The Importance of Meaningful Classroom Assessment in Promoting College and Career Readiness

A Texas Higher Education Coordinating Board Project in Conjunction with:

Stephen F. Austin State University
Department of Secondary Education
and Educational Leadership
College of Sciences and Mathematics

Rural High Schools
Hudson High School
Lufkin High School
Nacogdoches High School
Woden High School

Angelina College
Mathematics and
Science Division

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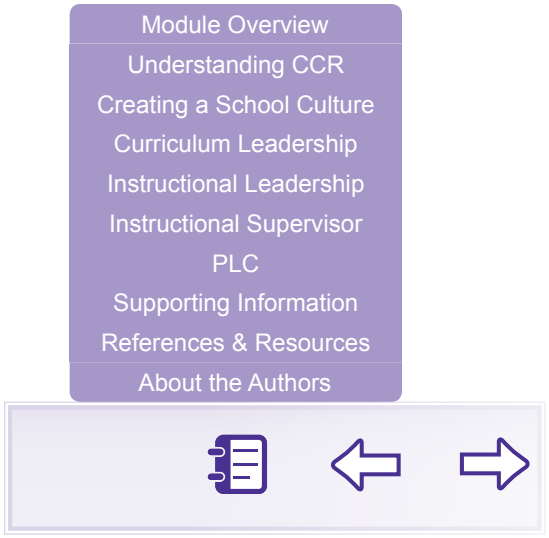

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Module Overview

Watch the The Importance of Meaningful Classroom Assessment in Promoting CCR.

Module Overview

Students currently attending Texas public schools are destined to enter a globally competitive, highly interactive job market upon graduation, an environment which has no historical precedent. In an effort to meet the challenges imposed by this new economic / employment landscape the state has developed and integrated the Texas College and Career Readiness Standards (CCRS) into the Texas Essential Knowledge and Skills. These new standards define what students should know and be able to do at entry level, postsecondary environments be they university, college, or career settings. The CCRS focus upon four content areas: English, mathematics, social studies, and science. Additionally, the CCRS address the Cross-Disciplinary Standards, those skills that should permeate all content areas. As organized, the CCRS define what secondary curricula must accomplish in order to prepare students for post high school realities.

With the alignment of the state's secondary curricula to the College and Career Readiness Standards, Texas high school students should attain a higher level of preparation for life after graduation, a future expected to offer an increasingly complex employment landscape. However, certain traditions

continue to threaten the curricular innovations of the CCRS, specifically a myopic perspective that envisions only select students as college or career capable while others are destined for vague, less secure work futures. The reality, as envisioned by the articulation of the CCRS, dictates that today all students must be highly prepared for the dynamic 21st century workplace. Inherent in this vision is the recognition that all students must be ready for postsecondary education or career training that demands the same knowledge, skills, and dispositions as entry level college or university course work. In short, today every student matters and every student must be prepared to be successful in the 21st century employment milieu.

Module Overview

The STEPS (Systemic Teacher Preparation Sites) grant is a collaborative between Stephen F. Austin State University, Angelina College, and four rural high schools located within Hudson ISD, Lufkin ISD, Nacogdoches ISD, and Woden ISD. This partnership collaboratively designed this Module as well as three others for the benefit of pre-service and inservice math and science teachers.

In the course of the grant's initial year of work, participants discovered a sound alignment between high school content and the College and Career Readiness Standards. Yet, challenges remained for those participating inservice and pre-service teachers in their efforts to resolve the following:

- how to integrate 21st century skills into teacher repertoires,
- how to embed the cross-disciplinary skills in demonstration lessons,
- how to teach reading comprehension skills in mathematics and science, and
- how to generate meaningful assessment examples that mirrored the rigor of classroom content and instruction.

Module Overview

As a result of these challenges, STEPS participants developed learning modules around the four galvanizing areas. These modules are: 21st Century Learning Skills and the College and Career Readiness Standards, The Importance of Using the Cross-Disciplinary Standards in Mathematics and Science, Independent Reading Practices for Mathematics and Science Students, and The Importance of Meaningful Classroom Assessment in Promoting College and Career Readiness.

Each module provides a valuable tool of available research and resources regarding the respective topic, briefly defines key components of the topic, and provides content area examples.

The STEPS team has prepared the instructional module for approximately one to one and one half hours of professional development. The modules are designed as a resource, not an exhaustive compilation of the subject. We recommend that the inservice and preservice teachers review all four modules.

While the module may appear content-dense at first glance, it is designed to be flexible and self-paced providing an opportunity for the reader to review and reflect upon all sections or choose only areas in which they are not familiar or have concerns.

> *"We encourage you, as teachers of Texas students, to incorporate the instructional expectation of the College and Career Readiness Standards into your daily practice; our students are worth it."*
>
> *(STEPS team)*

Components of this Module

A particular focal area that surfaced in the course of STEPS grant activities during the first year was that of assessment. This evolved out of concern for the potential of a diminution of student academic success in light of increased rigor associated with the integration of the CCRS with the TEKS, Texas Essential Knowledge and Skills. The crucial link between instruction and assessment was recognized and consequently, plans were formulated for the creation of an assessment module. Meaningful assessment of instruction and of student learning is a vital component of the teaching – learning process. Heightened teacher awareness of assessment philosophy and practices ensures a higher probability of learner success and teacher effectiveness and likewise, offers a stronger framework for a more rigorous curriculum. For this to occur, teachers require additional assessment skills, strategies, and insight.

This module explores the principles, purposes, possibilities, and characteristics of assessment in the Texas public education environment at the outset of the 21st century. This undertaking is simultaneously focused upon enhancing the educational and pedagogical capacity of preservice and inservice teachers as well as the academic and career potential of Texas high school students.

Components of this Module

Figure 1 depicts the assessment discussion in this module beginning with an assessment overview. Subsequent sections address assessment design, types, and alternative options. The overarching focus of this module is to illustrate the belief that appropriate, thoughtful, and ongoing assessment design and implementation is a necessary and proportional attendant to instructional design and delivery. The successful interweaving of these two key pedagogical elements comprises the essential strategy for preparing Texas students to become college and career ready.

The STEPS team encourages professional educators to reflect upon the critical role that assessment plays in effective classroom instruction and student achievement. It is hoped that all Texas teachers will develop their own assessment philosophy and as a consequence will strive to implement meaningful assessment strategies as essential elements of their ongoing efforts to improve pedagogical practices and in so doing, facilitate student learning that will align with the purpose and intent of the College and Career Readiness Standards.

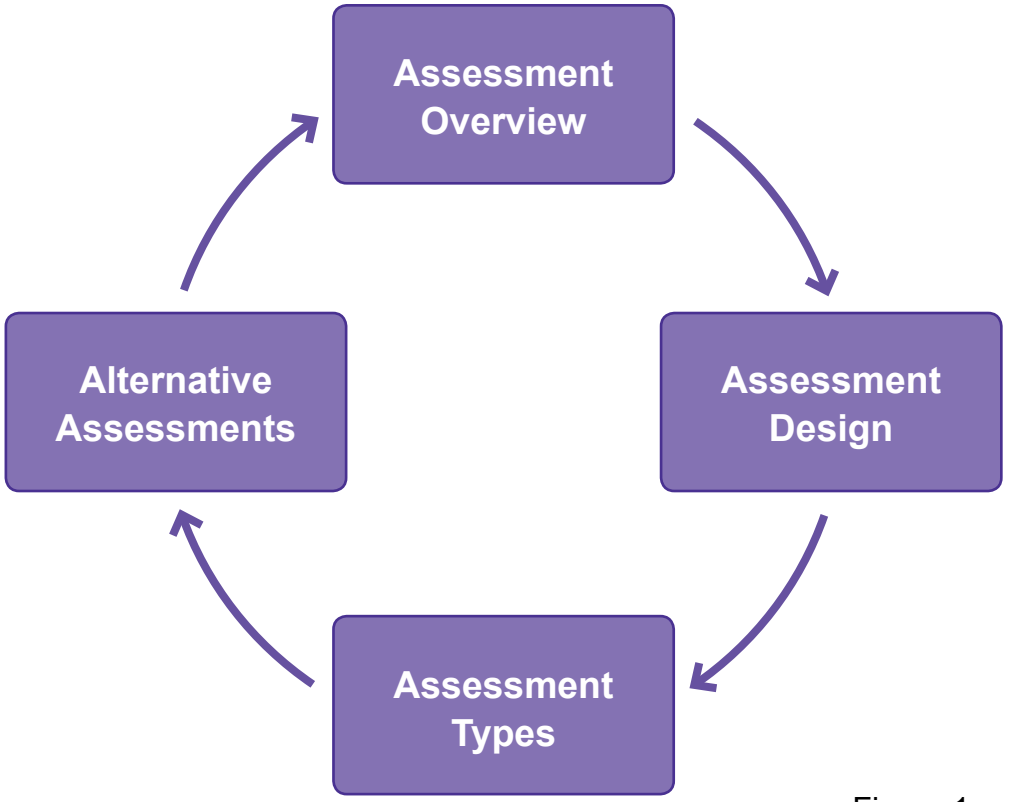
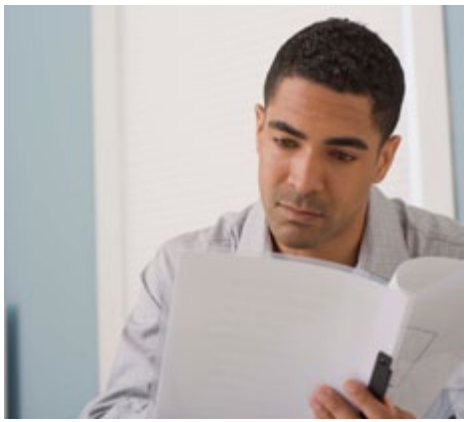


Figure 1

Relationship of Assessment to College and Career Readiness Standards

Throughout the STEPS grant's year-long study of high school and postsecondary alignment, numerous former high school students, when interviewed, attributed their success at the secondary level to their ability to recall factual information, oftentimes through multiple choice or fill in the blank tests. When these students encountered assessments at the postsecondary level, they discovered that they were generally required to engage content more deeply and in an open-ended fashion. As a result, many of these students struggled to overcome failing or subpar grades in their initial college courses. Analysis of student comments led grant participants to determine that area high school students were more likely to achieve a higher degree of postsecondary success when they receive more rigorous instruction and likewise, experience exposure to more meaningful, ongoing assessment strategies.

This module presents ideas for a wide range of assessment options, especially formative and alternative assessments that will allow secondary teachers to monitor student learning more effectively and as a consequence, enhance student achievement. Rigorous instruction, aligned with ongoing, meaningful assessment procedures, encourages the skill building that the College and Career Readiness Standards seeks particularly in the areas of problem solving, reasoning, inquiry, accuracy, precision, and writing.



Relationship of Assessment to College and Career Readiness Standards

Although there is not a specific CCRS standard addressing assessment, the Cross-Disciplinary Standards seek to develop necessary cognitive and academic skills that are acknowledged as essential requirements for students to achieve success in postsecondary learning environments, to include advanced career training. The strong connection between instruction and assessment demands that 21st century educators develop a repertoire of assessment strategies that will inform them of student progress in all learning endeavors and at every stage of the curricular continuum.

Figure 2 depicts the Cross-Disciplinary Standards. The STEPS team strongly supports a classroom assessment framework that incorporates the implementation of a wide variety of assessment strategies that seek to ensure that today's high school students effectively gain the key cognitive skills required for success in postsecondary education and training and beyond.

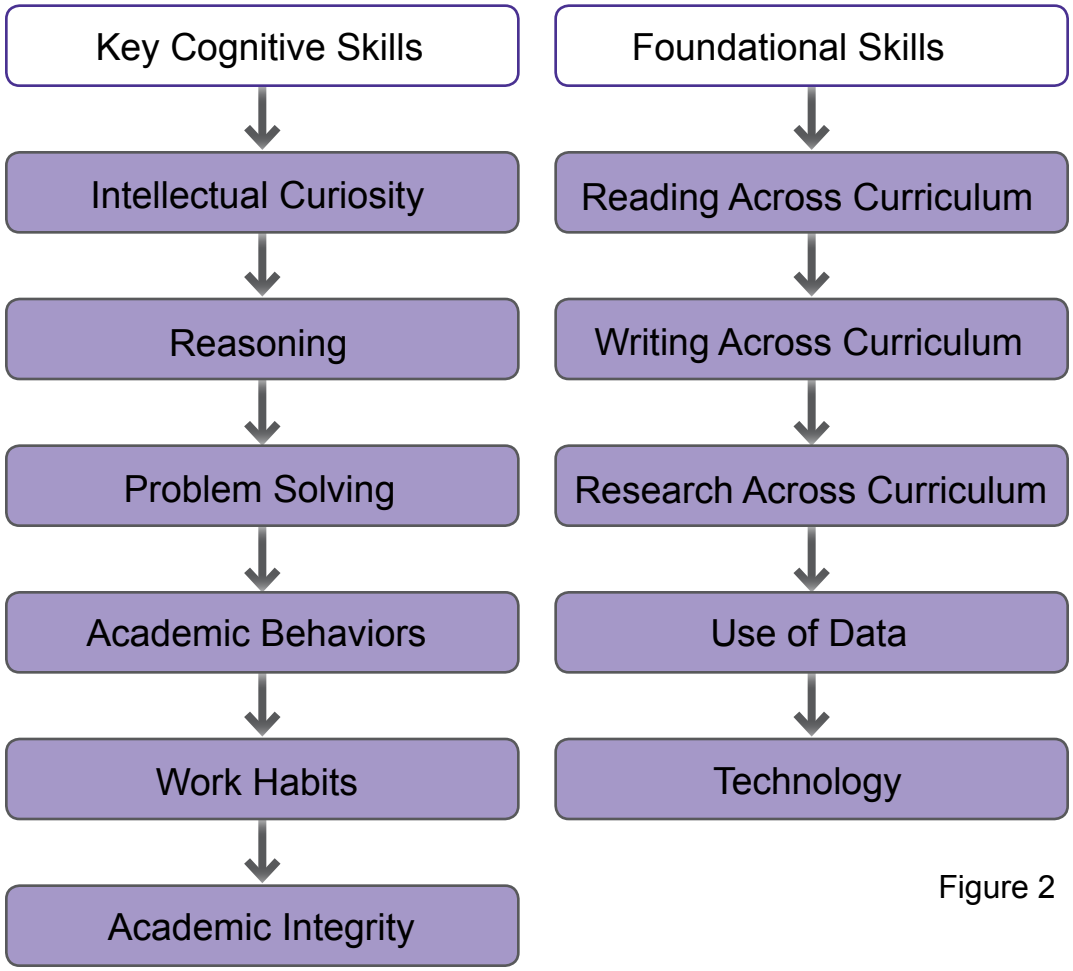


Figure 2

Assessment Overview

Assessment for Mathematics and Science Content

"Teaching and learning are reciprocal processes that depend on and affect one another. Thus, the assessment component deals with how well students are learning and how well the teacher is teaching" *(Kellough & Kellough, 1999, p. 417)*.

Moreover, assessment is a process of documentation, a way of measuring knowledge, attitudes, skills, and beliefs. This could certainly include a student's progress in gaining skills defined in the CCRS.

The American Association for Higher Education (AAHE) has established Nine Principles for Assessment *(Pausch & Popp, 1997)*. These principles may serve as a guide for the formation of a sound and practical knowledge base for educators seeking to construct a deeper and more relevant understanding of assessment in the teaching and learning environment in an ever-changing, standards-based, educational milieu characterized by increasing student diversity and ongoing teacher accountability.

