

Introduction to Assessment

Dr. Carmel Parker White

Kansas State University

This segment will be a brief primer on how assessment can be used in your classroom with the technology-mediated instruction that you may develop.

Before we begin a discussion of assessment, it is important to define assessment and then discuss why we need to conduct assessments over the technology-mediated instruction

Huba and Freed define assessment as “the process of gathering and discussing information from multiple and diverse sources in order to develop a deep understanding of what students know, understand, and can do with their knowledge as a result of their educational experiences” (p. 8). For our purposes here, however, we can substitute technology-mediated learning for educational experiences. More specifically, the educational experience might be a communication and collaboration technology or a presentation technology.

Why we need to do assessment?

Most of us in education understand why we need to do assessment and the variety of questions that a thorough assessment can answer. I would like to discuss three benefits from conducting an assessment. The first benefit is that you can document the student learning that occurs. For example, are students learning the material that is taught through the technology? Are students learning the content better through the use of technology than they would have without the technology? The second reason to conduct assessments is that they frequently are required by school districts or state departments of education to

document the quality of learning that occurs, and it is important to meet these obligations. Questions such as, Can I document to my principal, the school district, or the state department of education that my students are learning what is required? and Can I demonstrate to others that any additional time that technology takes is worthwhile and makes a greater impact on student learning? The answers that you receive to these two sets of questions are what are typically known as Summative Assessment. They provide a summary or a documentation of the student outcomes or learning that occurs. Most teachers have had experience assessing summative learning outcomes.

The third benefit that can come from conducting assessments is that you can learn about improvements that can be made in the instruction that would better meet student needs. This type of assessment employs a different set of questions. These questions will help you fine-tune or modify the technology-mediated instruction to enhance teaching and student learning outcomes. Such questions might include: What problems or glitches were observed in the instruction? What worked especially well and how can you increase those types of positive teaching and learning moments? Did the technology work especially well for certain types of students? What in the instruction did not proceed as you had planned and how might you modify that component the next time that you teach this concept? What concepts did the students learn well and what concepts were difficult for them to grasp? Did some students learn better than other students? This type of assessment, known as Formative Assessment, allows teachers to continue to emphasize what in the instruction is helping the student learn and to alter what is not facilitating learning.

Therefore, the two main purposes for doing assessment are to provide summative information to document student learning and to provide formative information that can be used to refine your technological-mediated instruction to improve teaching and student learning outcomes. Let's listen as two teachers describe the technology-mediated instruction they implemented in their classroom and the formative and summative assessments they used.

ANNA HAFFNER: I wanted the third-graders to learn about magnets, to discover the north and south poles of magnets, and to understand the concepts of attraction and repulsion. I wanted them to investigate the strength of different magnets and the distance from objects that a magnet would attract. Students were asked to design a fair test to measure the relative strength of magnets. I wanted my students to observe in their everyday world and find magnets and what they were used for, and how magnets made their lives more convenient and enjoyable.

For my summative assessment, I had my students develop PowerPoint presentations where they explained what they had learned in each of these areas. I scored the student presentation based on rubrics that I had developed. A long-term summative assessment occurred the next year in fourth grade when the state assessment in science included questions about magnets.

For my formative assessment, I taught this unit in my own third grade classroom, found out what worked well and what I needed to change to improve student learning, and then I went on to teach it in my team teaching partner's classroom. One of the main strategies I used for formative assessment was to have students write answers to questions about magnets, I called them minute writes. I could tell from the student

responses what they had learned and what was still not clear to them. I also observed the students' attitudes towards the magnet unit as part of my formative assessment. In general, I found that boys were particularly interested in the hands-on work with magnets. In fact, one boy who typically had trouble focusing in the classroom became very focused on understanding iron filings in water and the attraction that magnets had for these filings.

PAT LAMB: I teach high school students in an advanced genetics science course. I wanted to develop an assignment for them that would require use of their knowledge about mitochondria DNA to solve a complex forensic mystery about the Russian Czar's family. They had mitochondria DNA from the remains of several individuals, including Anna Anderson, who some suspected was really the Czar's daughter, Anastasia. The mystery that had to be solved involved determining who was actually related to the Czar and who was not. I wanted to use a presentation technology because I typically rely a great deal on lectures or lab experiences for student learning, and the multi-path student-directed presentation program seemed like an ideal way to allow students to problem solve and apply their knowledge to an intriguing and complex problem.

My summative assessment consisted of several things. Students were asked to complete lab assignments on recombinant DNA prior to beginning this assignment and to complete study guides to demonstrate their knowledge on these modern genetic techniques. Students needed to transfer their knowledge of nuclear DNA to mitochondria DNA. If they didn't have this knowledge, then they wouldn't have the requisite skills needed to solve the forensic mystery. The study guides were similar to a pre-test of the student's knowledge of mitochondria DNA. Once they had the requisite knowledge of

mitochondria DNA and how mitochondria DNA is passed among family members, they could utilize this information to solve the forensic puzzle. It was clear to me that if they correctly solved the mystery, they had applied their knowledge correctly.

