

From speaking to writing in the structured English immersion science classroom

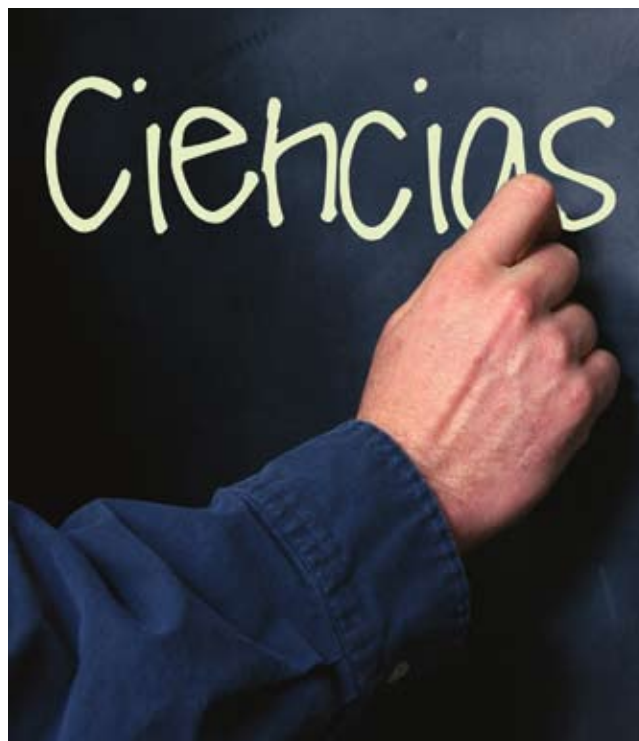
by **Conrado Laborin Gómez and Margarita Jimenez-Silva**

For many years, teaching English language learners (ELLs) was the exclusive responsibility of teachers endorsed for bilingual and English as a second language (ESL) instruction. However, through voter initiatives and legislative decree, the bilingual education and ESL options to educate ELL students have almost become defunct (Crawford 2004). In most cases, structured English immersion (SEI) has replaced bilingual and ESL programs as the preferred method of educating ELL students (Crawford 2004).

Structured English immersion

SEI is an approach for teaching content to English learners in ways that make the concepts comprehensible while promoting English language development. For example, teachers provide explicit instruction of vocabulary terms that may be new to English learners. This definition implies that subject-matter teachers are expected to teach both language and content. Not surprisingly, many content-area teachers feel ill prepared to teach ELL students using SEI methodology. After all, never before have they been expected to incorporate a language requirement into their content teaching (Echevarría, Vogt, and Short 2008).

Several states require that state-certified school personnel receive SEI training. The intent of this policy is to make all teachers responsible for the education of ELLs. Consequently, all teachers in states with high numbers of English learners, including California, Arizona, and Florida, are now required to incorporate language teaching into their instruction, regardless of the content area. Although the goal of the policy is laudable, implementing it has been a challenge for many teachers who in the past seldom had ELLs in their classrooms and who assumed that ELLs were taught English in another class (de Jong and Harper 2005). Sci-



ence teachers, because of the hands-on, activity-based approach, provide a supportive environment for ELL students. Nonetheless, even science teachers may be apprehensive about working with ELLs because of the additional responsibility to teach language skills.

Developing content and language in science

Science teachers need specific strategies to develop language skills along with content. Fortunately, research has demonstrated that science-teaching methodology can accomplish both the teaching of science content and English language skills. A technique suitable for and used by science teachers is the *mode continuum* (Gibbons 2002), a process that leads students from speaking about science to writing about science. The mode continuum also lends itself very well to concurrently incorporating listening and reading skills. Furthermore, the mode continuum allows teachers to plan science lessons that are situation embedded, providing students with opportunities to use their social English language skills to discuss academic topics. This leads students to the more academic, less situation-embedded written forms of English.

The mode continuum consists of four specific phases:

- doing an experiment,
- introducing key vocabulary,
- teacher-guided reporting, and
- journal writing (Gibbons 2002)

Phase 1

In phase 1, students are assigned to groups and are asked to perform experiments in a specific area or topic (e.g., gravity is used here as an example topic). It is recommended that the teacher design various experiments that are related to the same concept. There are books that focus on a particular topic and can provide

the basis for classroom experiments. For example, VanCleave (1993), in her book *Gravity: Mind-Boggling Experiments You Can Turn*

Into Science-Fair Projects, lists 20 different experiments related to gravity, each one covering a different problem. The teacher provides both written instructions along with pictures to help students do their assigned experiment. Visual aids assist students in organizing and making sense of information that is presented (Echevarría, Vogt, and Short 2008). The objective is for students to use their current vocabulary and prior knowledge of the topic while engaging in the experiment. Students are told that at the end of the experiment, they will have an opportunity to describe and explain to their peers what they did in their groups.

