion Participation Scoring Guide
Formative Evaluation: Developing a Framework for Using Assessment Data to Plan Instruction
APA Style and Format

u10d2 - Summary Discussion

You have reached the end of the course. Reflect on your learning experience by answering the following:

- How have your understanding and beliefs about science assessment changed or developed over the past 10 weeks?
- How will you apply your learning to your professional practice?
- What additional areas related to assessment would you like to explore?
- What questions remain for you?

Response Guidelines

Respond to two other learners. Post your responsive discussion according to the requirements explained in Faculty Expectations. Your responses should be 100–150 words, original, and substantive. Reference your own experience, the assigned readings, and other theoretical, empirical, or professional literature to support your views and writings. Cite all articles or URLs you consulted for your post using current edition APA format.

Course Resources
Graduate Discussion Participation Scoring Guide
APA Style and Format