For formative assessment, I noticed that if students didn't understand recominant techniques, then they were not able to manipulate the DNA to solve the forensic problem. If they didn't understand how to cut up DNA with restriction enzymes, then they wouldn't understand how electrophoresis worked, and therefore they wouldn't understand how to analyze the DNA fragments to know who is related to whom. I embedded this pre-required knowledge into the technology so the student could review whatever information they didn't understand. Students simply needed to go to the "Ask the Expert" section and click on the section that they didn't understand. Thus, formative assessment was built into the technology—if students didn't understand the information, they couldn't solve the mystery. If they needed to review the information, it was just a click away.

Learning Outcomes or Objectives

Let's now turn to the specific outcomes or objectives that you have for the learners. What are the student learning objectives or outcomes? What specific knowledge, skills, or attitudes do you want the learner to acquire? From this point on as we discuss what you would like for your students, I will use student learning objectives and outcomes interchangeably because I perceive them to be similar.

Why do you need learning objectives?

Why do you need student-learning objectives? Some of what I will be discussing about learning objectives will come from Huba and Freed's book *Learner-Centered*

Assessment on College Campuses. Their discussion of learning objectives is very appropriate for learners of any age, from kindergarten through higher education.

Having clearly stated student-learning objectives has at least three advantages. First, it will allow you to understand what student learning you want to measure. When you clearly understand the learning outcomes, it will be much easier to develop appropriate assessments that measure the student learning or to find existing assessment tools. Second, the learning objectives will provide you with direction and a focus for the technology-mediated instruction that you are developing. You will be more clear on what knowledge, skills, or attitudes you are targeting and can focus on these objectives as you develop the instruction. Often times, you will want to understand where the students are in relation to the learning objectives prior to the instruction. That is, you will want to know what the students know, what skills the student has, or what attitudes the student has prior to starting the instruction. The final benefit of having student-learning objectives is that the students will be better informed about your goals for the learning activity. This will help the student remain focused on what knowledge, skills, or attitudes they are to be learning.

Characteristics of learning objectives or outcomes

Let's spend a few minutes discussing characteristics of learning outcomes. These outcomes should focus on the learning resulting from the instructional activity and not the activity itself. The learning objectives should be important and ones that the public, school district, or state department of education would view as essential for learners to achieve. The outcomes might be stated in a general way to capture student learning that is occurring but also should be specific enough to be measurable. Student learning

outcomes can include knowledge outcomes. Remember Anna's and Pat's knowledge outcomes that they had for students. Some student learning objectives might involve changes in student attitudes, such as students will be more motivated to complete the reading on an assigned book as Shelley discussed in the collaboration and communication module. Another example of a student-learning outcome that would target an attitude would be that a student would become more enthusiastic about completing a difficult math assignment. The final type of outcome that you might have is related to student skills or behaviors. Examples of such learning outcomes might include that students will spend more time on task or students will utilize a certain number of appropriate on-line references for a research paper.

Typically, when one thinks about the objectives for the learning, they should be phrased in terms of action words that describe students' performance or how they demonstrated that they accomplished the objective. For different types of learning, action words that might assist you in developing learning objectives might include some of the following. You can see that the different types of learning are related to Bloom's taxonomy of learning. Let's listen as Pat and Anna discuss their learning objectives using Bloom's taxonomy and action verbs.

ANNA: Students should know the characteristics of magnets, such as the north and south poles, the repulsion and attraction of magnets, and how magnets are used in items that are familiar to the students.

PAT: Students should be explain what mitochondria DNA is and then recognize how this DNA pattern would be passed on to others in the family. Mitochondria DNA is always passed through the female.

PAT: Students will apply their knowledge of how mitochondria DNA is passed on as they investigate forensic information related to the Russian Czar's family. That is, when they are given the mitochondria DNA of someone named Anna Anderson they can determine if it is really Anastasia, the missing daughter of the Russian Czar.

ANNA: Another learning outcome for my third graders was to apply what they had learned about magnets to materials they found in the real world to determine if these materials were indeed magnets.

PAT: I also wanted the students to synthesize the historical information about the Czar's family with the mitochondria DNA forensic information to come to conclusions about the family's history.

ANNA: The students needed to judge if a magnet was attracting or repelling another magnet. Experiencing what this attraction or repulsion felt like through the actual use of magnets could do this.

To summarize then, the following examples illustrate action verbs and knowledge, attitudinal, and behavioral student learning outcomes.

At the conclusion of the technology-mediated instructional unit, students ...

can *name* four common characteristics that ancient civilizations shared.

will be *motivated* when using the World Wide Web to research their ancient civilization.

can *illustrate* through a topical map or diagram how geography influenced developing civilizations.

can *judge* why some civilizations advanced more quickly than others, based on geographical characteristics.