Phase 2

In phase 2, the teacher introduces key vocabulary verbally and in writing. After students have spent some time developing an understanding of gravity using familiar words and exploratory talk, the teacher spends time with each group and introduces the scientific concepts and vocabulary the teacher has identified in the lesson's objectives. In the meantime, the other groups continue with their experiments and deciding how they will explain their work to the other students in the class. For instance, one of VanCleave's (1993) gravity activities deals with

the term *free fall*. After students have conducted two related experiments, the teacher introduces the key vocabulary term *free fall* in small groups and models for students how to use the term appropriately.

Phase 3

Once students are familiar with the vocabulary and have had some practice using terms, they are ready to use them in phase 3: teacher-guided reporting. The overall aim of this phase is "to extend children's linguistic resources and focus on aspects of the specific discourse of science" (Gibbons 2002, p. 45). As ELLs explain to the whole class what they learned, the teacher interacts with students, recasting their attempts at expressing themselves. For

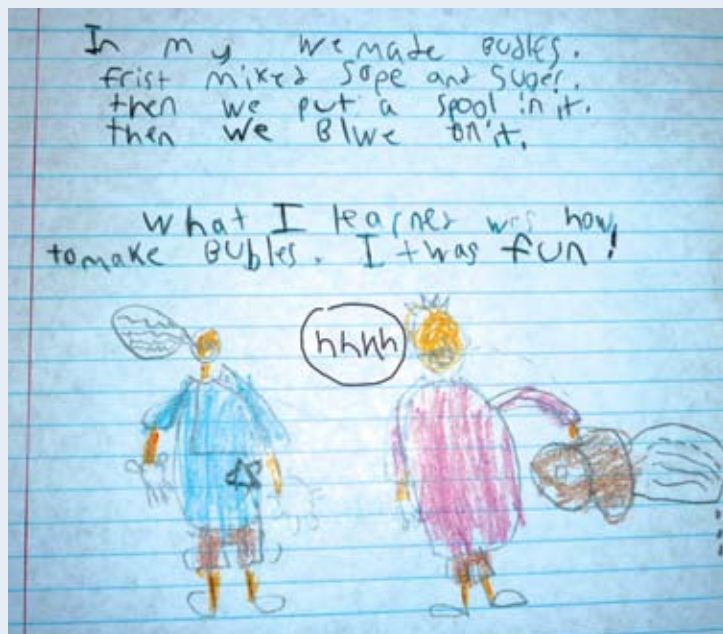
example, a student may state, "The thing made the ball do it," after which the teacher can recast the student's response by prompting, "What do we

call the force that made the ball fall down?" or stating, "Oh, *gravity* made the ball *fall down*." Thus, the teacher is facilitating language learning by providing support for students to express their ideas. In teacher-guided reporting, the teacher establishes a bridge between describing phenomena in everyday language and the more formal, academic language associated with science content (Gibbons 2002). This prepares students for putting their thoughts on paper during the last phase of the mode continuum, journal writing.

Phase 4

In journal writing, the teacher prompts students with a question such as "What have you learned?" The intent of this phase is for students to use the formal vocabulary terms that the teacher introduced in phase 2 and that the teacher and students used during teacher-guided reporting. VanCleave (1993) recommends that students purchase a bound notebook to write about their science activities as part of a student portfolio. O'Malley and Valdez Pierce (1996) refer to this as a *collections portfolio*, which contains all daily assignments as well as showing evidence of process and product. Vitale and Romance (2000) further discuss the value of using portfolios in science instruction, emphasizing their value as effective tools for

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FIGURE 1 Joel's writing sample

instructional assessment in classroom settings. Because the portfolio contains everything produced by the student, it allows the teacher to assess progress in writing as well as content knowledge.

The mode continuum in action

To demonstrate the effectiveness of the mode continuum in meeting the language and science content needs of ELLs, a series of six different experiments focusing on gravity was conducted by students in a dual-language class. The class consisted of 20 students, 10 designated as ELLs and 10 as English proficient. The ELLs in this class were at various levels of English language proficiency. The groups of students were integrated, half ELL and half English proficient. English proficient students were tasked with reading the instructions. Following the teacher-guided reporting phase, students wrote in their science journals. For this particular lesson, the teacher selected two separate text types for students' writing: procedure and recount. Consequently, the teacher prompted students with the following two questions: "What did you do?" and "What did you learn?"

Joel is an ELL student at the basic stage of English, having been in American schools for a little over a year. His experiment examined the content objective of how gravity affects the shape of soap bubbles. The key vocabulary for this lesson included the terms *gravity*, *bubbles*, *spool*, *mix*, and *then* (a sequence word to designate the steps of the experiment). Joel was asked to write the steps used for the experiment (procedure text) and what he learned from it (recount text) (see Figure 1).