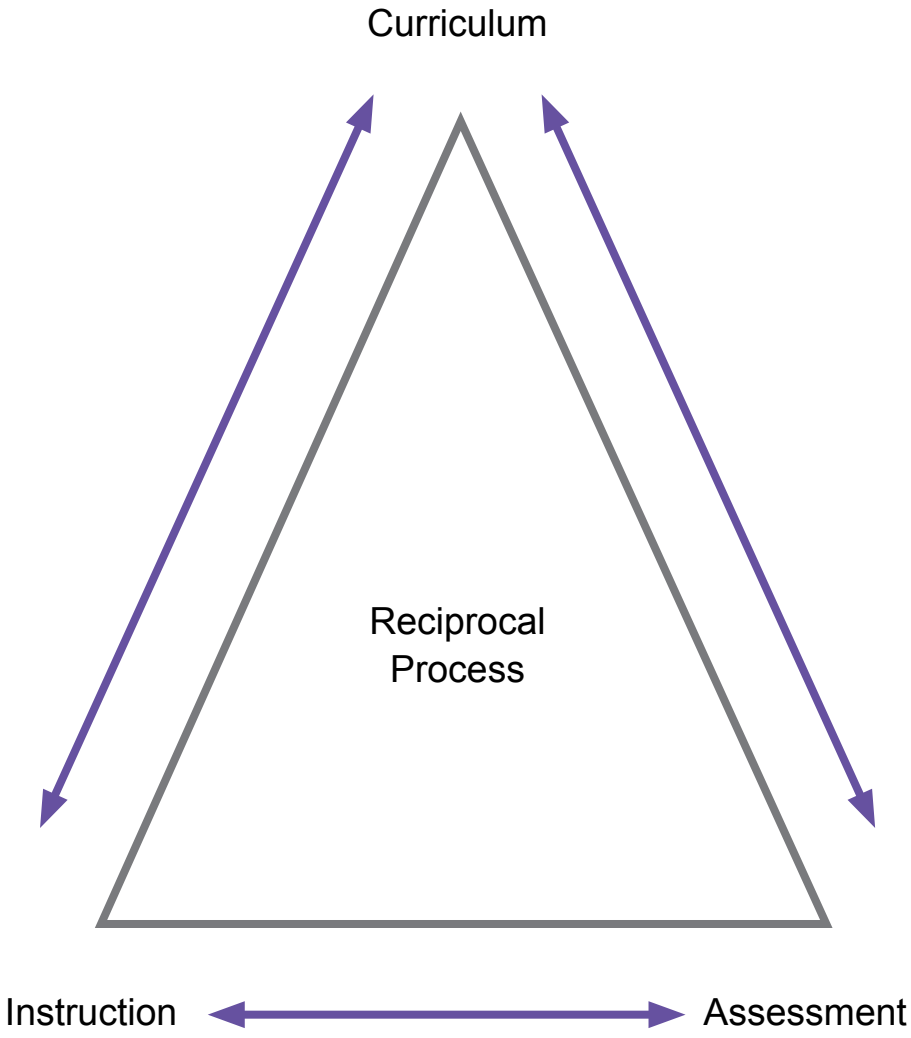


Figure 3

Assessment for Mathematics and Science Content

It is important to acknowledge that student evaluation will only be as accurate as the instruction and formal assessments on which it is based. For this reason, it is essential to understand that grading is a process that cannot be separated from the quality of the instruction and the assessment data that teachers collect. Meaningful, high quality student evaluation and grading must be supported by valid and reliable assessments. Additionally, grading should draw upon a variety of assessment procedures such as quizzes, tests, assignments, papers, projects, and other activities that allow students to demonstrate their achievement. Gronlund and Waugh specify Eight Guidelines for the effective use of student assessment. *(Gronlund, N. & Waugh, K., 2009, pp.19-23)*.

Relevance in assessment is frequently associated with authentic assessment but has general application across the assessment spectrum. In this sense, it is related to the nature of the project, assignment, or tasks that teachers create for their students and focuses upon the meaningfulness (or relevance) of that effort.

Generally speaking, high quality standardized assessments are deemed to be those with a high level of reliability and validity. Reliability and validity can also be considered when conducting classroom assessments.

Importance of Understanding Assessment

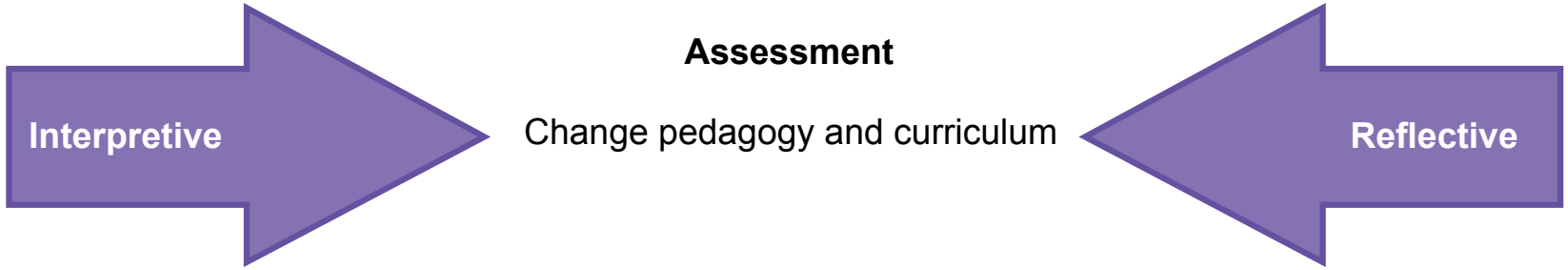


Figure 4

Assessment for mathematics and science is a process of collecting information about student progress in order to demonstrate teacher effectiveness and to guide the teacher's next steps instructionally. Kellough et al *(pp. 418-419)* lists Six Purposes of Assessment.

Assessment is essentially comprised of the process of observing learning and this entails describing, collecting, recording, scoring, and interpreting data about one's students. Thus assessment is both interpretive and reflective.

Assessment is also evaluative in that it should aid the teacher in making changes in pedagogical and curricular aspects of his/ her practice. In fact, it should become an integral component of ongoing, mindful activities that directly improve educational practice.

> *"Assessment provides a mirror of teacher effectiveness by viewing learner progress. Although the CCRS do not include assessment standards, the Cross-Disciplinary Standards can all be addressed when assessment reflects the content and rigor of instruction, and is relevant, reliable, and valid."*
>
> *(SFA Faculty Secondary Education)*

Final Thoughts on Assessment Overview

As teachers, we should be continuously monitoring the progress of our students. Whenever there appears to be a breakdown in the learning process, we must be able to immediately make changes in the pedagogy so that the students can get back on track.

Assessment Design

Assessment Design

Standardized assessment can be divided into two general categories – criterion referenced and norm referenced. Both categories of assessment can help you determine what your students are learning and to re-evaluate your teaching strategies based on your results.

Importance of Understanding Assessment Design

For college and career readiness, understanding **norm-referenced testing** is important because the ACT and the SAT are utilized for college entrance. On these occasions, some of the material will be that for which students have not been exposed. Norm-referenced testing acclimates them to a new, highly important testing format. The purpose in this case is to differentiate ability levels as opposed to the determination of mastery of previously taught concepts. To prepare for the ACT and/or the SAT, schools often provide students with opportunities to practice timed testing.

Norm-Referenced Assessments

Norm-referenced assessments/tests are those assessments in which a student or a group's performance is compared to that of a norm group. A norm group is a random group of students selected by a test developer to take a test for the purpose of providing a range of scores and to establish percentiles of performance for use in setting scoring standards.

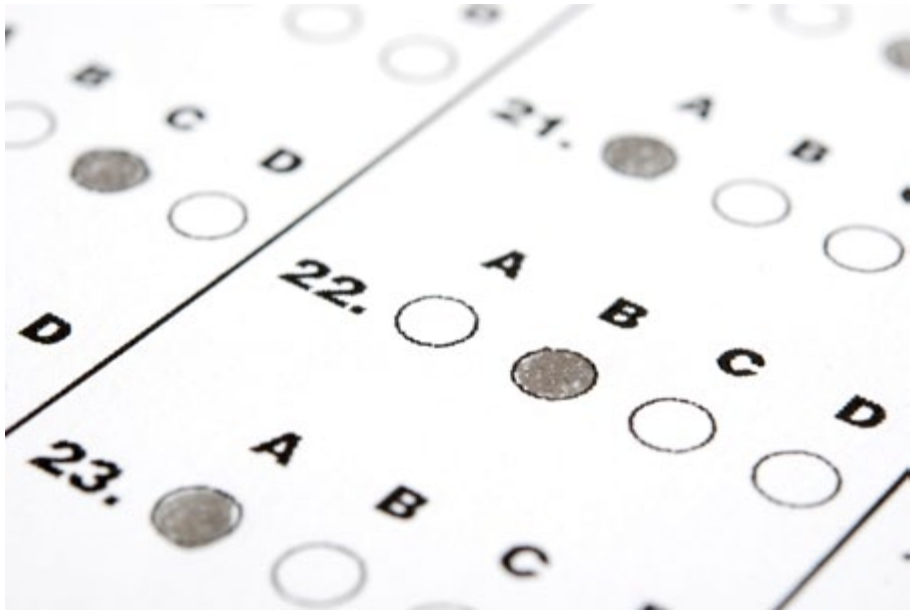
In subsequent testing iterations, students' individual scores or the group scores will not fall evenly on either side of the median established by the original test takers. The results are relative to the performance of an external group and are designed to be compared with the norm (original) group providing the performance standard.

Norm-referenced assessments are often used to measure and compare students, schools, districts, states, regions, etc. on the basis of norm-established scales of achievement. This kind of assessment is relative to the student group undertaking the assessment. Norm-referenced assessments provide a way for student comparison. Learn more about Norm-Referenced Assessments.

Criterion-Referenced Assessment

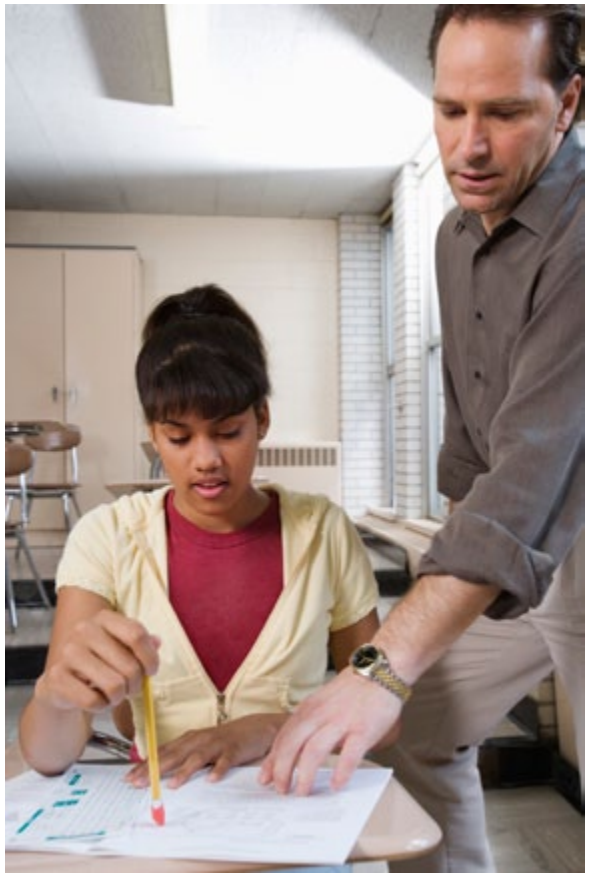
Criterion–referenced assessments are those assessments / tests that may be used to determine a student's progress toward mastery of a specific content area. Student performance is compared to an expected or designated level of mastery in the content area as opposed to other students' scores. Assessments of this nature typically include questions that are based upon what the teacher has taught. As such the assessment is designed to measure student mastery of designated objectives stemming from the teacher's instructional program. Learn more about Criterion-Referenced Assessments.

STAAR™
State of Texas Assessments of Academic Readiness



Final Thoughts on Assessment Design

It is important that our students be exposed to both criterion referenced and norm referenced assessments. The students must be able to compete with not only the students at their particular campuses but with those students that they will encounter when they leave the relative “safety” of their home school environment. Teachers should be asking the students to stretch their understanding from simple processing of data to application under the critical thinking venue of today, a process which indicates broader understanding.



Assessment Types

Assessment Types

For the new inservice or preservice teacher, the differentiation between the different assessment phases or types is often perplexing. This section will define diagnostic, formative, and summative assessments as noted in Figure 5 and how they can be used to inform instruction and how to implement them in the classroom.

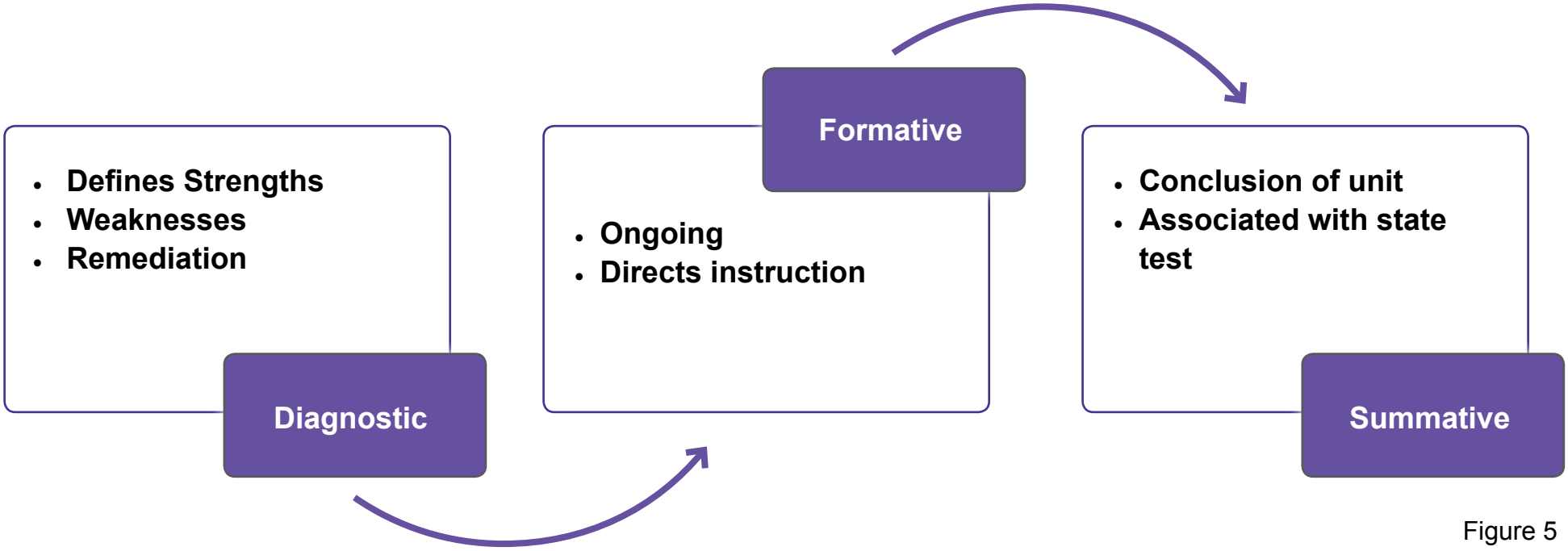
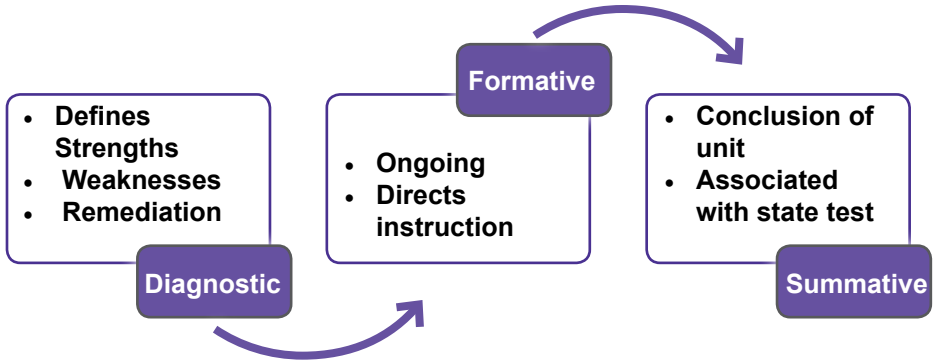


Figure 5

Diagnostic Assessment

A diagnostic test is an assessment technique / tool used to determine specific areas of learning difficulty. Its purpose is to identify students' strengths and weaknesses, specifically what student need to learn in designated fields.

Some theorists and practitioners view diagnostic assessment as a component of formative assessment; others perceive it as a distinct form of measurement *(Kellough et al, 1999, McMillan, 2010)*.



