Educative assessments for English language learners: The value of increased student writing in science

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Abstract

We present an argument for the importance of a greater emphasis on content-area writing for middle school English language learners to support student problem solving abilities. We focus our work in the subject area of science, but a parallel argument can be made for other content areas. Currently, in U.S. middle schools, writing for meaningful purposes is receiving decreased attention as teachers feel pressure to cover large numbers of content standards. New Common Core State Standards have not diminished this concern. Additionally, the high stakes assessments that have become the definitive measure of student learning are overwhelmingly in multiple-choice format, further de-emphasizing the value of academic writing. To counter these trends, we propose the notion of educative assessment materials – writing-rich assessments that are designed to support teachers in better using assessments to promote meaningful learning. Such assessments benefit all students, but particularly English language learners.

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Academic Language in Science

There is a relationship between the increasing complexity of science content as students move from elementary to middle school and the increasing complexity of the language used to explain that content (Schleppegrell, 2006). This results in a triple intellectual challenge for English language learners who must simultaneously cope with increasingly abstract content that uses increasingly complex academic language, all in a second language. Indeed, many students (ELLs and native English speakers alike) who make adequate progress in learning to read in elementary school begin to struggle with making sense of academic text in middle school (Short & Fitzsimmons, 2007). A joint report by the International Reading Association and the National Middle School Association (2001) addressed the need for continued support for reading and writing at the middle school level for all students.

But what should this support look like? It has been shown that academic language learning for all students, including English language learners, can be developed through opportunities for frequent reading of academic text, including free choice reading (Krashen, 2004). Additionally, increased opportunity to practice academic writing allows students to clarify their thinking about new and challenging middle school content (Buxton, Lee & Penfield, 2010). Thus, ongoing attention to reading and writing as part of content area learning can provide students with tools to both clarify and express their thinking about academic content. This is true for all students, but especially English language learners.
Science provides an important context for developing academic writing skills because of the ways in which writing in science can be built upon hands-on inquiry experiences (Keys, Hand, Vaughn & Collins, 1999). These inquiry activities provide a rich context and a body of shared classroom experience that can support meaningful and extended academic writing (Lee & Buxton, 2010). Frequent use of academic writing based on shared science problem solving experiences is critical for students to learn to communicate scientifically (Lemke, 2001) and can help students become smarter in science. Science lab reports, for example, are an authentic context for science writing and an excellent indicator of how students are learning to incorporate the academic vocabulary and discourse structures typical of scientific communication. Other contexts for meaningful science writing practice include student-lead public service announcements, mock scientific conferences, and class science museums (Buxton & Provenzo, 2011).

Perhaps most importantly, however, science tests for middle school students should require substantive written responses. More than any other aspect of schooling, tests send the clearest message about what educators feel is important for students to learn. Multiple-choice tests send the message that what is most important is memorization rather than meaning. In contrast, substantive written responses highlight the value of meaning (Lemke, 1990). School systems in the U.S. seem to have lost sight of the idea that we should judge the success of our teaching by our students’ ability to make meaning rather than to provide memorized answers. We propose the idea of educative assessment materials as a framework for highlighting the importance of meaning making through writing in science learning (and beyond). As with the other aspects of writing to learn, a focus on written assessment is important for all students, but especially for English language learners.

**Educative Assessment Materials**

Davis and Krajcik (2005) proposed the notion of “educative curriculum materials” as a way to better support teachers in getting the most out of curriculum. Educative features of the curriculum are those that are designed to enable teachers to fully realize the intentions of the curriculum and to utilize the curriculum as a scaffold to promote teacher (as well as student) learning.

In a similar way, it is possible to conceptualize “educative assessment materials” as assessments that are designed to enable teachers to better realize the intentions of assessment for promoting meaningful learning. That is, educative assessment materials should foster both student content learning and teacher learning about student meaning-making. We argue that to be educative in this sense, assessments must rely heavily on student writing, since written explanations of concepts serve both to clarify the student’s own thinking and to give the teacher a rich source of information for better understanding how the student is making meaning of a concept. Developing models of educative assessments has the potential to benefit all students, but especially English language learners, since teachers typically struggle more to adequately understand what their ELL students are and are not learning well.