The assessment-of-text framework assists in determining what kinds of text students are able to handle and any linguistic strengths and difficulties they may have (see Figure 2). We have used the framework to evaluate Joel's writing and how it reflects his understanding of the experiment. Teachers are able to keep individual profiles of learners as well as class profiles to conduct future teaching to specific student needs.

In the procedure section of the assignment, Joel demonstrates that he can write the steps of the experiment in sequence, incorporating one of the key vocabulary words, *then*. He still needs help using complete sentences and with spelling and capitalization. In the recount section, Joel needs help with expressing the main idea (concept) and providing details. In the content-knowledge column of Figure 2, it is noted that although Joel understood the various steps of his experiment, he did not specifically address in his writing the objective of how gravity affects the shape of bubbles. It should be noticed, however, that Joel has some understanding of the concept as reflected in his drawing. Although he did not incorporate the key vocabulary term *gravity* in his writing, the contour lines in the bubble he drew curved downward and the water droplets demonstrate the effect of gravity, revealing an understanding of the scientific concept of gravity.

With ELL students, it is critical to use multiple forms of assessment to measure the extent to which they understand the content objective. In Joel's example, only by analyzing his drawing can we determine that he understood the main concept of how gravity affects the shape of bubbles. We recognize that it is a challenge to assess for content knowledge and evaluate whether or not an ELL student has met the national and state

FIGURE 2 Using the assessment-of-text framework to evaluate Joel's writing (Figure 1).

Text type	Content knowledge	Overall organization	Cohesion	Vocabulary	Sentence grammar	Spelling and punctuation
Procedure	Understood major steps in experiment	All major steps are present	Used proper connectives	Good Used vocabulary from instructions	Proper use of tense Needs help with complete sentences	Spelling problems Proper use of periods Needs help with capitalization
Recount	The main concept of the experiment is missing Student did not use the term <i>gravity</i> Lacks details	Good—expressed the major task and included a personal feeling about the task	Ideas are linked appropriately	Good Used vocabulary from instructions	Good Complete sentences	Good

Adapted from Gibbons (2002).

science standards. We suggest that science teachers be very clear about the objectives of their lessons and provide the vocabulary and language that the ELL student will need to demonstrate an understanding of those objectives. It is helpful to provide a list of the key vocabulary for the lesson to all students, whether or not they are ELLs. Students who are English proficient can also benefit from such scaffolding of language and reinforcement of key scientific vocabulary. In many of our classrooms, we may have only a few ELL students; while this model of instruction has proven successful for helping ELLs improve their academic writing (Gibbons 2002), it can also help other nonELLs in the class.

It is critical when addressing the needs of ELLs that science teachers not only assess at the end of each chapter or unit of study (summative assessments), but that they also incorporate formative assessments throughout the period of instruction. Formative assessments provide a more informal means for checking

for understanding and are key for ensuring that ELL students are meeting the content standards (Carr, Sexton, and Lagunoff 2007). Teachers can also check for understanding of content through the use of oral discussions and presentations, such as the language interaction that will occur in the first three phases of the mode continuum model. Teachers can also check for understanding through the use of pictures and drawings, such as the one provided in Figure 1. Although the focus of this paper is on transitioning ELL students from speaking about science to writing about science, we strongly encourage science teachers to check for understanding of content through a variety of methods and strategies to ensure that students are meeting national and state content objectives.

Conclusion

A science program designed to meet the needs of ELLs must have a number of components. First, it must provide ELL students with opportunities to lis-

ten, speak, read, and write English. It also must use a hands-on, project approach to science learning. Furthermore, it must provide an opportunity for ELL students to work cooperatively to develop both social and academic language skills. But most importantly, it must provide the teacher with a framework to address the linguistic and content-area needs of ELLs in the mainstream classroom. The mode continuum provides such a framework. It incorporates all of these components into an organized, meaningful, and authentic approach to teach language skills needed to communicate in an academic setting (Gibbons 2002).

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Assessing student motivation, performance, and engagement with an action research project

by Kathy Hoppe



The Monroe 2-Orleans BOC-ES is an organization that serves nine school districts west of Rochester, New York. One of the many programs provided by Monroe 2-Orleans BOCES is a regional summer school program that allows students to recover credit during the summer. In the past, the grade 7 and 8 summer program was very traditional. It involved direct instruction that was developed by individual science and math teachers with no integration of subject matter. During the past three years, an innovative new program that is interdisciplinary, integrated, case based, and problem based has been developed and implemented.

As the curriculum developer of this regional summer school program, it is my goal to provide students with an engaging program and an environment where they will not only have the greatest opportunity for success in summer school but also become engaged in content with which they had previously struggled. To achieve this, the program where I work recently introduced new intermediate-level curricula in science and math developed to address student engagement and motivation, as well as increase the percentage of students passing. This paper describes the new cur-