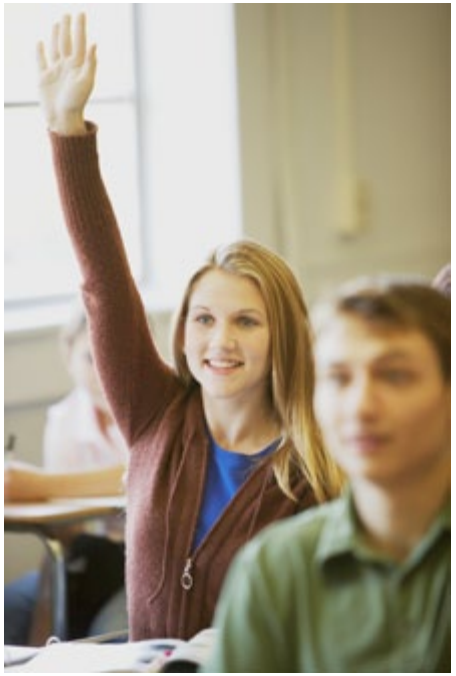
Importance of Diagnostic Assessment
In practice, as mentioned above, the most common purpose of diagnostic assessment is to determine individual student's strengths, weaknesses, knowledge, and skills.

Acquiring these insights allows teachers to remediate students and to modify their curriculum so that each student's particular needs may be better met. As a cue for remediation, it is best employed as an ungraded tool and likewise, as a low-stake process.

Strategy: Diagnostic Assessment

Developing Diagnostic Assessments

- Survey students to determine prior knowledge using clickers or whiteboards or hand signals:
  - fist – 0 – know nothing;
  - 1 finger – I've heard of it;
  - 2 fingers – I've heard of it but need more information;
  - 3 fingers – Know it but can't explain it;
  - 4 fingers – Understand most of it and can explain it;
  - 5 fingers – completely understand it.
- Question students on what they know on a pre-lab assignment.
- Question students on what they know about a concept that you are teaching that day. For example, describe what a mole (in chemistry) is and how large this quantity actually is.
- Use a pretest that mimics a final exam from the previous class.



Mathematics Example: Diagnostic Assessment

Content Objective: Logic and Proof

To prepare students for a study of logic and proof, teachers can determine the status of the prerequisite knowledge of their students by using a diagnostic assessment. Some examples of items for a diagnostic assessment are:

- Have students "prove" a statement, claim or hypothesis using logic in writing or by discussion statements like "All birds can fly" or "Some cows are purple." A lively discussion of the truth or non-truth of these statements encourages students to consider what is necessary to prove or disprove a statement.

- Have students solve a simple linear equation with an emphasis on justifying steps instead of just stringing together equalities. From the student responses, a teacher can see what the students' concept of "Justify your steps" is, and this is usually the area to be targeted.

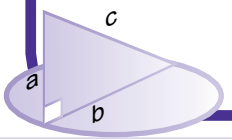
- If the goal is ultimately to prove a statement such as "Vertical angles are congruent," a diagnostic assessment could be for the students to recall or look up necessary definitions to reinforce that we cannot make a proof without knowing what all the words mean!

All of the above suggestions can help teachers identify what concepts, if any, are being misunderstood.

The diagnostic assessment can help teachers determine if

- student difficulty is being caused by not understanding the need for supporting one's statements,
- not understanding how to support one's statements,
- or not understanding how to begin a proof in a new area, that is, by knowing all the definitions required.

(SFA Mathematics Faculty)



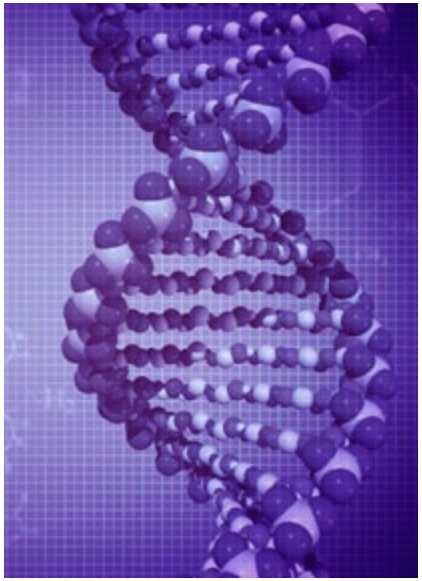
Learn more about the Cross-Disciplinary Standards' connection to the example.

Science Example: Diagnostic Assessment

Content Objective: Genetics

Before teaching this concept, the teacher will want to know the students' prior knowledge about genes, traits, and DNA. A diagnostic assessment will reveal this information. One example of a diagnostic assessment for this concept might entail the teacher asking students to brainstorm such questions:

- In families in which siblings have the same parents, why do siblings often have different hair color?
- How would you define the meaning of a gene? What is its purpose? Where are they located?
- How would you define the meaning of a trait? What is its purpose?
- Describe how information for a specific trait, such as hair color, is carried in the DNA molecule.
- What is the relationship between DNA, genes, chromosomes, and traits?



In a short amount of time, the teacher will establish what students know and where instruction needs to begin.

(AC Biology Faculty)

"In geometry we teach transformations which are taught to a lesser degree in 7th and 8th grade. When we discuss dilations, I specifically give a diagnostic test to determine what the students know about scale factor and similarity. This assists me in connecting what they remember from middle school to the currently taught concept."

(Hudson HS Geometry teacher)

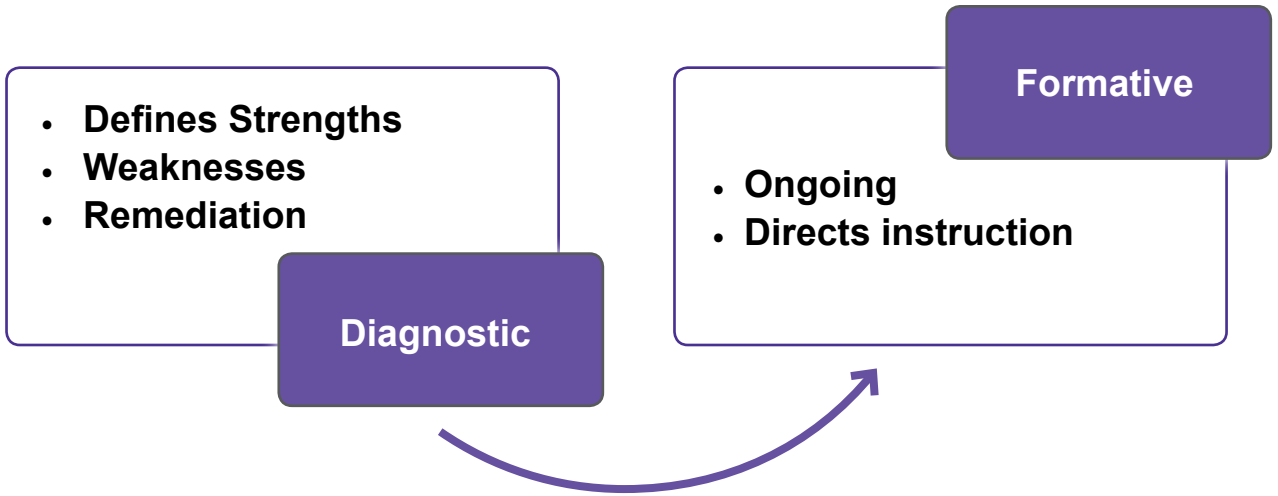
Learn more about the Cross-Disciplinary Standards' connection to the example.

Formative Assessment

Formative assessment is an integral part of the instructional process. Black and William (1998) define formative assessment as, “all those activities undertaken by teachers, and by students, in assessing themselves, which provide information to be used to modify the teaching and learning activities in which they are engaged.” Formative assessments are a wonderful strategy to assess a student’s progress in gaining the College and Career Readiness Content as well as the Cross-Disciplinary Standards. These assessments guide the student in a low stakes environment, which seems less threatening and allows for greater participation.

Formative assessment is comprised of a wide range of strategies utilized in order to determine student progress towards achieving specified learning goals. Menken (2000) specified that, “for assessments to be effective and useful for educators in instructional practice, they must be deeply entwined with the classroom teaching and learning driven by the standards.”

Timely teacher feedback is an essential component of this process. The practice of embedding formative assessments at key points during instruction supplies teachers with essential information that can then be used for identifying and responding to those elements of the curriculum that are shown to be problematic.



Importance of Understanding Formative Assessment

When formative assessment is incorporated into classroom practice, it provides necessary information that allows for adjustments in both teaching and learning as they are occurring.

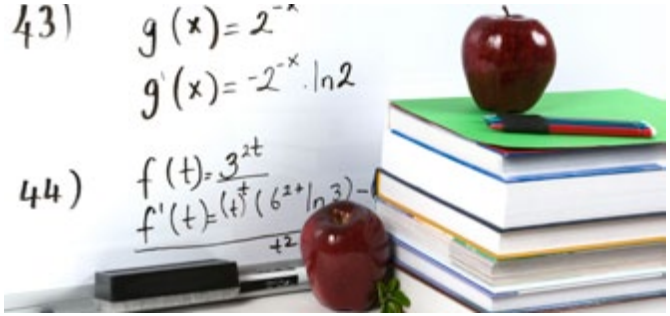
It informs both teachers and students about student learning at a point where **on-the-spot** adjustments can be made. In this sense, formative assessment can be conducted during the learning experience in order to promote student success.

The STEPS team recommends that student acquisition of the CCRS is assessed at multiple points so that students are not caught off guard by summative assessments. The formative assessment provides an opportunity for teachers to re-teach or re-emphasize content.

Strategy: Formative Assessment

Developing Formative Assessments

- After practicing several proofs, and modeling proof skills, have students individually make a proof of a new claim (similar to one practiced).
- Observe students as they work in a lab to determine what knowledge they are gaining.
- As students are working mathematics or science problems, ask them to explain what they are doing and why.
- Have one student explain the concept to another in a group work situation.
- See other Examples of Formative Assessment Strategies.

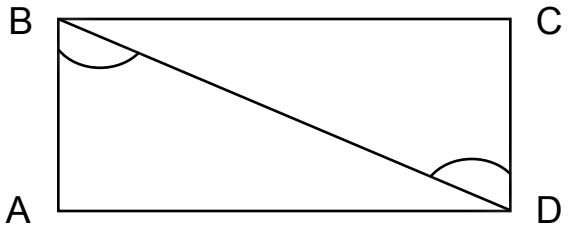


Mathematics Example: Formative Assessment

Content Objective: Logic and Proof

Given: $\overline{BC} \parallel \overline{AD}$ $\quad\quad$ $\angle ABD \cong \angle CDB$

Prove: $\triangle ABD \cong \triangle CDB$



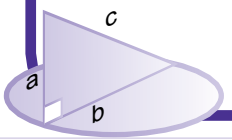
To build students' skills in developing an independent proof, teachers can make use of formative assessments. While students' proof skills might not be totally developed along the way, teachers can:

- Start with having students give one-line justification for claims that require only one step.
- For two-column proofs, have students match assertions with justifications.
- For two-column proofs, have students fill in a missing assertion given the justification or have students fill in a justification to support a given assertion.

These types of assessments lead students through the steps of making an independent paragraph style proof, identifying skills not mastered along the way.

Statement	Justification
1. $\overline{BC} \parallel \overline{AD}$	1. Given
2. $\angle ABD \cong \angle CDB$	2. _____
3. _____	3. Reflexive Side
4. $\triangle ABD \cong \triangle CDB$	4. _____

(STEPS Geometry Teachers)



Learn more about the Cross-Disciplinary Standards' connection to the example.

Science Example: Formative Assessment

Content Objective: Genetics

How Genes Control Traits
Moving from diagnostic to formative in the instructional sequence of teaching how genes control traits, a formative assessment will reveal how well students are learning. During the instructional sequence, the teacher could ask any variety of questions.

Some of those questions might be:

- If there is one change in the DNA sequence, what are the possible effects?
- In the following sequence what protein would be made? AGG AGG AGC
- Using the following sequence AGG, GGT, CTA, make three different types of mutations. Give the sequence after each mutation.
- How does the amino acid sequence determine a characteristic (trait) of an organism?

Background Information: Genes are the units that determine inherited characteristics, such as hair color and blood type. Genes are the lengths of DNA molecules that determine the structure of polypeptides (the building blocks of proteins) that our cells make. The sequence of nucleotides in DNA determines the sequence of amino acids in polypeptides, and thus the structure of proteins.

In a process called transcription, which takes place in the nucleus of the cell, messenger RNA (mRNA) reads and copies the DNA's nucleotide sequence in the form of a complementary RNA molecule. Then the mRNA carries this information in the form of a code to the ribosome, where protein synthesis takes place. The code, in DNA or mRNA, specifies the order in which the amino acids are joined together to form a polypeptide. The code words in mRNA, however, are not directly recognized by the corresponding amino acids. Another type of RNA called transfer RNA (tRNA) is needed to bring the mRNA and amino acids together. As the code carried by mRNA is "read" on a ribosome, the proper tRNAs arrive in turn and give up the amino acids they carry to the growing polypeptide chain. The process by which the information found in the DNA is changed into the language of protein is known as translation.

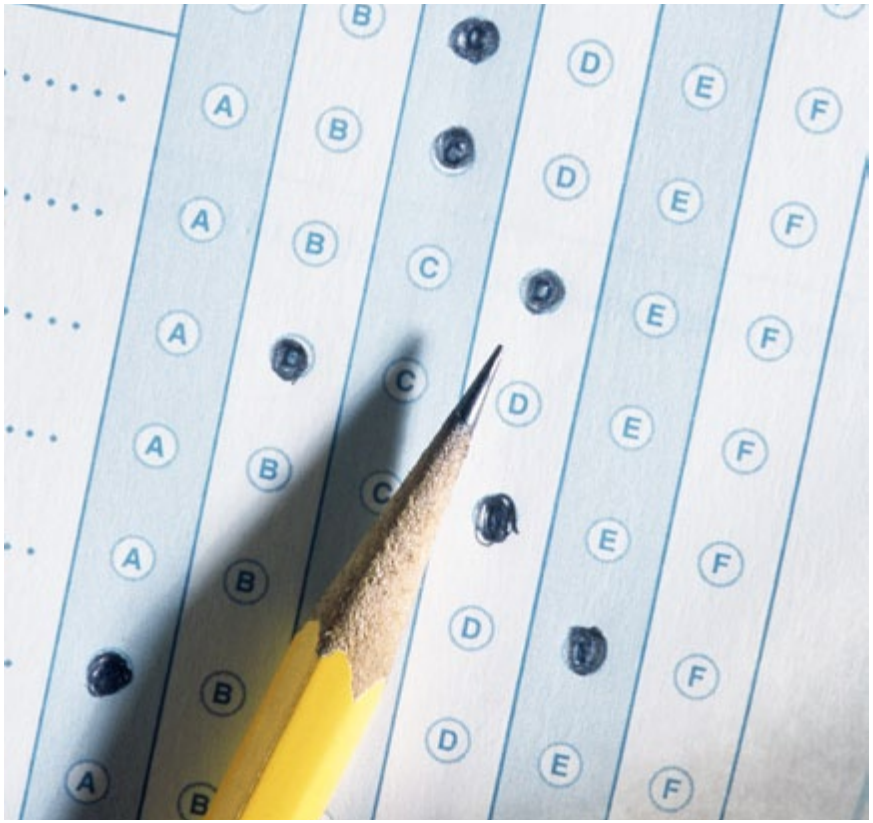
Learn more about the Cross-Disciplinary Standards' connection to the example.

Summative Assessment

Summative assessment comprises an evaluation that typically comes at the conclusion of a unit or a learning activity certifying completion of projects, classes, and programs. Summative evaluations often consist of a letter grade. This form of assessment is usually associated with standardized tests, state tests in particular.

In light of the CCRS-TEKS alignment, it is extremely important that students have been provided the opportunity for sufficient practice in comparing, contrasting, making connections and drawing inferences in order to be successful on the culminating summative assessment (STAAR). Prior to any summative assessment, students must have had prior experience with the content material such that the testing does not yield an invalid measurement of student achievement.

> *"While my classroom summative assessments reflect what students know. They also reflect how well I taught the content."*
> *(STEPS teacher)*



Importance of Understanding Summative Assessments

Summative assessments are also used at the district and classroom level as accountability measures that generally comprise a portion of the grading process.