The push within schools for a greater emphasis on benchmark and interim testing as a way to hold students and teachers accountable for content standards may seem to be a move toward educative assessment materials, but has turned out to be a largely misguided one. The frequent “data team meetings” in which teachers routinely participate actually do little to focus on how examining students’ responses on assessments can support meaningful student learning. The focus of these meetings tends to be on accountability but not on learning. We argue that as long as student assessments consist only (or overwhelmingly) of multiple-choice items, teacher “data mining” cannot serve the purposes of educative assessment. Only when assessments actually require students to express their understanding of ideas through written (or oral) production of language, can we hope to use assessments to understand how students are making meaning of what they are being taught.
In our current research project known as Language-rich Inquiry Science with English Language Learners (LISELL), we work with middle school science and ESOL teachers, their students and the students’ families to support the simultaneous development of science inquiry skills and the academic language of science. We have designed several new instruments for studying how students express their developing understandings of science inquiry practices. One of those instruments is a written response inquiry assessment that is given to students in participating classrooms at the start and end of the school year. Unlike the end-of-year state criterion-referenced science test used in our state, the LISELL science assessment is a good example of an educative assessment.

In the appendix we present an example question from the LISELL science assessment and the rubric used to score it. We use this question to highlight three of the educative features of our assessment. First, the items on the LISELL assessment require writing in two formats. Each item has a table in which students can respond in short phrases and then lines that prompt students to explain their thinking in more elaborated academic writing. As teachers work with students to develop their academic writing through LISELL classroom activities, we can measure the degree to which students improve their short and extended academic writing on the assessment items. We meet regularly with teachers in the project to look at student work and to consider how patterns teachers see in student responses can inform their classroom practices.

Second, the scoring rubric focuses on three constructs: 1) a specific science inquiry construct (explaining cause and effect relationships in the case of the example presented in the appendix); 2) the use of language, with a focus on the progression we hope to see from students’ use of “everyday” language to explain science concepts to students’ use of the academic language of science; and 3) the science content knowledge necessary to fully answer the question. We are interested in better understanding, along with our project teachers, the relationships that exist between these three constructs, if these relationships differ depending on students’ English proficiency, and how a better understanding of these relationships might influence the practical instructional decisions that a teacher might make in her classroom.

Third, all of our LISELL assessment materials are English/Spanish bilingual, and for each item, we ask the students to mark whether they read the question in English, Spanish or in both languages. The assessment instructions also make it clear that students can respond in Spanish if they prefer. We will be analyzing data to look for relationships between student language choices, student English language proficiency and student performance on the assessment. Again, we hope to support teachers in better understanding such relationships and their implications for classroom instruction. This is where we see the primary value of educative assessments that foreground student writing.

Conclusion

More attention is being paid now than ever before to student assessments in U.S. schools, with the focus typically being on perceived bad news. For example, despite major flaws in how we test for meaningful science understanding, it is commonly reported that English language learners in U.S. schools continue to lag behind their native English-speaking peers on national and international science assessments (Lee & Buxton, 2010). The resulting overemphasis on preparation for particular types of assessments (standardized, multiple choice) has resulted in a number of unfortunate changes in teaching practices, including decreased attention to the value of writing for meaningful purposes. In our own work focusing on science learning with ELL students we are attempting to re-conceptualize assessments in ways that promote academic writing, student expression of meaning, and teacher learning from student written responses. This notion of educative assessment materials can support teachers in using assessments to better promote meaningful learning in ways that benefit all.
students, but should be particularly beneficial to English language learners. By requiring students to read, write and talk science frequently, teachers can help their students learn to meaningfully use the academic language of science. Written response assessments, both formative and summative, can play an important role in this process.

References
Appendix – Sample Question & Rubric from the LISELL Science Inquiry Assessment

The food chain in the diagram below shows that in a pond ecosystem the small fish eat the algae and the large fish eat the small fish. This year, a disease killed most of the small fish. In the table, answer the following questions:

What is the effect on the population of the large fish?
What is the cause of this effect on the population of the large fish?
What is the effect on the population of the algae?
What is the cause of this effect on the population of the algae?

Then, on the lines, use scientific language to describe the causes and effects of what will happen in the pond.

¿Cuál es el efecto sobre la población de peces grandes?
¿Cuál es la causa de este efecto sobre la población de peces grandes?
¿Cuál es el efecto sobre la población de algas?
¿Cuál es la causa de este efecto sobre la población de algas?

Después, en las líneas, usando lenguaje científico describe las causas y los efectos de lo que pasará en el estanque.

