**Equity in Science Classrooms**

**Science Education and English Language Learners**

Issues of language: For newly immigrated students learning the technical terms in science can be as challenging as if they were learning a third language. Academic English can include complex sentence structures and verb tenses; sophisticated, content specific vocabulary; and passive voice structure. There are three levels of vocabulary in Science: Tier 1 (basic, everyday words; high frequency) Tier 2 (frequent for mature, literate individuals) Tier 3 (low frequency; limited to specific fields of study or professions). The chart below shows some examples of the three levels of Tiers in Science.

|  |  |  |
| --- | --- | --- |
| Tier 1 | Tier 2 | Tier 3 |
| Eat | Consume | Masticate |
| Food | Nutrients | Sustenance |
| Skin | Hide, pelt | Epidermis |

Science textbooks consists more of high-level vocabulary than textbooks in other content areas. Many Tier 2 and Tier 3 words in Science are from Greek and Latin origin. When learning new academic vocabulary, students may recognize similar words in their own language (Spanish, Portuguese, French, and Italian) and should be encouraged to share pronunciations and spellings of these words with the class. The teacher can keep running a list of these words to help all students develop metalinguistic awareness.

Since many ESL students may be familiar with the Tier 1 vocabulary than Tier 2, science teachers may want to use Tier 1 and 2 vocabularies interchangeably to increase comprehension. To help students further understand the vocabulary, teachers can introduce the technical terms in clusters. Some of the classroom activities that science teachers can try are classification activities, semantic webs, visualization, learning logs, and review key points.

In the senior level science, students must provide more complex writing such as a laboratory report or a research essay and this can be seen as extremely difficult for ELL. We should provide each student the opportunity to hand in one or two draft copies of their work before they hand in a final copy, this way we can provide a large amount of feedback to ensure that the students can not only provide a good English paper but also provide the necessary Science terminology that makes it a Science paper.

**Gender and Science Enrolment**

Low representation of females in STEM careers due to expectations of success in STEM areas and the subjective value of tasks related to math and science (e.g., Eccles, 1994). Women have low self-confidence in their ability to do math-related tasks and low expectations of the outcomes of pursuing such careers (Farmer, Wardrop, & Rotella, 1999; Hackett, Betz, Casas, & Rocha-Singh, 1992; Lent, Brown, & Hackett, 2000). Researchers (e.g. Lent et al., 2001) have also argued that environmental supports can facilitate participation whereas barriers can impede participation.

Study by Nadya A. Fouad et al found 75 supports and barriers which fit into five domains:

* Parental and familial influence – encouragement from parents, parental knowledge in math/science
* Institutional and school influences – teaching methods, encouragement from teachers
* Financial and environmental influences – perceptions of gender role stereotypes
* Social influences – peer influence, interest and perceptions of difficulty of science subjects
* Internal influences – self-efficacy, interest, perception of workload/difficulty, initiative to seek help

**Gender and Science Anxiety**

The causes of science anxiety are many, including past bad experiences in science classes, science-anxious teachers in elementary and secondary schools, lack of role models, gender and racial stereotyping, and the stereotyping of scientists in the popular media. Science anxiety almost inevitably leads to science avoidance. Among the most science anxious students are education majors, almost all female: the teachers of the next generation (Udo et al. 2004).

**Ways to Combat Gender Anxiety**

* Cite role models
* Keep it conceptual. Do not introduce technical terms unless and until they are really needed.
* Discuss science anxiety as well as fear of failure, fear of speaking up in class, and fear of laboratory apparatus. Explain that these fears are often due to overbearing siblings and parents, or parents and teachers who are themselves anxious about science or math.
* Keep classes interactive and student-oriented. Call on students by name, even in large lectures, where you can at least learn the names of those who speak up in class. Toss out topics for brainstorming and discussion.
* Use peer instruction techniques.
* Provide gender neutral examples or ensure that the gender examples are split 50/50

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