They seek to provide parents, educators, and policy makers with information (data) on students' progress with regard to a course or a standard.

Summative assessments are also administered periodically in order to determine at a particular point in time what students do and do not know.

Figure 6 depicts a few examples of summative assessments. With each, the teacher begins with the exam then works backward to teach the content.

- District benchmark assessments
- End-of-unit or chapter tests
- End-of-term or semester exams
- State assessments
- Accountability scores that (AYP) and students (report card)

Figure 6

Strategy: Summative Assessment

Developing Classroom Summative Assessments

- Because the summative classroom assessment should target the teacher's instructional objectives, start with the end in mind. Consider the outcome that you want and map backwards as you design your summative assessment.
- Teach the content, your objectives, not the test questions.

- When determining if your students have accomplished the objectives, use the summative evaluation as well as their formative assessments. This gives the teacher a broader perspective.

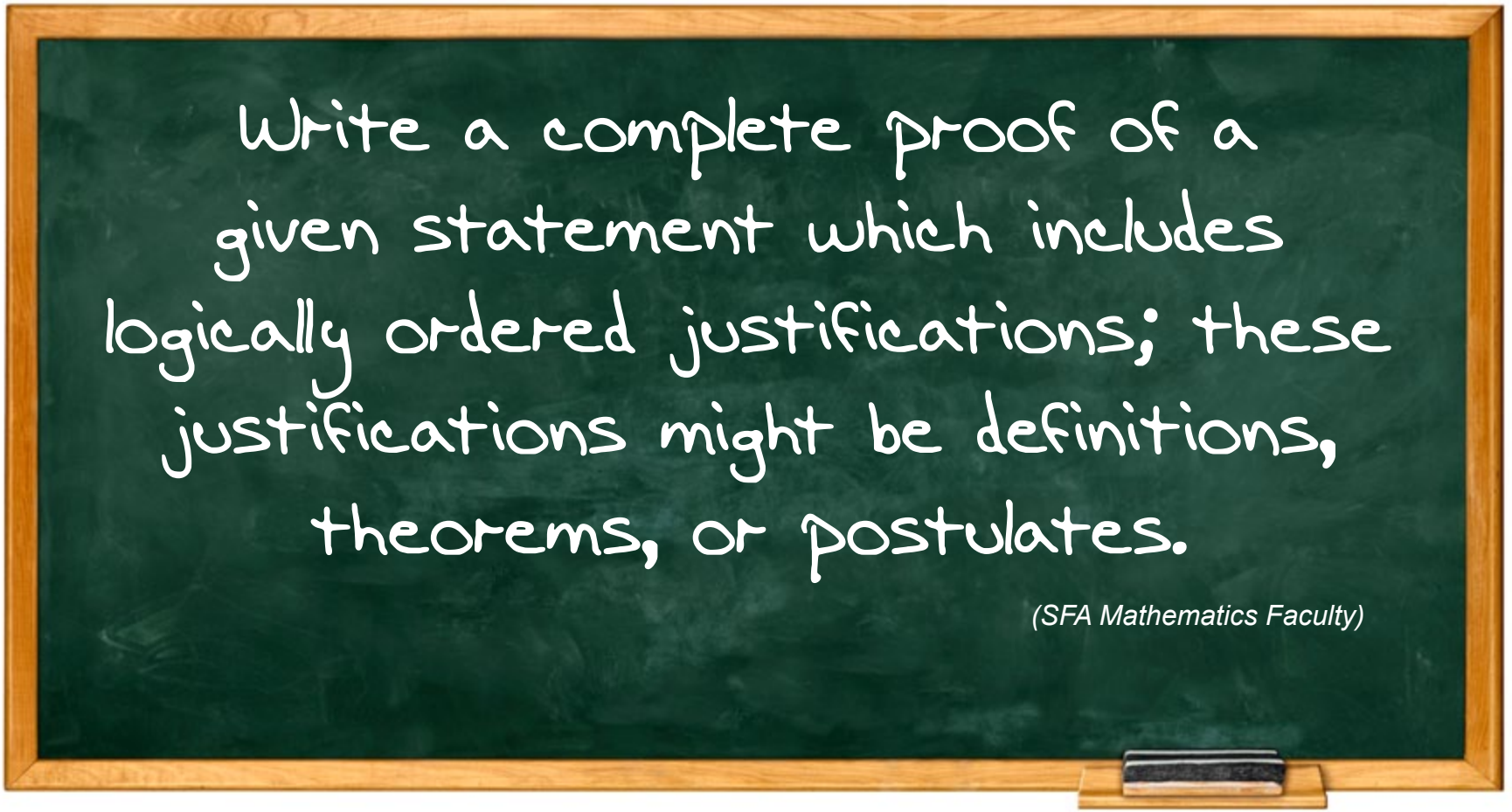
- Think about choosing questions that reflect material that the student should have in his/her notes.

- The teacher can use student feedback on the summative assessment to see if there needs to be a quick remediation on some part of the taught unit.

Mathematics Example: Summative Assessment

Content Objective: Logic and Proof

A summative example from the former diagnostic and formative assessments might look something like:



Learn more about the Cross-Disciplinary Standards' connection to the example.

Science Example: Summative Assessment

Content Objective: Genetics

How Genes Control Traits

In this investigation, the student will simulate the mechanism of protein synthesis and thereby determine the traits inherited by the fictitious organism called the Mysterious Monster (MM) whose cells contain only one chromosome. Its chromosome is made up of 6 genes (A, B, C, D, E, and F) each of which is responsible for a certain trait.

Procedures:

1. To determine the trait for gene A of your MM, fill in the information in the box labeled Gene A in the Data Table. Notice the sequence of nucleotides in the DNA. In the space provided, write the sequence of nucleotides of mRNA that are complementary to the DNA which codes for gene A.

2. In order to determine the sequence of amino acids, match each mRNA codon with the specific amino acid in Figure 1. Using a hyphen (-) to separate each amino acid number, record this information in the appropriate place in the Data Table.

3. Using Figure 2, find the trait that matches the amino acid sequence. Record this information in the appropriate place in the Data Table.

4. Repeat steps 1-3 for the remaining genes. (B through F).

5. Using all of those inherited traits, access the below link, complete Table 1 using the information from Figure 1 and 2 then sketch your MM.

(Hudson HS Biology Teacher)

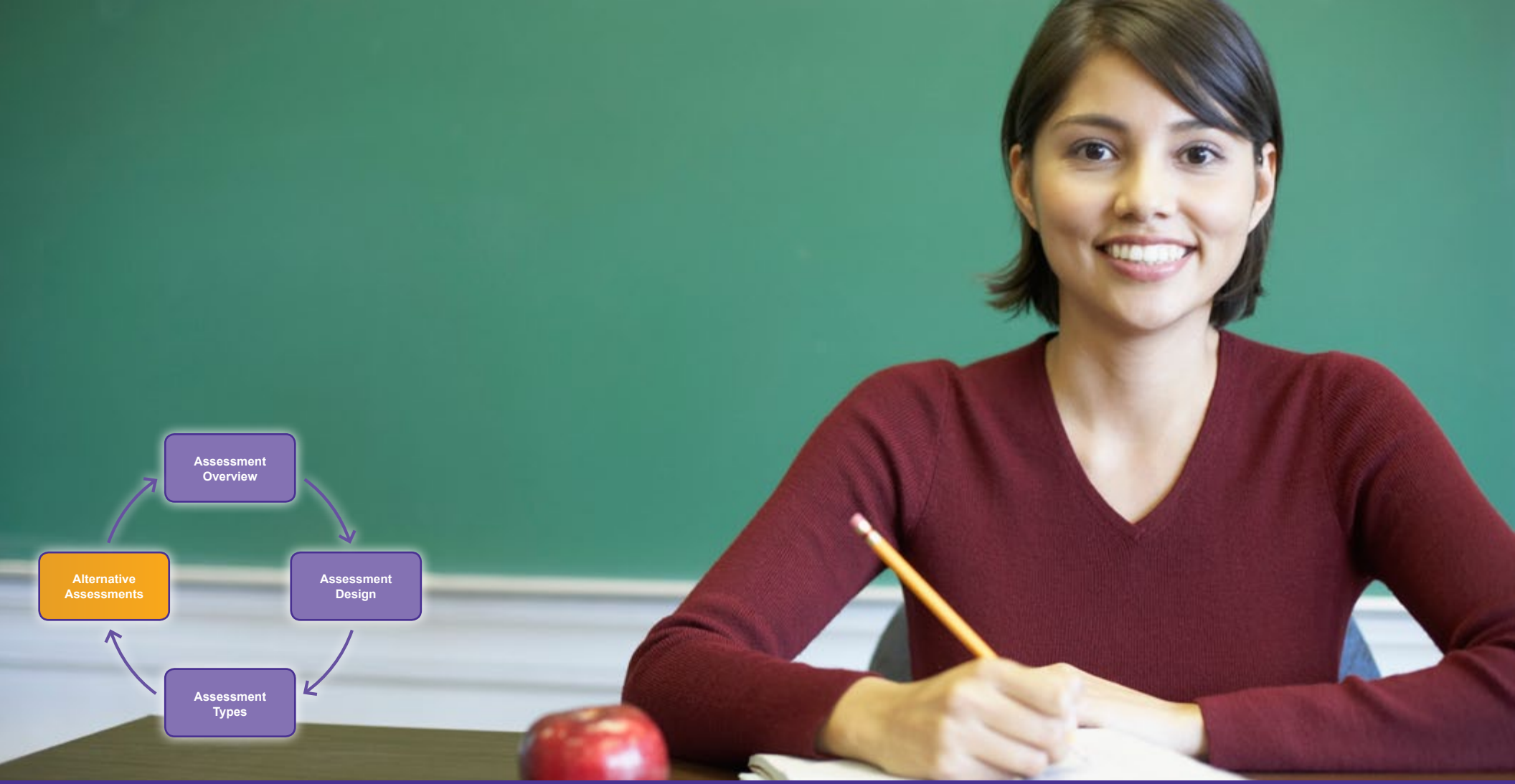
Learn more about tables and background for the lesson.

Learn more about the Cross-Disciplinary Standards' connection to the example.

Final Thoughts on Assessment Types

As inservice and preservice teachers:

- How might I incorporate diagnostic, formative, and/or summative assessments into my current practices?
- How will I utilize the results of the above assessments to impact or change my instruction/curriculum/ lessons?
- How will I use the data from these assessments for decision making?



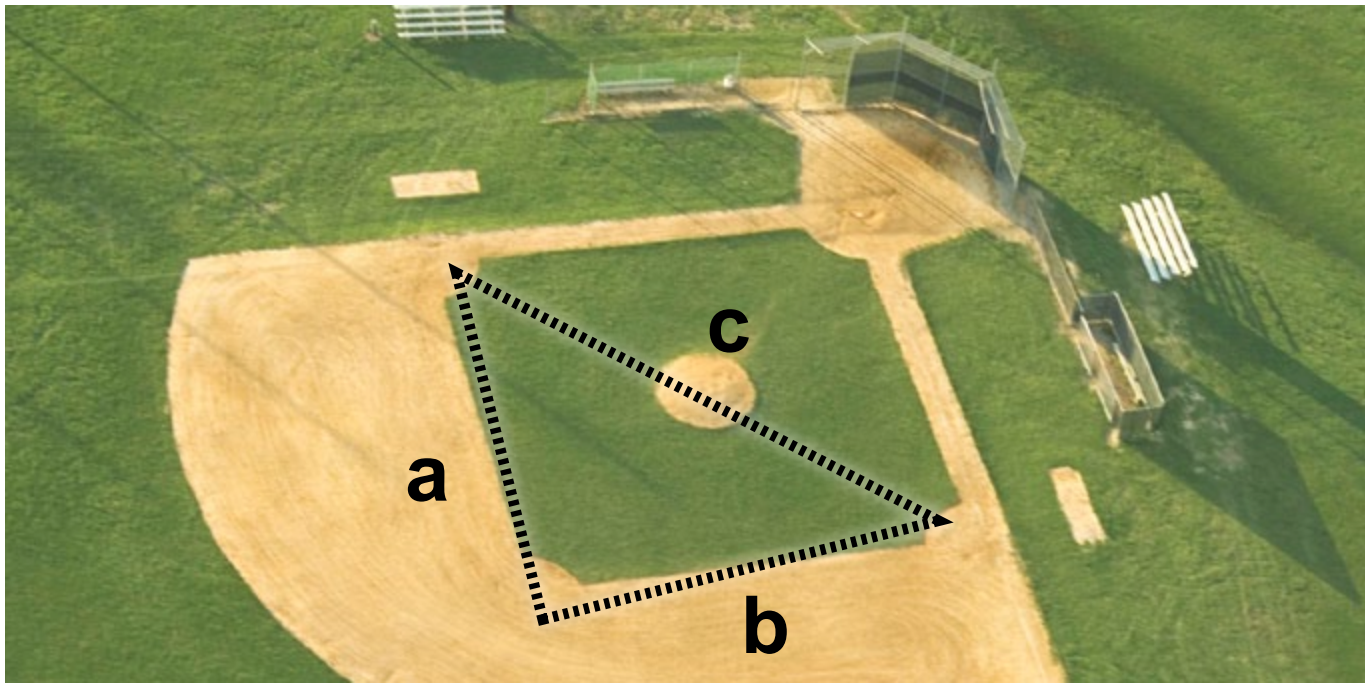
Alternative Assessments That Promote CCR

Make the Material Relevant

As part of my consultant duties for a small rural school, I was asked to explain the importance of mathematics, algebra and geometry in particular, to a group of high school sophomores. In the course of this discussion a very respectful young man asked when he would ever use this stuff.

This young man was a good baseball player and his position was second base. So I asked him why he thought the coach put him on second instead of third. He responded that he had a stronger arm than the third baseman but the third baseman was more accurate. We then had a discussion of the Pythagorean Theorem and some basic right triangle trigonometry. This discussion eventually led to the realization by the student that a small amount of error on a throw from his position to first was not nearly as costly as a small amount of error on a throw from third to first. He (and the other baseball players) left the class with more appreciation for mathematics than what they had before the discussion.

(SFA Mathematics Faculty)



Alternative Assessments

Alternative assessments are a form of formative and summative assessments. They are generally defined as any assessment technique or method that serves as an alternative to traditional paper-and-pencil tests. What sets this form of assessment apart from others is its requirement that students demonstrate knowledge and skills in ways that cannot be assessed by multiple-choice or true-false tests.

They do not necessarily lend themselves to comparing or ranking students in the way standardized testing does. Rather, the goal is to determine not only what students know but also what they can do. Proponents of alternative assessment stress that such assessment is more aligned with real-life practice and that it tends to reduce competition for grades while helping students become more proficient judges of their own efforts. What students know, in terms of fact-based knowledge, remains important as a component of the learning that is being assessed. However, its measurement does not comprise the sole function or purpose of the assessment.

Typically, alternative assessment is teacher-created and wholly grounded in the curriculum under study. Additionally, alternative assessments are usually customized to the students and to the subject matter as well.

Alternative assessment is diverse, assuming multiple forms according to the nature of the skills and knowledge under assessment. Students are generally asked to demonstrate learning by creating a product, as with a poster or speech, or performing a skill such as designing an experiment or conducting a demonstration.

Importance of Alternative Assessments

Alternative assessments are particularly essential for math and science teachers in that the College and Career Readiness Standards require that students be able to demonstrate key skills that focus upon observable abilities, specifically to formulate, solve, create, interpret, and evaluate. The following video, Beyond Standardized Testing, provides insight into performance assessment.

Connecting Alternative Assessments to CCRS

They are particularly important to college and career readiness because the teacher is attempting to guage the students' abilities to formulate and solve complex problems, create logical arguments, interpret findings, self-monitor, and evaluate conflicting information. Learn more about the state's alignment team's listing of performance examples of skills needed for critical thinking.