Did you read this question in:
Leíste lo anterior en:

☐ English only ☐ Español solamente ☐ Both/Ambos
6. Pond Ecosystem Experiment
   Experimento en el ecosistema del estanque

| a) What is the effect on the population of the large fish? | b) What is the cause of this effect on the population of the large fish? |
| ¿Cuál es el efecto en la población de peces grandes? | ¿Cuál es la causa de este efecto en la población de peces grandes? |

| c) What is the effect on the population of the algae? | d) What is the cause of this effect on the population of the algae? |
| ¿Cuál es el efecto en la población de algas? | ¿Cuál es la causa de este efecto en la población de algas? |

<table>
<thead>
<tr>
<th>Did you read this question in:</th>
<th>Leíste lo anterior en:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ English only ☐ Español solamente ☐ Both/Ambos</td>
<td></td>
</tr>
</tbody>
</table>
Food Chain Experiment Question Scoring Rubric
Inquiry focus is on cause and effect relationships
Content focus is on species interdependence in food webs

<table>
<thead>
<tr>
<th>What is the effect (of the small fish dying) on the population of the large fish?</th>
<th>What is the cause of this effect on the population of the large fish?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response is given as a statement indicating that the population of large fish will decrease.</td>
<td>Response is given as a statement indicating that the food source for the large fish (the small fish) has decreased.</td>
</tr>
</tbody>
</table>
| **Acceptable examples include:**
  - It would lower because of food
  - It will decrease (They will go down)
  - Less population of fish | **Acceptable examples include:**
  - The small fish dying
  - Because the population of little fish went down |
| **Unacceptable examples include:**
  - They will get the disease
  - The large fish will stay the same | **Unacceptable examples include:**
  - Algae in the water is making the fish die
  - The small fish
  - It will decrease ‘cause of the disease |
| Inquiry Scoring
  1 = response mentions that population of large fish will decrease
  0 = response does not mention that population of large fish will decrease
  9 = blank/no response | Inquiry Scoring
  1 = response mentions that food source for large fish (the small fish) has decreased
  0 = response does not mention that food source for large fish (the small fish) has decreased
  9 = blank/no response |
<table>
<thead>
<tr>
<th>What is the effect (of the small fish dying) on the population of the algae?</th>
<th>What is the cause of this effect on the population of the algae?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response is given as a statement indicating that the population of algae will increase.</td>
<td>Response is given as a statement indicating that the population of the consumers of the algae (the small fish) have decreased</td>
</tr>
<tr>
<td><strong>Acceptable examples include:</strong></td>
<td><strong>Acceptable examples include:</strong></td>
</tr>
<tr>
<td>It will increase (It gets larger)</td>
<td>The small fish not eating it</td>
</tr>
<tr>
<td>More algae</td>
<td>It will get bigger b/c nothing is eating it</td>
</tr>
<tr>
<td><strong>Unacceptable examples include:</strong></td>
<td><strong>Unacceptable examples include:</strong></td>
</tr>
<tr>
<td>It carries the disease that the small fish are getting</td>
<td>It makes the little fish sick and they die</td>
</tr>
<tr>
<td>Small fish</td>
<td>Less fish, more algae</td>
</tr>
<tr>
<td>Small fish eats algae</td>
<td>Disease</td>
</tr>
<tr>
<td>It will stay the same</td>
<td>The algae will decrease</td>
</tr>
</tbody>
</table>

**Inquiry Scoring**

1 = response mentions that the algae population will increase  
0 = response does not mention that the algae population will increase  
9 = blank/no response

**Language Scoring**

2 = The student uses appropriate academic language of science teaching (see above examples) in at least 3 cases  
1 = The student uses appropriate academic or everyday language in at least 2 cases  
0 = The student’s ability to meaningfully explain ideas about causes and effects in the pond food web is unclear or not evident; or the student copies directly from the question  
9 = Blank / No Response

**Content Scoring**

3 = Evidence of full understanding: the student explains **both** that the large fish population will decrease because there are less small fish to be eaten and that the population of algae will increase because there are less small fish to eat them.  
2 = Evidence of emergent understanding: 1) the student explains **either** that the large fish population will decrease because there are less small fish to be eaten or that the population of algae will increase because there are less small fish to eat them OR 2) the student explains both causes **or** both effects adequately  
1 = Evidence of significant incorrect content knowledge: the student clearly demonstrates a misconception about species interdependence in food webs such as stating that the big fish population will increase or that the algae population will decrease, or that the disease would spread across the different species  
0 = Unclear: It is unclear or not evident whether the student understands science content related to species interdependence in food webs  
9 = Blank / No response