Questions to ask prior to assessment

After you have specified the student learning objectives, you can begin to consider the actual assessment process. Questions that you might ask prior to the assessment include: Are the student learning objectives reflected in the assessment? If the data you are collecting during the assessment does not closely match with the student learning objectives, your assessment will not provide you the information you desire. Will the assessment be imbedded into the course? Will the assessment occurring immediately following the presentation of the technology-mediated instruction or will it occur at the end of the school year?

Another important question is who will be responsible for conducting and analyzing the assessment because assessments can require significant resources, including both time and money. Another important question relates to how the assessment will be used. Will it be used to provide information to improve the instruction, which is formative assessment? Or will it only be used to summarize student learning? If it is used to summarize student learning, how will that information be used at my grade-level, school, or district? Will the outcomes be published somewhere, such as school district reports, local newspapers, and so on?

The final set of questions relates to the methodology you use as you collect assessment data. What techniques will I use during the assessment? Will I observe student behavior or will I have students record their behaviors? We will discuss more about assessments techniques in the next section. Will existing instruments be used in this assessment or will I need to develop my own questions to assess this objective? Are there state-standards of assessment that I will be required to follow?

Concepts related to assessment techniques

Any of the assessment techniques that we will discuss next could be used to understand the student's knowledge, attitude, or skills and behaviors. These techniques are flexible and can be tailored to assess what students have learned or acquired. If you use multiple and diverse sources of assessment, your assessments are more likely to be helpful to you and the others that are interested in this assessment. Often times, summative assessments might require techniques that are more formalized in nature, which could include using instruments that are standardized across the state or school-district, or instruments that have been subjected to tests of reliability and validity. For this reason, summative assessments often require more resources in time and money to administer. But many times summative assessments are not optional and are required by some external organization. These types of assessments are frequently embedded into the curriculum. With formative assessment, you can find out what is working well, what might need some improvement, and what might need to be eliminated entirely from the technology-mediated instruction. Therefore, formative assessment is recommended to occur early in the life of the technology instruction. In fact, some individuals do not recommend that a more resource-intensive summative assessment occur until a thorough formative assessment has happened and the recommended improvements in instruction are implemented. By conducting a formative assessment, you can learn if the instructional activity was delivered as you had intended for it to be delivered.

Assessment techniques

Some assessment techniques might include:

Counts: In this technique, you would count the number or frequency with which some event occurs, such as the number of e-mails received from students about completing an assignment or the number of times your students hit an assigned web site.

PAT: When I first taught DNA mapping, I counted the number of students that didn't understand it by the number of students who couldn't complete a simplified DNA mapping correctly. Until an adequate number of students could correctly map the DNA, I knew from this informal formative assessment that we needed to spend more time on mapping a simplified DNA so that more students understood the concept.

Observations: You can observe and then record a wide variety of student events, such as what percentage of students appear to be on-task during a technology presentation or the unexpected student collaboration from completing an assignment online.

ANNA: At frequent intervals throughout the magnet unit, I would stop and observe how many students were on-task with their hands-on projects. I learned what aspects of the hands-on work kept students focused and what parts I needed to change to have students on-task more of the time.

Journaling: You can require students to respond to prompts and submit these to you for review. An example of such journaling might include a weekly question that asks students to describe what they have learned about e-mail and communicating with others through e-mail.

ANNA: My students wrote a weekly journal about any experience that was important to them that week. I was amazed and pleased with the number of students that reported how much they had learned about magnets and how they had enjoyed the unit.

Surveys: You can ask students to provide you feedback about events through surveys. Such surveys could inquire about the same information as journaling would but if you had pre-assigned responses, it would not be necessary for you to code the responses.

PAT: I gave my students a survey after they had successfully completed the multi-path student-directed presentation program. This survey asked if they enjoyed the program and what recommendations they had to improve the program. All of the questions had pre-assigned response categories. Based on their recommendations, I found out that the students thoroughly enjoyed their learning and I was able to slightly modify the presentation program based on their recommendations.

Scoring performance through rubrics: Rubrics are increasingly being used to rate student performances. Rubrics can provide scores or rating on almost any event or experience that you would like. Anna developed several rubrics to score her students' work.

ANNA: This rubric was used to score the test that students undertook to measure the strength of a magnet. Students were then required to graph through Excel the strength of three magnets to pull a paper clip, and then write a paper that compared their findings. With this rubric, I scored their paper. I also used a scored rubric to grade student PowerPoint presentations.

Student projects or assignments: Assessments are frequently tests or examinations that are required locally or through the state. Most often these tests are consider summative assessment of student learning.

Locally developed tests: A test can be developed for your classroom, your school, or school district to assess student performance, most likely in the knowledge or content areas.

State assessment tests: A state department of education frequently requires state assessment tests.

Finally, there are many standardized tests that can be given to students. Teachers should be cautious about using a standardized test that does not closely align with your specific student learning outcomes.

In conclusion, assessments can provide you rich and valuable information to determine if students are learning from the technology-mediated instruction. On-going formative assessment will help you fine-tune your instruction to allow all students to achieve the learning objectives. Summative assessment will provide evidence of the learning that has occurred.