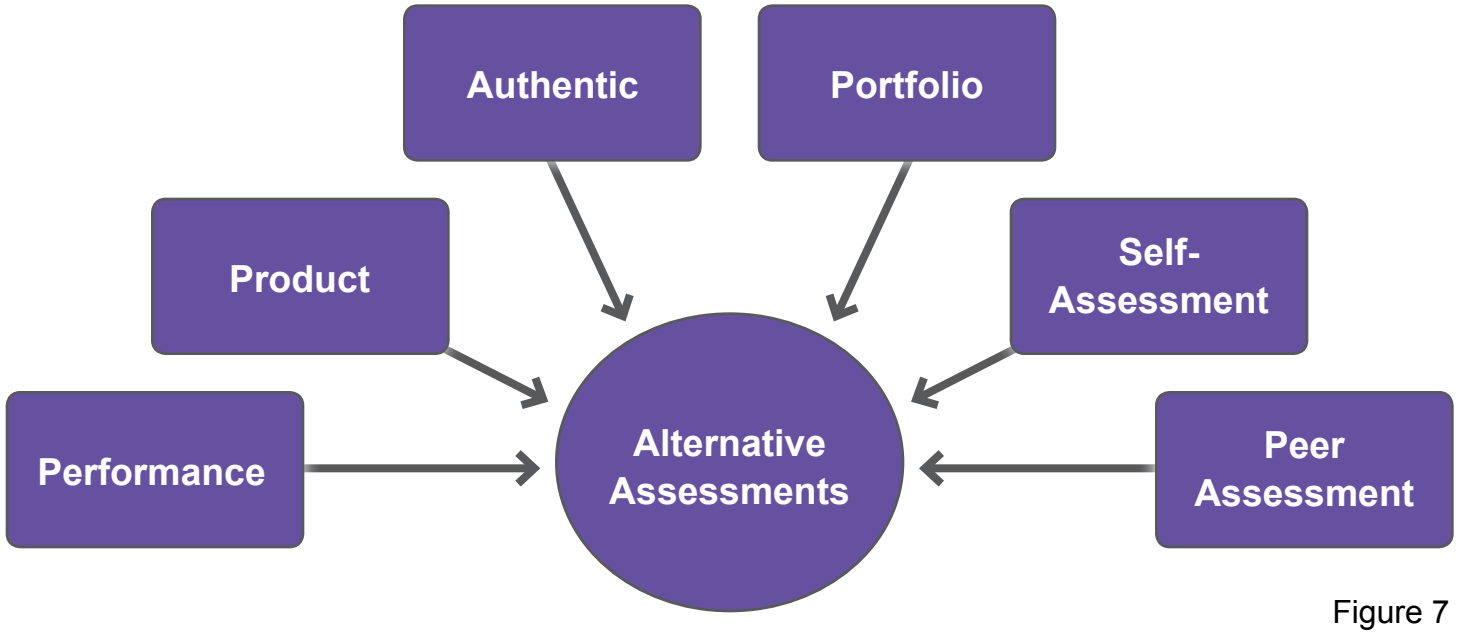


Figure 7

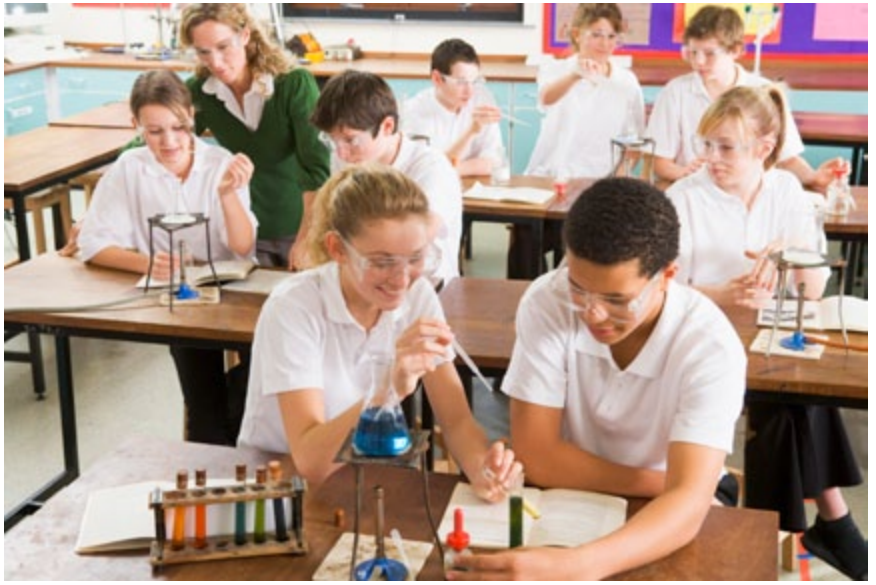
Performance Assessment

Performance assessment refers to a wide range of assessment activities that provide the teacher with an opportunity to observe students undertaking tasks that make use of the skills being evaluated.

The teacher must detail precisely what standards are used to evaluate the performance. This allows students to judge their own work as they proceed.

Importance of Understanding Performance Assessments

When students are required to demonstrate what they can do, teachers can actually observe their understanding and abilities. There is a big difference between giving an answer to a mathematics or science problem and demonstrating that answer through performance or application to a real work situation.



Strategy: Performance Assessment

Developing Classroom Performance Assessments

Open-ended or extended response exercises require students to explore a topic.

Portfolios are selected collections of a variety of performance-based work. They may include “best pieces” with the student’s evaluation of the strengths and weaknesses of several pieces.

Mathematics Example: Performance Assessment

Content Objective: Developing Performance Assessments

- Have students collect and keep handouts, notes, and homework in a notebook. At the end of the six weeks, have them write a personal assessment entry in their notebooks on what new concepts they have learned, how they gauge their mastery of these concepts, new skills they have practiced, and how it relates to another mathematics concept.

- Have groups of students assigned a different mathematical concept to support. Have them present how the concept applies to real world concepts.

(STEPS Geometry Teachers)

Learn more about the Cross-Disciplinary Standards' connection to the example.

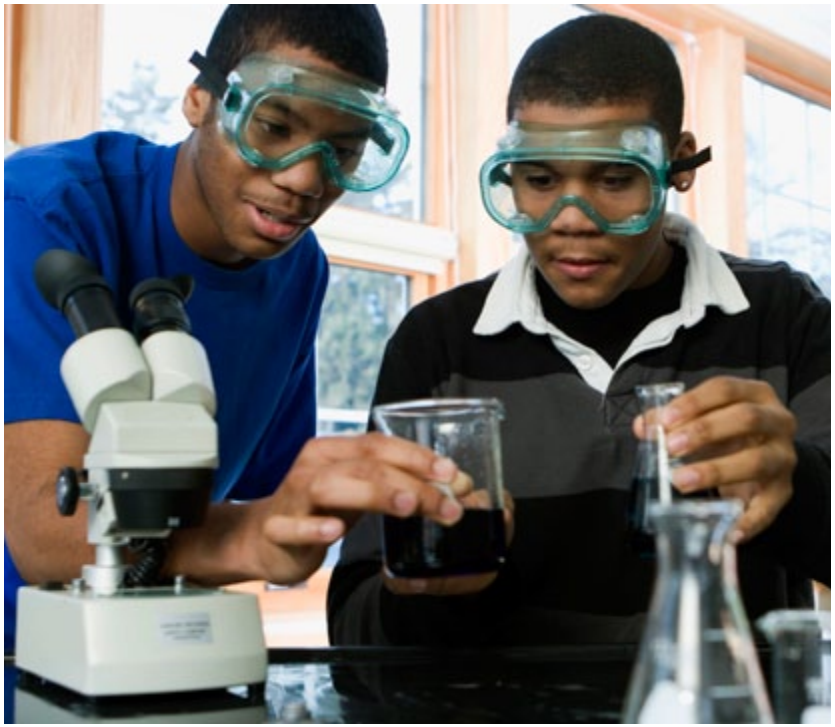
Science Example: Performance Assessment

Content Objective: Developing Performance Assessment

- In lieu of having students take a multiple choice test over a range of scientific experiments, have students conduct a lab experiment and afterwards write about their processes, discoveries, and choices in a lab report.

- The student is to use a teacher designed rubric to determine accuracy fulfilling lab investigation, including assessing and analyzing their errors.

(STEPS Biology Teachers)



Learn more about the Cross-Disciplinary Standards' connection to the example.

Product Assessment

Product assessment consists of assessing a student's performance based on a resulting work product that aligns with a unit of learning. The product is tangible and is a result of the performance of a task. The focus is upon the evaluation of the outcome.

Importance of Product Assessment

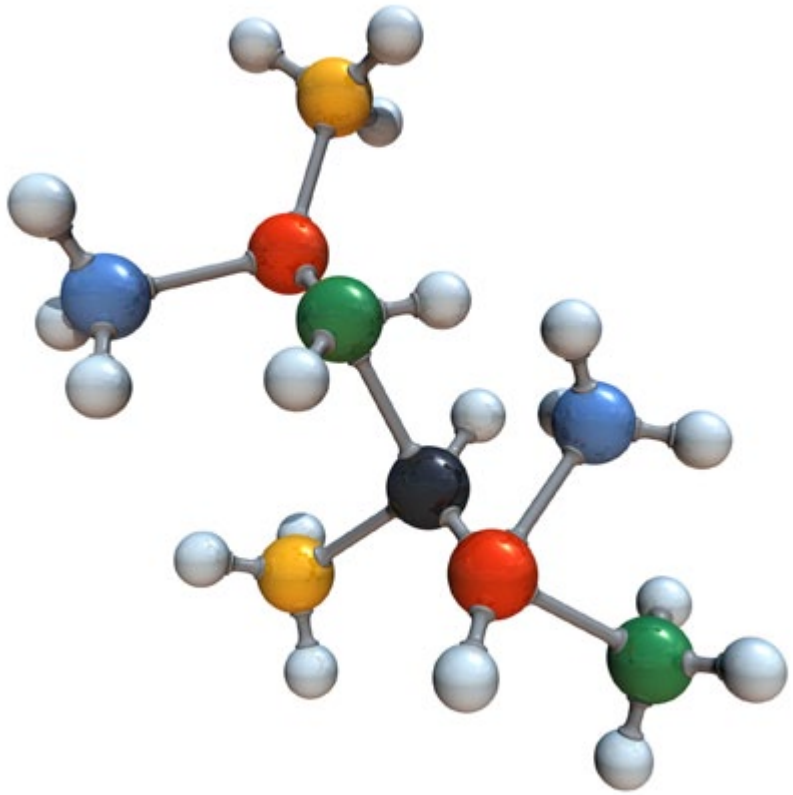
This form of assessment is most appropriate for documenting proficiency or competency in a given skill; as such, it is often used for summative purposes.

Strategy: Product Assessment

Developing Classroom Product Assessments

Provide students with a rubric that defines expectations and product criteria. A laboratory would be done in which the students practice making (with a modeling kit) and drawing molecular models. A rubric would be used to provide students feedback on the molecular modeling unit done in chemistry.

Be flexible. A product assessment can be a diagnostic, formative, or summative dependent upon your purpose.



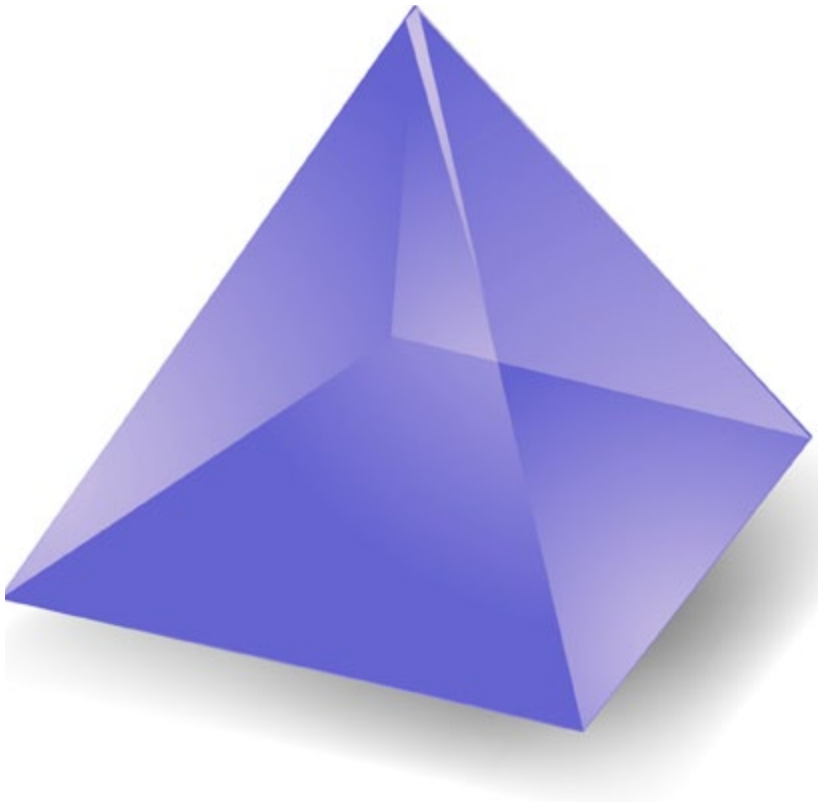
Mathematics Example: Product Assessment

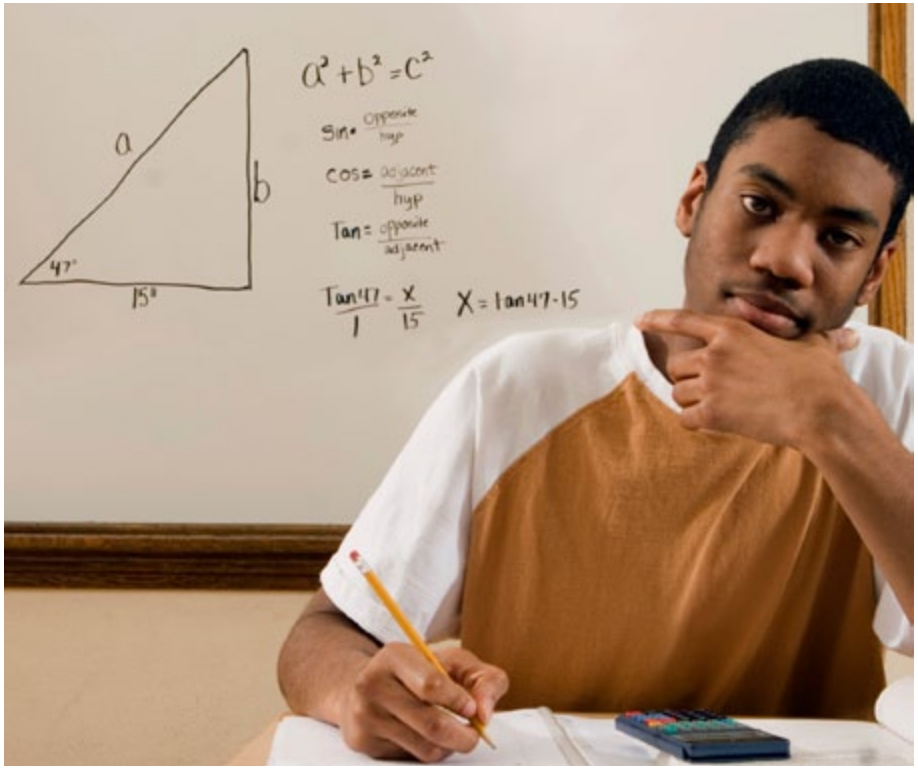
Content Objective: Dimensional Change

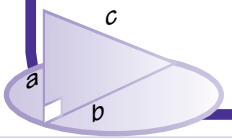
Constructing a Square Pyramid

Given a square pyramid, determine the dimensions. Construct a similar pyramid using a scale factor of your choice.

- State the scale factor
- Describe how it relates to the change in volume and surface area.







Learn more about the Cross-Disciplinary Standards' connection to the example.

Science Example: Product Assessment

Content Objective: Ecosystems

Creating Your Own Ecosystem

1. Determine the abiotic factors of your ecosystem including:
   - Location on the planet
   - Water availability
   - Soil composition
   - Climate
   - Hours of sunlight

2. Determine the biotic factors of your ecosystem including:
   - Producers
   - 1st level, 2nd, 3rd level consumers
   - Scavengers
   - Decomposers

3. Construct 1 food chain involving 5 trophic levels

4. Identify symbiotic relationships including:
   - Parasitism
   - Mutualism
   - Commensalism
   - Predator/prey

5. Analyze the flow of energy through your ecosystem

6. Analyze the cycling of matter through your ecosystem

7. Make one environmental change to your ecosystem such as a flood, fire, or drought. Describe how this change will impact the ecosystem, explaining ways the ecosystem might recover.

