

Focus on the Content Areas: Science

Outcome: In this segment, we will explore several strategies for teaching science and English language skills simultaneously to English Language Learners.

Science, with its opportunities for hands-on experiences that allow students to see and feel the meaning of words instead of just hearing the definitions, is an excellent vehicle for second language development. Proficiency in the language of instruction can be developed as science content is taught.

Science content taught to ELL students should be the same as content taught to the other students. Science explains how and why the environment operates as it does. These understandings are universal and appropriate for members of all cultures and races.

Cultural examples relevant to ELL students should be used to illustrate science content. An easy way to make science relevant to students is to point out the role it plays in their everyday lives. Explaining how water gets into their faucets and how heat gets into their homes are two examples. Using students' own diets to explain the food chain and referring to agricultural practices in their native countries also personalize learning. Students should be encouraged to draw examples from their lives as a way of sharing information with students from different backgrounds, validating their own experiences, and learning to communicate in English.

In addition, it is important to point out minority scientists who have made significant contributions to scientific knowledge in the U.S. Doing so promotes admiration by all students for the accomplishments of people of many different backgrounds as well as providing students with a role model and the hope they, too, can have a successful career in science.

Science instruction is most effective when the content is organized around common themes. The themes can be broad science concepts such as the nature of matter or magnetic energy, or they can be societal issues such as the pollution and the purification of water. This approach puts scientific knowledge in a comprehensible context with relevance to students' lives. This increases the probability that students will continue to want to learn science and language on their own and allows more time for understanding, reflection, and repetition.

Effective instructional strategies for curricula based on themes include hands-on experience in a cooperative learning environment. In addition, many reference materials are needed so students learn the value of investigating and comparing a variety of sources in order to learn, and are exposed to many types of writing and a larger English vocabulary.

English language development must be an integral objective in all science instruction. It is important to incorporate vocabulary development into science lessons both to ensure that students understand the science and to improve their English skills. Teachers should review the English terms or names to be used in a lesson before it is begun; help students label items to be used in an experiment; and verbally describe what they are doing, using language appropriate to the students' proficiency level. They should follow up by asking students to repeat the activity and describe it in their own words.

Research and experience have demonstrated that the classroom organization strategy most effective for teaching science to ELL students is cooperative learning because it fosters language development through student communication. In classrooms where ELL students have varying degrees of English language proficiency or come from different language backgrounds, the groups should be heterogeneous to reflect these variations as much as possible.

To assure maximum involvement of all students within each group, each student should be assigned a specific task such as chief investigator, observer, recorder, and mathematician.

Tasks should be rotated among the students from lesson to lesson to provide each student with the opportunity for varied contributions and experiences. Students should be given ample opportunity to make choices and decisions about how to organize their projects. They should be encouraged to evaluate their own work, to challenge each other's explanations and approaches within the group, and to discuss coursework with the teacher. Science is the perfect time for teachers and students to model think alouds.

In a discovery environment, students have the opportunity to find the answers to the questions they themselves pose about a topic. They develop their English language skills as they articulate the problems they have devised and their efforts to solve them, and they learn to learn on their own. Students should also be given ample opportunities to test their own ideas and be provided with a variety of resources to support students' discovery activities.

Lectures and demonstrations by teachers should be limited to use as summaries of what has been covered. They should not be used to convey new information since the purpose of the inquiry/discovery technique is for students to find out science information through their own efforts.

What is the teacher's role in Inquiry/Discovery Instruction? In order to provide students with the opportunity to think about and apply science concepts and to formulate complete thoughts in English, teachers should pose open-ended questions for them to answer. Teacher involvement can take the form of providing references, helping students to use English to express their questions and answers; and helping

them develop investigations that will lead to answers. While this approach may result in coverage of less content, students will have a deeper understanding of the material and will ultimately learn more because they have learned how to problem solve.

As students pose and solve science problems, they will naturally require the use of mathematics. Combining instruction in both subjects, along with English language skills development, reinforces learning in all areas.

It is especially important for students to use mathematics to answer questions arising from their investigations which helps them better appreciate practical math.

Science and mathematics are excellent contexts for teaching the computer skills likely to be needed in the work world. Technology provides visual and simulated material that otherwise is very abstract and difficult to understand. Technology can also provide opportunities that are not available in a typical classroom such as space exploration and access to online databases where students can take part in activities such as monitoring the migration patterns of animals and sharing their data with students from other parts of the world.

In summary, science instruction for ELL students should include:

- Hands-on experiences
- Connections to the students' cultures and backgrounds
- Thematic organization so students can easily follow the topic
- The integration of English language objectives including vocabulary development and descriptive language
- Cooperative learning to increase communication
- More inquiry and discovery with little lecture
- And the integration of mathematics

Keeping these ideas in mind when planning science instruction, allows your students to build multiple language and content concepts simultaneously.

Reflection:

With limited time for science instruction, how can you begin to integrate science content with language arts and language development to achieve the greatest impact?