Krystal Rodney
Assessment Analysis and Critique

In March of 2009, I delivered an assessment of a unit on the water cycle. This assessment was administered in a third grade class of 22 students at Norge Elementary School in Williamsburg, VA. The students range in age from 8 to 9. The majority of the class is on grade level in science. The assessment was designed to measure how well students understood a unit on the water cycle. In this unit, students explored how water moves around the Earth through the processes of evaporation, condensation, and precipitation. Students also learned about places water is stored on Earth, and analyzed the importance of water to life. The test and table of specifications are included. The aggregate scores are as follows:

Multiple Choice Questions

Question #	Percentage of class answering correctly
1	95
2	77
3	82
4	95
5	90
6	90
7	77
8	72
9	90
10	100
11	100
12	59
13	68
14	77
15	72
16	90
17	81
18	36

Short Answer Questions

Question #	% whose answer demonstrated understanding	% whose answer did not demonstrate understanding
19	86	14
20	77	23
21	86	14

*Note: On Question #21, more raindrops were added to the copy of the test that was administered to the class.

Content	KNOWLEDGE	COMPREHE-NSION	APPLICATI-ON	ANALYSIS	SYNTHESIS	EVALUATI-ON
Importance of water to people and other living things						X Report
Methods of water conservation for home/school		X 4,8,15				
The water cycle (model)				X Project	X Project	
How living things get water from the environment	X 5,19					
The origin of energy that drives the water cycle	X 1,9					
Evaporation, condensation, and precipitation in relation to the water cycle	16,17,18			X 3,13, 20,21		
Major water sources for communities	X 2,6	X 7,14				
Sources of pollution in the neighborhood, school, and community, including, over-fertilization, oil from parking lot, eroding soil, and animal waste.				X 10,11,12		

Key:

90% or more of the class answered correctly

50% or less of the class answered correctly

Aggregate Scores

Looking at the scores in the aggregate, I would say that most of the students in the class understood the unit. From analyzing the percentage of the students who correctly answered a question, I became concerned about questions 12 and 18. When I looked at the questions, I decided that these questions were not fair. As I looked at question #12, I realized that we had not discussed air pollution in class as much as I previously planned to do. Therefore, this question had two plausible answers. Even though more than 50% of the class answered it correctly, it was clear that students either used good process of elimination skills, or made a lucky guess; answering this question correctly was not an indication of student learning. As a result of this, question #12 was not counted in the grading of this test.

Question #18 was also not counted in the grading of the test. After rereading the question, I decided that the wording of the question made two answers plausible. Question: Water that falls to the ground can flow into rivers, oceans, and lakes. When this happens, it is called

a) Evaporation
b) Conservation
c) Precipitation
d) Accumulation

Answer choices c (precipitation) and d (accumulation) could be considered to be correct based on the wording of the question, and therefore this question was not counted.

Question #13 was also a question that I reviewed. The question reads as follows: When Lisa was walking to the store, it started to rain. What process in the water cycle happened before this?

a) Precipitation
b) Condensation
c) Evaporation
d) Conservation

I noticed that, even though more than half of the class responded correctly, it was still a low percentage compared to other questions. While I decided to keep the question, I think that it might have been good to emphasize the word "before." Also, before the test, I gave the students some practice questions at the analysis level. One of the practice questions was very similar to the above question, and it seems that students had some difficulty with it. I think that, maybe when I was teaching, I did not give the students as much practice in working backwards through the water cycle. However, considering this, it was good that the majority of the class was able to use their analysis skills to answer this question.

For the rest of the questions, 70% or more of the class responded correctly. There were 7 questions that 90% or more of the class answered correctly. Five of these questions were at the knowledge or comprehension levels of cognitive demand, and it was expected that students would not have a problem answering them. These were questions 1, 4, 5, 6, and 16. The other two questions (#10 and 11) were at the analysis level of cognitive demand, and 100% of the class answered both of these questions correctly. The questions relate to a chart, giving information about the pollution in a town's lake. Students were asked to identify which pollutants were causing the most and least pollution in the lake. From rereading the questions and looking at the chart, I cannot

identify any bias in the question. Also, when giving the class practice questions for the test, students were able to analyze the pollution chart quite well. Because of this, I must assume that the students are very skilled at interpreting information from charts.