8. Illustrate your ecosystem with diagrams.

(Lufkin HS Biology Teacher)

Learn more about the Cross-Disciplinary Standards' connection to the example.

Authentic Assessment

Authentic assessment asks students to perform real-world tasks that demonstrate meaningful application of essential knowledge and skills *(Mueller, 2011)*. Wiggins views authentic assessment as “engaging of worthy problems or questions of importance, in which students must use knowledge to fashion performances effectively and creatively. The tasks are either replicas of or analogous to the kinds of problems faced by adult citizens and consumers or professionals in the field.” *(1993, p. 55)* Stiggins adds, “Performance assessments call upon the examinee to demonstrate specific skills and competencies, that is, to apply the skills and knowledge they have mastered.” *(1987, p. 34)*. An authentic assessment usually presents a task for students to perform as well as a rubric by which their performance on the task can be measured.

Importance of Understanding Authentic Assessment

As teachers, you do not want students to just know the content of the disciplines, but you also want them to be able to use the acquired knowledge and skills in the real world. Therefore, our assessments have to also tell us if students can apply what they have learned in authentic situations. The authentic assessment assists with transfer of student knowledge; they are applying what is familiar to an unfamiliar context.

Strategy: Authentic Assessment

Developing Classroom Authentic Assessments

STEPS teachers suggest that one primary question to ask is: Why does the student need to know this concept? The answer will lead you to real world applications.

Inform students of your expectations:

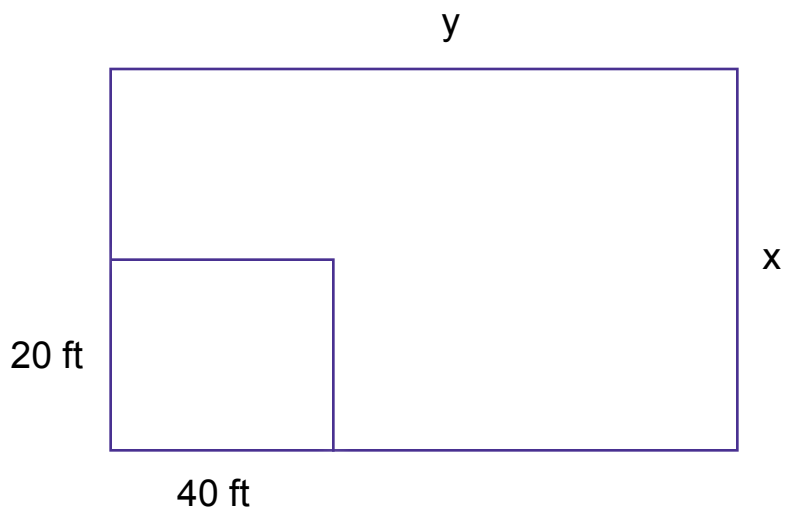
- Define the knowledge and skills students need to apply.
- Determine the standards against which students will be judged.
- Define indicator levels of competence.
- Design an authentic task that is somewhat undefined, complex, and has multiple entry and exit points.

Mathematics Example: Authentic Assessment

Content Objective: Quadratics

Professor Harris, farmer of mathematics, wishes to enclose an area in which to expand his operation to poultry farming. Current stock laws in Texas prevent free-ranging chickens so a chicken pen is absolutely necessary. Also, Farmer Harris plans to use an existing barn that is twenty feet by forty feet as part of the enclosure. Since farmers are frugal by necessity, Farmer Harris plans to only use 400 feet of fence to construct the pen (as shown).

What dimensions of the fence will maximize the area?



(SFA Mathematics Faculty)

Learn more about the Cross-Disciplinary Standards' connection to the example.

Science Example: Authentic Assessment

Content Objective: Measurement Conversion

The Importance of Chemistry in the Kitchen

Anise $C_{10}H_{12}O$	Flour $C_4H_8O_4$
Baking Soda $NaHCO_3$	Lemon Juice (extract) $C_6H_8O_7$
Baking Powder $NaHCO_3$	Margarine $C_9H_{12}O_6$
Brown Sugar $C_{12}H_{22}O_{11}$	Milk 85% H_2O; 15% $C_9H_{14}O_6$
Butter $C_9H_{14}O_6$	Molasses $C_{12}H_{22}O_{11}$
White Sugar $C_{12}H_{22}O_{11}$	Pepper $C_{17}H_{19}O_3N$
Chocolate $C_4H_8O_4$	Salt $NaCl$
Cinnamon C_9H_8O	Vanilla $C_8H_8O_3$
Cloves $C_{10}H_{12}O_2$	Eggs $C_6H_{12}O_3N_2$
Cream of tartar $KHC_4H_5O_6$	

Our chemistry STEPS teachers use authentic assessments as they asked students to convert a chocolate chip cookie recipe from moles to standard cooking measurements.

(Woden HS Chemistry Teacher)

Learn more about the Chemistry Cookie Project.

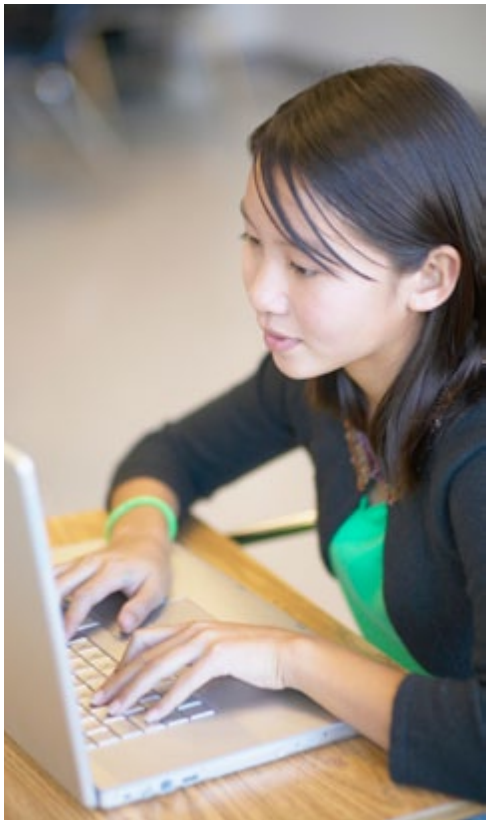
Learn more about the Cross-Disciplinary Standards' connection to the example.

Portfolio Assessment

Portfolios are typically comprised of student work that has been completed over time such as an entire grading period or semester. Teachers who choose to utilize portfolios require their students to review their work and then select items (artifacts) that best demonstrate that specific learning objectives / goals have been met. It is not uncommon for teachers to ask students to compose reflective essays that support the items selected for the portfolio. The essays serve as evidence of what they have learned or the goals that they have created. Traditional paper-based portfolios can be chosen or computer-based variations depending upon student and / or teacher preference. In the final analysis, portfolios should be judged against a predetermined set of criteria and must provide evidence of the learning that has occurred over time.

Importance of Understanding Portfolio Assessments

In thinking about students mastering curriculum content for graduation, the portfolio provides the student and teachers a picture over time of student progress in accomplishing instructional goals.



Strategy: Portfolio Assessments

Developing Classroom Portfolio Assessments

There are 3 generally recognized forms of portfolios:

Developmental portfolio – the primary aim of this type of portfolio is for students and teachers to have evidence of how the student has progressed in the course of a period of time (nine weeks or a semester). Typically, students would be asked to select examples of their work that best demonstrate their progress in the course. This variety of portfolio may also be used to assess individual learning contracts.

Showcase portfolio – this variety of portfolio provides an opportunity for students to display their best work. Teacher guidelines might direct students to include particular pieces or types of work that have been completed over a period of time. Showcase portfolios allow students the occasion to devote continued effort to their work in order to refine it to a higher standard.

Reflective (or artifact) portfolio – This form of portfolio may be similar to a learning journal wherein students write about how they feel they have achieved specific goals or objectives embedded in the course. Should artifacts be used, students could choose triggers or pieces of work designated as a starting point to provide evidence of their achievement. They could then write in more detail specifying how that achievement took place. Reflective portfolios are especially useful for assessing development of behavioral objectives / goals.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Self-Assessment

Self-assessment pertains to the student's ability to observe, analyze, and mediate one's own performance in relation to a criteria and then to make a determination as to how that performance may be improved. Self-assessment is frequently used interchangeably with self-evaluation and self-study.

As mentioned above, self-assessment involves students judging the quality of their own work, based upon evidence and specific criteria, for the express purpose of creating better work in the future. When students are instructed by effective teachers to assess their own progress against meaningful standards, much benefit accrues. Of special value is the positive impact on student performance in terms of heightened self-efficacy and enhanced intrinsic motivation. Evidence of the benefits of self-assessment on student performance is especially strong in the face of difficult work *(Maehr & Stallings, 1972; Arter et al, 1994)*.

Above all, self-assessment must be perceived as a reflective process, one in which students assess their own attitudes, motivation, and thinking. Navigating the information-rich landscape of the 21st century requires learners to manage their own learning, to discriminate amongst endless data streams, and to assume increasing control of their academic responsibilities.

Importance of Self-Assessment

All students benefit from self-assessment whether they are recognized as high performing or struggling. Self assessment assists with:

- Identifying their own strengths and weaknesses
- Maintaining a student journal or portfolio which utilizes established criteria wherein students select samples of their writing or work and then explain the value of that work in relation to the criteria
- Offering descriptive feedback to peers
- Making use of teacher and peer feedback to identify gaps in their performance and to establish goals for future learning
- Preparing for self-assessment to include receiving specific guidance from teachers so that they know what to strive for. When students have a clear understanding of the learning target (s) they are aiming for, their self-assessment will have a much higher degree of accuracy.

Strategy: Self-Assessment

Developing Self-Assessments

All assessment, especially self-assessment, allows teachers to gain meaningful insight into the impact and effectiveness of their instructional efforts. Well directed student self-assessment provides teachers with a special grasp of student differences and thus creates an added avenue for teachers to respond to learner needs.

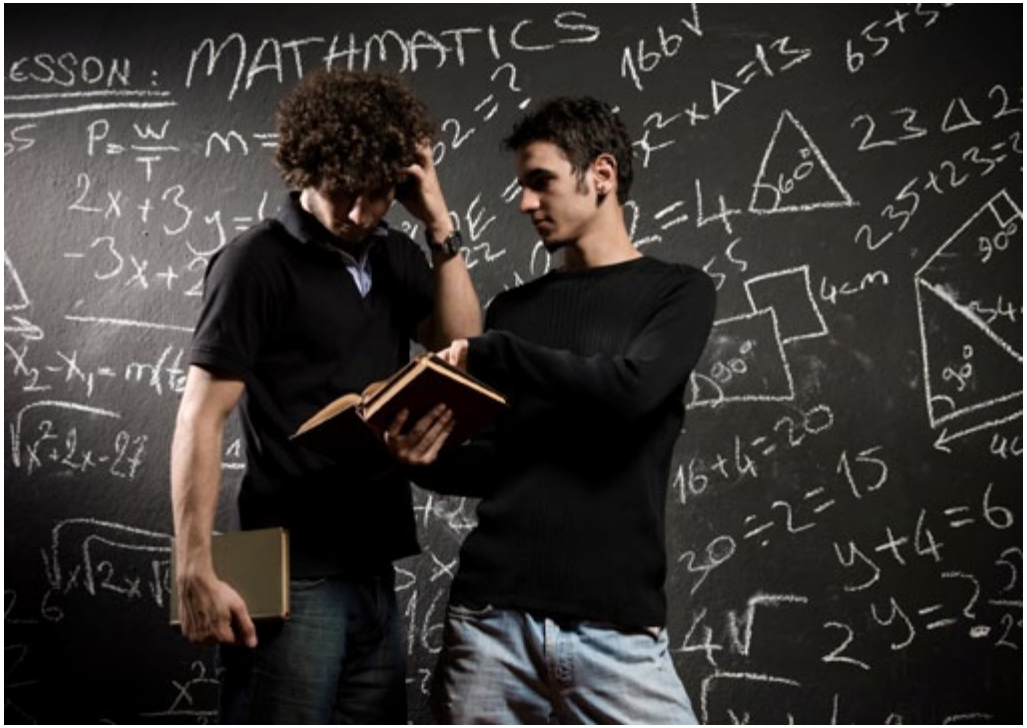
Some examples of self-assessment strategies that might inform instruction or promote student reflection include the following:

- Student-Created Rubric
- Learning Contracts
- Reflection Logs
- Checklists
- Process Folios

Peer Assessment

Peer assessment involves students individually evaluating one another's work or contribution to a task using a predetermined or self-generated form of criteria. Such activities require carefully structured guidelines so that feedback from peers is valid. As such, peers are asked to reflect upon, formulate judgments about, and generate feedback on a peer's behavior, performance, or effort.

As with self-assessment, in peer-assessment student involvement and responsibility is encouraged. Students are motivated to reflect upon their roles and contributions to the task at hand. A key teacher focus is the development of students' judgment skills and their ability to assume ownership of the process or task in which they are engaged.



Importance of Peer Assessment

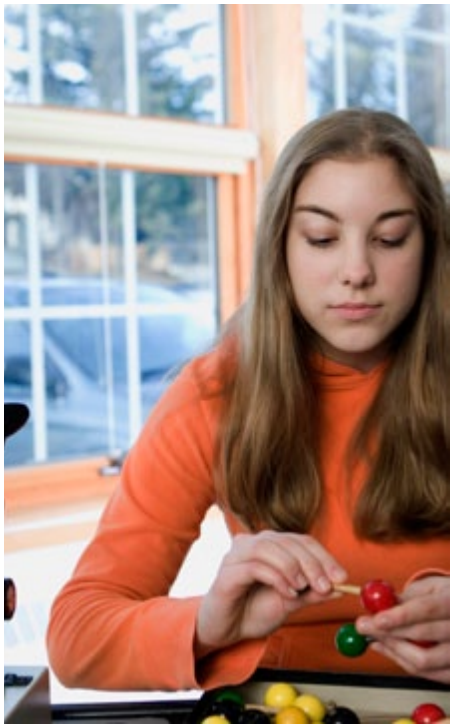
Metacognition refers to learner awareness of thinking processes and one's ability to understand, control, and manage their own cognitive procedures. This concept is commonly perceived as "thinking about thinking". It is extremely relevant in today's learning environment, be that at school or throughout life, in that metacognitve capacity positively impacts the notion of learning how to learn. In an era of chronic change, individuals must learn how to manage their own learning. This includes understanding one's preferred approaches to learning, one's control over the learning process, and awareness of one's self as a learner.

Both self-assessment and peer-assessment enhance student metacognitive capacity. Exposure to these forms of assessment extends an individual's ability to identify more effective procedures for accomplishing learning tasks and to monitor and revise strategies while engaged in learning. Key categories associated with metacognition include the following:

Metamemory – learner awareness of and knowledge about their own memory processes and strategies for utilizing their memories effectively.

Metacomprehension – learner's ability to monitor the degree to which they comprehend information communicated to them, to recognize failures to understand, and to implement strategies to rectify such failures when they are identified.

Self-Regulation – learner's ability to make adjustments in their own learning processes in response to their perception of feedback.



Strategy: Peer Assessments

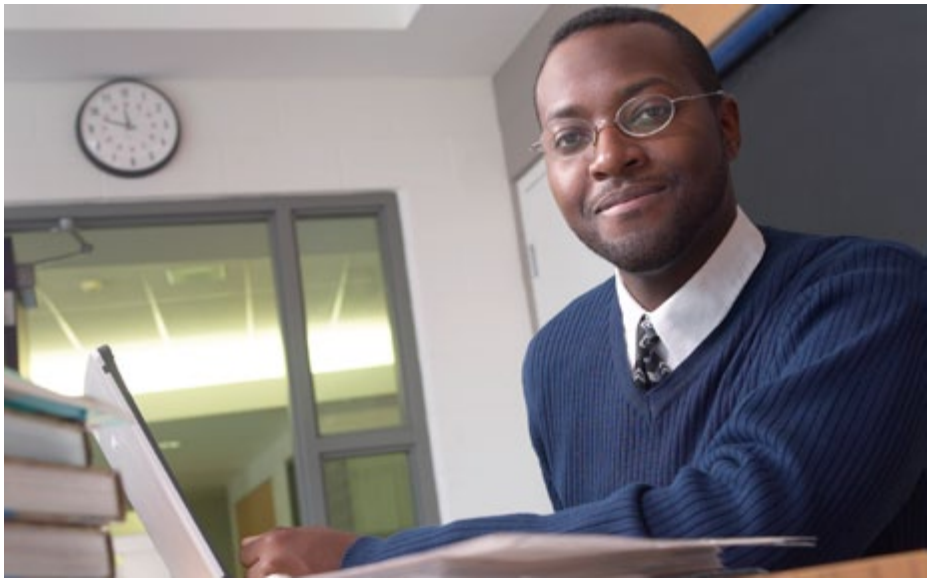
Developing Peer Assessments

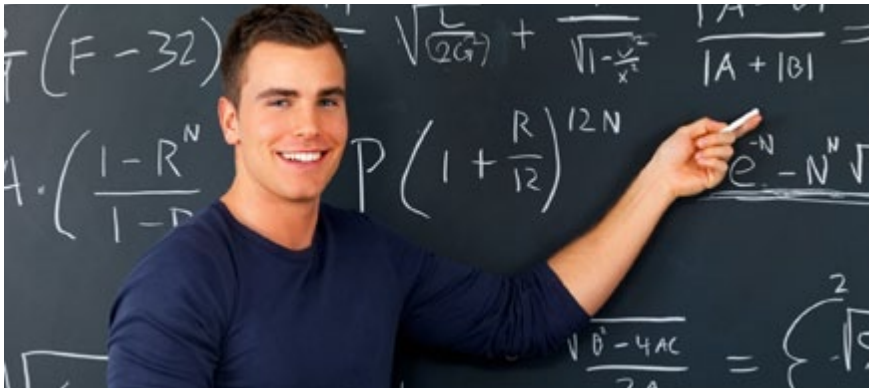
- Have students grade presentations of solutions to mathematics problems made by their peers.
- Have students work in groups.
- Some occasional small group work could be used here with students working on a limited group of problems. As the students work in the confines of the group and run into situations in which one of the students did not know how to proceed to finish the problem, another one of the students could be observed as taking the “lead” and explaining the next step to the student that was stuck.

Final Thoughts on Alternative Assessments That Promote College and Career Readiness

As an inservice or preservice teacher:

- How, when, and how often do you incorporate alternative assessments into your current curriculum?
- In what ways will an alternative assessment would provide a more in-depth reflection of the students' skills than a paper pencil exam?





> *"From a postsecondary standpoint, if a student can correctly justify in a conversation his answer, then he has successfully passed my assessment."*
>
> *(SFA Mathematics Faculty)*

Closing Remarks

The STEPS team commends you as you have voluntarily pursued this module as one resource to enhance your understanding of the necessity of meaningful assessment to ensure that your students are meeting the College and Career Readiness Standards.

As teachers, we must use any and all assessments at our fingertips so that we know we are producing students and workers who can use critical thinking skills to find their way through the myriad of choices available to them as they are becoming productive adults of tomorrow. Assessment matters.

The STEPS team acknowledges your dedication to our Texas students and confidently joins you as we prepare our students. to enter a globally competitive, highly interactive job market upon graduation.

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About the Authors

Dr. Neill F. Armstrong, Ed.D. is a graduate of Oklahoma State University. He is an Associate Professor in the Department of Secondary Education and Educational Leadership and is currently the Coordinator of the Secondary Education program. He works extensively in local public schools in support of secondary education pre-service candidates as well as in-service teachers. Dr. Armstrong is involved in cross-cultural learning experiences in Central America, professional development activities for local and international schools, and issues related to transformational learning and critical pedagogy.

Dr. Roy Joe Harris received his Ph.D. in mathematics from Texas A&M University (TAMU) in 1999. For the last thirteen years he has taught in the Department of Mathematics and Statistics at Stephen F. Austin State University at the ranks of Assistant Professor and Associate Professor. Dr. Harris teaches all levels of mathematics with a particular interest in dual credit courses.

Toni McCall began her career in higher education at Angelina College thirty years ago after nine and on-half years in public education in Texas. She is an instructor in the science and mathematics division where she teaches Chemistry and Developmental mathematics classes. Mrs. McCall was instrumental in the development and construction of the computerized science laboratory for the chemistry and other life science classes. She is a member of TCCTA and has served as a member of the STEPS grant for the past two years.

The findings related and views expressed in this report are solely those of the authors and do not necessarily represent the views of, and should not be attributed to, the Texas Higher Education Coordinating Board.

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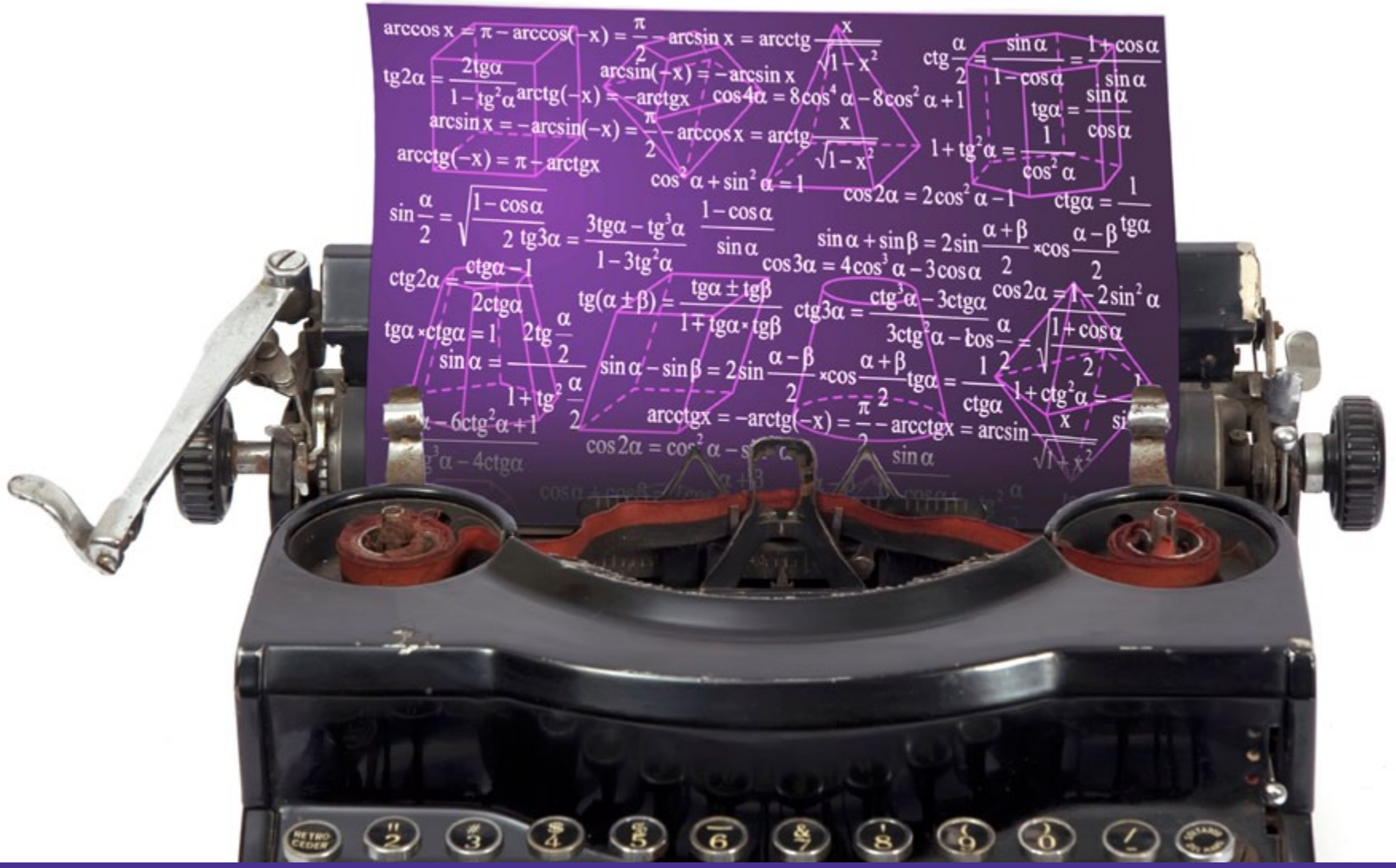

Supporting Information

Cross-Disciplinary Standards

Key Cognitive Skills
A. Intellectual curiosity 1. Engage in scholarly inquiry and dialogue. 2. Accept constructive criticism and revise personal views when valid evidence warrants.
B. Reasoning 1. Consider arguments and conclusions of self and others. 2. Construct well-reasoned arguments to explain phenomena, validate conjectures, or support positions. 3. Gather evidence to support arguments, findings, or lines of reasoning. 4. Support or modify claims based on the results of an inquiry.
C. Problem solving 1. Analyze a situation to identify a problem to be solved. 2. Develop and apply multiple strategies to solve a problem. 3. Collect evidence and data systematically and directly relate to solving a problem.
D. Academic behaviors 1. Self-monitor learning needs and seek assistance when needed. 2. Use study habits necessary to manage academic pursuits and requirements. 3. Strive for accuracy and precision. 4. Persevere to complete and master tasks.
E. Work habits 1. Work independently. 2. Work collaboratively.
F. Academic integrity 1. Attribute ideas and information to source materials and people. 2. Evaluate sources for quality of content, validity, credibility, and relevance. 3. Include the ideas of others and the complexities of the debate, issue, or problem. 4. Understand and adhere to ethical codes of conduct.

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Cross-Disciplinary Standards

Return

Foundational Skills

A. Reading across the curriculum

1. Use effective pre-reading strategies.
2. Use a variety of strategies to understand the meanings of new words.
3. Identify the intended purpose and audience of the text.
4. Identify the key information and supporting details.
5. Analyze textual information critically.
6. Annotate, summarize, paraphrase, and outline texts when appropriate.
7. Adapt reading strategies according to structure of texts.
8. Connect reading to historical and current events and personal interest.

B. Writing across the curriculum

1. Write clearly and coherently using standard writing conventions.
2. Write in a variety of forms for various audiences and purposes.
3. Compose and revise drafts.

C. Research across the curriculum

1. Understand which topics or questions are to be investigated.
2. Explore a research topic.
3. Refine research topic based on preliminary research and devise a timeline for completing work.
4. Evaluate the validity and reliability of sources.
5. Synthesize and organize information effectively.
6. Design and present an effective product.
7. Integrate source material.
8. Present final product.

D. Use of data

1. Identify patterns or departures from patterns among data.
2. Use statistical and probabilistic skills necessary for planning an investigation and collecting, analyzing, and interpreting data.
3. Present analyzed data and communicate findings in a variety of formats.

E. Technology

1. Use technology to gather information.
2. Use technology to organize, manage, and analyze information.
3. Use technology to communicate and display findings in a clear and coherent manner.
4. Use technology appropriately.

Purposes for Assessment

Return

- To facilitate student learning
- To identify students' strengths and weaknesses
- To assess and improve curriculum programs
- To assess and improve teaching effectiveness
- To provide data that assist in decision making
- To communicate with and involve parents

(Kellough et al p. 418-419)

Nine Principles for Assessment

Return

1. The assessment of student learning begins with educational values.
2. Assessment is most effective when it reflects an understanding of learning as multidimensional, integrated, and revealed in performance over time.
3. Assessment works best when the programs it seeks to improve have clear, explicitly stated purposes.
4. Assessment requires attention to outcomes but also and equally to the experiences that lead to those outcomes.
5. Assessment works best when it is ongoing, not episodic.
6. Assessment fosters wider improvement when representatives from across the educational community are involved.
7. Assessment makes a difference when it begins with issues of use and illuminates questions that people really care about.
8. Assessment is most likely to lead to improvement when it is part of a larger set of conditions that promote change.
9. Through assessment educators meet responsibilities to students.

(Pausch & Popp, 1997)

Guidelines for Effective Use of Assessment

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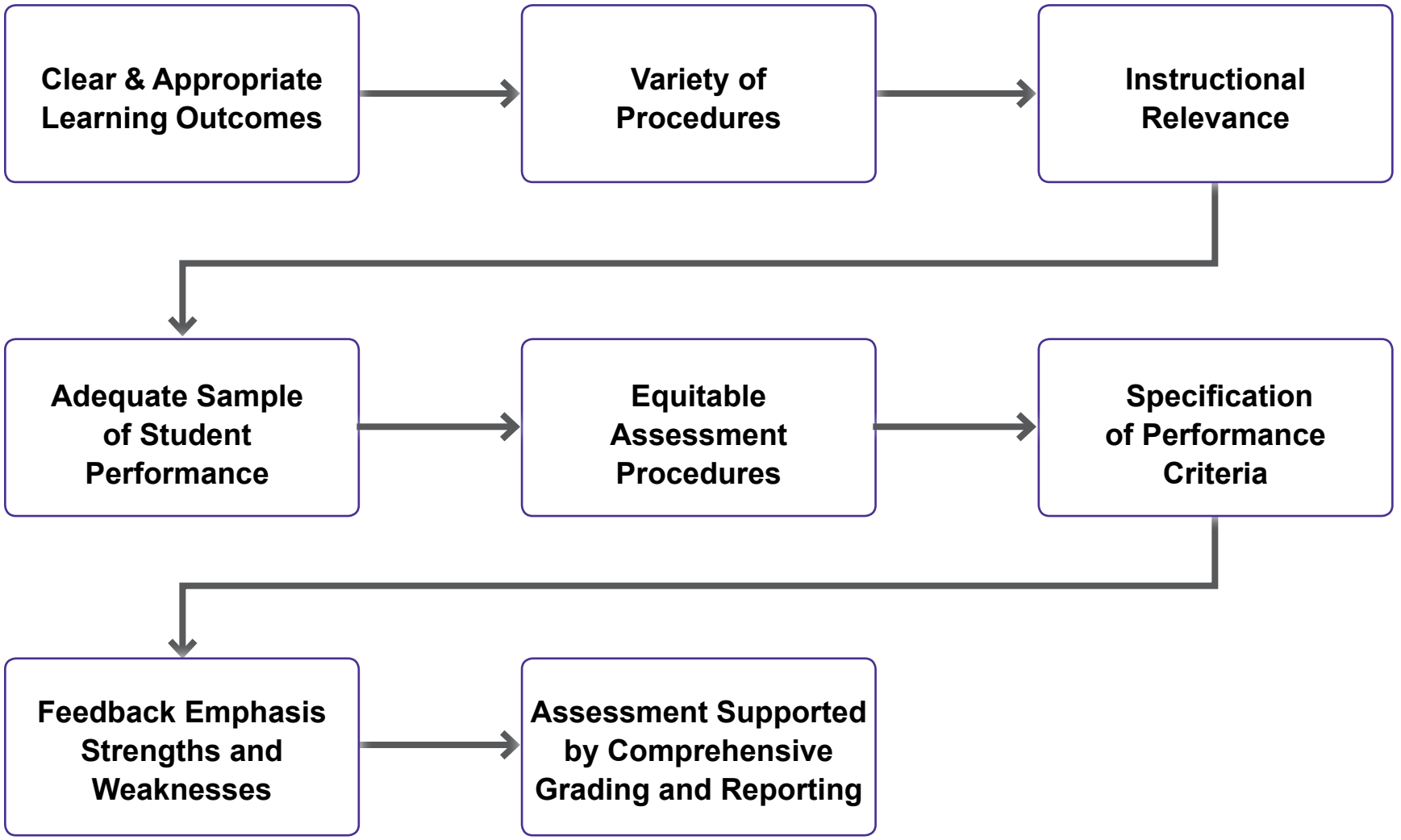


(Gronlund, N. & Waugh, K., 2009, pp.19-23)

Reliability

Return

Reliability pertains to the measure of consistency for an assessment. The assessment instrument (test) should yield similar results over time with similar populations in similar circumstances.

A test could be valid but not reliable. Teachers could however, facilitate reliability in a number of ways. One approach could be the utilization of rubrics. If one's colleagues agreed to assess an instrument (test) or other activity using a rubric and achieved the same or similar results as the teacher who designed the instrument then the rubric would be considered a useful tool for enhancing reliability for that test. The hallmark of assessment reliability is the reproduction of assessment results.