Overall, I can infer that the students have a deep understanding of the origin of the energy driving the water cycle, the processes of the water cycle (at the cognitive level of knowledge), sources of pollution, and how living things get water from their environments. Students have a satisfactory understanding of the water sources for a community, methods of water conservation, and the processes of the water cycle at the analysis level.

Individual Student Analyses

Two individual tests will be analyzed. Student #1 received a score of 73%, and Student #2 received a score of 48%. The questions that the students answered incorrectly are color coded according to the content of the intended learning outcomes.

Student #1 answered questions 2, 8, 12, 13, 15, 17, 18, and 20 incorrectly. According to the analysis of the aggregate scores, questions 12 and 18 were deemed invalid, and were not counted in the computation of the student's score. Looking at the incorrect questions, it seems that the student had trouble with the intended learning outcomes concerning "methods of water conservation" and "evaporation, condensation and precipitation in relation to the water cycle". This is because, out of the 3 questions assessing methods of water conservation, the student answered 2 incorrectly. In reference to the intended learning outcomes about the processes of the water cycle, there were 7 questions assessing it, and 4 of the questions were at the analysis level of cognitive demand. It seems that this student struggled with the more complicated analysis questions. While questions 3, 13, and 20 were all analysis questions, I would consider questions 13 and 20 to be more difficult than question 3. In question 3, students are asked to analyze one process of the water cycle. However, in questions 13 and 20, students are asked to do a more broad analysis of the entire water cycle. From this, I would infer that the student is able to analyze only one process at a time.

Student #2 answered questions 1, 2, 3, 4, 7, 8, 12, 13, 14, 19, 20, and 21 incorrectly. Again, question 12 was not counted in the student's grade. Just by looking at the number of questions that the student answered incorrectly, I would say that this student really struggled with the entire unit. Particularly, the student struggled with the intended learning outcomes concerning "methods of water conservation," "evaporation, condensation, and precipitation in relation to the water cycle", and "community water sources". It is difficult for me to assess the student's understanding of the other intended learning outcomes. It might have been good to have one more question to assess each of the other intended learning outcomes, so that I could make more sound inferences. However, from the results of the test, I would assume that the student understood "sources of pollution," "the origin of energy driving the water cycle," and "how living things get water from the environment."

Instructional Decisions

Analysis of the data from this test has led me to formulate some instructional decisions. While creating this test, I determined that a grade of 70% would constitute passing the assessment. As one of the students received a grade of 48%, I will be

engaging in 1:1 instruction with that student, and administering another test on the water cycle.

As for the rest of the class, I will do a small group review of water sources for a community, as about 30% of the class did not do well on this section of the test. This small group activity will probably consist of students doing a matching activity, where the name of the water source must be matched to a water source category. For example, some categories could be: Natural, artificial, reservoir, and flowing. A student may be given the word "Stream," and would be expected to put that word under the categories of natural and flowing.

Validity and Reliability

After administering and reflecting on this assessment, I would determine that it has a moderate degree of validity and reliability. Reliability was reduced by the two faulty questions that had to be omitted from grading. In terms of validity, I think that the test was valid enough that I could make good inferences about student learning, and make sound instructional decisions based on the results, for the most part. The test only measures the intended learning outcomes about the water cycle at the required level of cognitive demand, or lower. This suggests that the test exhibits strong construct validity. As this test measures the same intended learning outcomes that will be assessed on the Standards of Learning assessment, it also has potential for predictive validity. However, it might have been good to have some more questions to assess students' understanding of "water sources for a community," "how living things get water from their environment," and "the origin of energy driving the water cycle." This lowers the test's content validity, because there might not have been an adequate sampling of the content.