Factors that affect reliability include ambiguous questions, excessive options for written response questions, and vague grading instructions.

Questions a Teacher Might Ask

- Does this test give similar results with each use?
- Are the results of this test consistent with those of other measures?
- A reliable assessment is one in which a student would perform similarly at different times.

Validity

Return

According to Crooks *(1988)*, “The validity of assessment refers to the extent to which the assessment measures performance on the aspects of the course which are important.” Simply put, validity and authenticity are synonymous; to be valid, a test must explicitly reflect and measure the course’s objectives. A clarifying example could be that of posing the validity of a student’s driving skills based upon a written test only. A more valid way of assessing that student’s driving skills would be through a combination of tests, to include a written test of driving knowledge and a practical test allowing the student an opportunity to demonstrate performance skills via actual driving.

When teachers complain that a particular assessment or test does not properly measure the content or curriculum upon which the test is based they are, effectively, questioning the validity of the assessment.

Questions a Teacher Might Ask

- Does the assessment focus on important ideas and skills that I wish to assess?
- Are the directions and wording of the questions clear, concise, and easy to understand so that that they do not impede the learners’ demonstration of what they know and can do?
- Is the assessment focused on concepts and skills that were taught?
- Is the assessment one in which learners will feel comfortable showing what they know and can do?
- Are the scoring directions clear, and do the directions specify the key components of the concepts and skills that are my focus?

(Musial, D., Nieminen, G., Thomas, J., Burke, K., 2009)4.67

Keeping it Relevant

Return

Assignments or assessment tasks that are perceived by students as trivial or superficial are less likely to motivate student commitment to full engagement. The notion of well conceived assessments provide teachers with unique opportunities to create relevant work that promotes academic achievement and simultaneously demonstrates to students how such work will benefit them beyond grades. When teachers tie assessment activities to future study and off-campus realities, be they workplace directed or higher education focused, students are much more likely to see the value of investing solid effort in seeing the task through.

Questions a Teacher Might Ask

- Is the work meaningful in the way it promotes academic achievement?
- Does it individualize the learning process?
- Is the work 'real', that is, does the task mirror skills and knowledge that will be necessary in the workplace or future learning?
- Is the task engaging? Or is the task undertaken solely for the sake of a grade?

Relevance in assessment can also have a reflective component in the way that thoughtfully conceived activities can foster students' perceptions of themselves as learners. In this fashion students are empowered to see how data may be used to alter or improve their academic abilities and achievement.

Relevance is also related to validity. Does the assessment align with the purpose for which it is conducted, that is, does the assessment link directly to instruction to which the students were exposed? Similarly, does the assessment measure what it is intended to measure?

Criterion-Referenced Assessments

Return

The “criterion” is the standard of performance established as the passing test score. In this case, scores have meaning in terms of what the student knows or can do, rather than how the test-taker compares to a norm group.

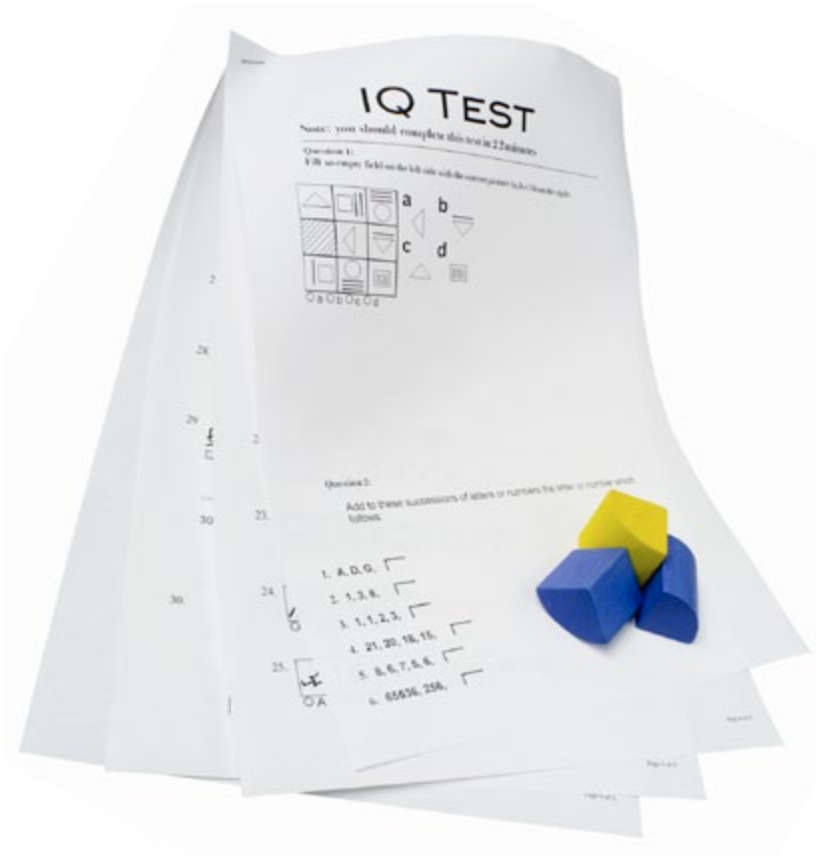
Criterion-referenced tests / assessments can have norms but comparison to a norm is not the purpose of the assessment. Criterion-referenced assessment is often, but not always, utilized to determine a student’s competence (e.g. whether he or she can do something).

Norm-Referenced Assessments

Return

The most well known example of norm-referenced assessment is the IQ test.

Entrance to many prestigious institutions is determined by a norm-referenced assessment SAT/ACT. This strategy permits a fixed proportion of students to gain entrance to a school or university without having to demonstrate an explicit level of ability. As such, admittance standards may vary from year to year depending upon the quality of those making application unlike a criterion-referenced process where there is no variance from year to year (unless the criteria change).



Formative Assessment

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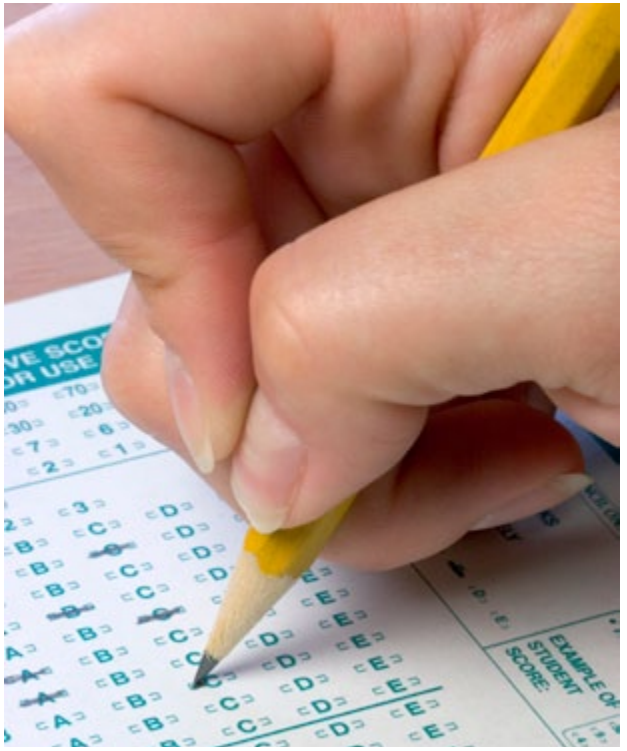
According to NCTM's Principles and Standards for School mathematics *(2000, p.1)*, assessment should be more than merely a test at the end of instruction to see how students perform under special conditions; rather, it should be an integral part of instruction that informs and guides teachers as they make instructional decisions.

Assessment should not merely be done **to** students; rather, it should also be done **for** students, to guide and enhance their learning *(The Assessment Principle)*.



Formative Assessment Strategies Examples

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Formative assessment, when implemented mindfully, has the potential for serving as one of the most useful and powerful instructional tools teachers can access for the promotion of student achievement. Fortunately, a great many formative assessment strategies have been developed and are readily available for teacher use. Some examples are:

Minute Paper: students identify the most significant (useful, meaningful, disturbing, etc.) things they learned during a particular session.

Muddiest Point: students write one or two ideas that were least clear to them from the current or preceding class period.

Memory Matrix: students fill in cells of a two-dimensional diagram for which the instructor has provided labels.

Directed Paraphrasing: students summarize in well-chosen (won) words a key idea presented during the class period or the one just past.

One-sentence Summary: students summarize knowledge of a topic by constructing a single sentence that answers the questions "Who does what to whom, when, where, how, and why?"

Application Cards: after introducing an important theory, principle, or procedure, ask student to write down at least one real-world application for what they have just learned.

RSQC2: in two minutes, students recall and list in rank order the most important ideas from a previous day's class; in two more minutes, they summarize those points in a single sentence, then write one major question they want answered, then identify a thread or theme to connect this material to the course's major goal.

Transfer and Apply: students write down concepts learned from the class in one column; in another column provide an application of each concept.

Exit Ticket: prompts students to answer a question targeting the big idea of the lesson.

- Give students "tickets" – small pieces of paper designed to look like tickets, but with space for writing.
- Ask students two questions. One that requires a factual answer about the big idea of today's lesson, but in their own words. A second question should require more explanation of a concept.
- Give students five minutes at the end of class to write their answers. Their names do not go on these exit tickets.
- They must give you an exit ticket to leave class for the day.
- Analyze the tickets to learn how many students got the big idea and how they understand it or misunderstand it. Photocopy 4-6 on a single sheet of paper for your portfolio. Select ones that you learned something about your students from that you didn't know before reading the Exit Tickets.

Is That a Fact: Prompts students to examine the difference between a factual statement and an opinion-based statement.

One Last Question: Uses a final question to facilitate critical thinking about a specific concept covered in a lesson.

Venn Diagram: Compares and contrasts two different objects, ideas, or events.

Cross-Disciplinary Standards

I. Key Cognitive Skills
A. Intellectual curiosity
1. Engage in scholarly inquiry and dialogue. a. Identify what is known, not known, and what one wants to know in a problem. b. Conduct investigations and observations. c. Cite examples or illustrations in which a clear-cut answer cannot be reached. **2. Accept constructive criticism and revise personal views when valid evidence warrants.** a. Articulate a point of view and provide valid evidence to support findings. b. Demonstrate willingness to take intellectual risks by investigating novel, controversial, or unpopular opinions or conclusions. c. Examine alternative points of view, taking different roles to defend, oppose, and remain neutral on issues. d. Recognize conflicting information or unexplained phenomena. *(EPIC, 2008, p. 59)*

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Cross-Disciplinary Standards

I. Key Cognitive Skills
B. Reasoning

1. Consider arguments and conclusions of self and others.

a. Know and apply logic to analyze patterns and descriptions and to evaluate conclusions.
b. Cite valid examples or illustrations that support the conclusions.
c. Question whether the claims and conclusions of self and others are supported by evidence.
d. Identify counter examples to disprove a conclusion.

2. Construct well-reasoned arguments to explain phenomena, validate conjectures, or support positions.

a. Participate in a debate that is based on facts and has a logical structure.
b. Construct a visual presentation, including hypothesis, data, results, and conclusion.
c. Write a paper that addresses counterarguments to advocated positions.
d. Recognize and apply techniques of statistical or probabilistic analysis to judge reliability of information.
e. Organize an argument separating fact from opinion.

3. Gather evidence to support arguments, findings, or lines of reasoning.

a. Use different kinds of data (e.g., case studies, statistics, surveys, documents) to support an argument.
b. Evaluate evidence in terms of quality and quantity.
c. Describe limitations of data collection methods.

4. Support or modify claims based on the results of an inquiry.

a. Refine claims and adjust a position in response to inquiry.
b. Review and check strategies and calculations, using alternative approaches when possible.

(EPIC, 2008, p. 59)

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I. Key Cognitive Skills

C. Problem Solving

1. Analyze a situation to identify a problem to be solved.

a. Represent and/or restate the problem in one or more ways (e.g., graph, table, equation), showing recognition of important details and significant parameter
b. Break complex problems into component parts that can be analyzed and solved separately.
c. Apply previously learned knowledge to new situations.
d. Analyze a media report, identify any misuse of statistics, and suggest ways to more accurately depict this information.

2. Develop and apply multiple strategies to solve a problem.

a. Use a range of standard methods, devices, techniques, and strategies to gather and analyze information.
b. Use knowledge gained from other subject areas to solve a given problem.

3. Collect evidence and data systematically and directly relate to solving a problem.

a. Use general and specialized reference works and databases to locate sources.
b. Collect evidence and data directly related to solving the problem and eliminate irrelevant information.
c. Produce charts, graphs, and diagrams accurately, including scale, labeling, units, and organization.
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(EPIC, 2008, p. 59)

Cross-Disciplinary Standards

Return

I. Key Cognitive Skills		
D. Academic Behaviors	B. Writing across the curriculum	C. Research Across the Curriculum
1. Self monitor learning needs a. Ask questions to check for understanding or to clarify information. b. Use a systematic method for recording, storing, and organizing materials and resources; avoid haphazard or messy accumulation of information. *(EPIC, 2008,p a60)*	**1. Write clearly and coherently using standard writing conventions.** a. Prepare a topic proposal that specifies a purpose and justifies the choice of audience to achieve that purpose. b. Craft a thesis statement that articulates a position and list relevant evidence and examples in logical groupings. c. Use symbols, diagrams, graphs, and words to communicate ideas. d. Use appropriate terminology and data expression to communicate information in a concise manner. e. Use a variety of reference guides for citation conventions, grammar, mechanics, and punctuation. *(EPIC, 2008,p a60)*	**2. Explore a research topic.** a. Produce an annotated list of sources consulted, differentiating among primary, secondary, and other sources and explain their relevance to the research topic. b. Outline the most significant controversies or questions on a research topic. c. Plan an investigative study. d. Explain reasons for valid competing points of view on a given topic. *(EPIC, 2008, p. a63)*

Cross-Disciplinary Standards

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I. Key Cognitive Skills
D. Academic Behaviors
1. Self monitor learning needs
a. Ask questions to check for understanding or to clarify information.
b. Use a systematic method for recording, storing, and organizing materials and resources; avoid haphazard or messy accumulation of information.
2. Use study habits necessary to manage academic pursuits and requirements
a. Manage time effectively to complete tasks on time.
b. Demonstrate accurate note-taking.
c. Use the appropriate level of detail necessary to complete an assigned task.
d. Balance academic and non-academic activities to successfully participate in both.
3. Strive for accuracy and precision
a. Collect and report experimental data carefully and correctly.
b. Produce charts, graphs, and diagrams accurately, including scale, labeling, units, and organization.
c. Eliminate irrelevant information from an assignment.
4. Persevere to complete and master tasks.
a. Persevere until a task is completed by working even when faced with uncertainty or open-ended assignments.
b. Seek assistance when needed to complete the assignment.
c. Recognize when a task is completed.
(EPIC, 2008, p. a60)

Cross-Disciplinary Standards

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1. Analyze a situation to identify a problem to be solved. a. Represent and/or restate the problem in one or more ways (e.g., graph, table, equation), showing recognition of important details and significant parameter b. Break complex problems into component parts that can be analyzed and solved separately. c. Apply previously learned knowledge to new situations. d. Analyze a media report, identify any misuse of statistics, and suggest ways to more accurately depict this information.
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b. Collect evidence and data directly related to solving the problem and eliminate irrelevant information.
c. Produce charts, graphs, and diagrams accurately, including scale, labeling, units, and organization.
d. Present the collected data visually, describe the data collection procedure, and defend choosing that procedure over other possibilities.

(EPIC, 2008, p. 59)

Cross-Disciplinary Standards

Return

I. Key Cognitive Skills
C. Problem Solving
1. Analyze a situation to identify a problem to be solved. a. Represent and/or restate the problem in one or more ways (e.g., graph, table, equation), showing recognition of important details and significant parameter b. Break complex problems into component parts that can be analyzed and solved separately. c. Apply previously learned knowledge to new situations. d. Analyze a media report, identify any misuse of statistics, and suggest ways to more accurately depict this information.
2. Develop and apply multiple strategies to solve a problem. a. Use a range of standard methods, devices, techniques, and strategies to gather and analyze information. b. Use knowledge gained from other subject areas to solve a given problem.
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