Weaving English Language Learning (ELL) throughout the Curriculum: Best Practices from an Integrated Science Curriculum

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Abstract

Education at all levels in our global society stresses the importance of comprehensive English Language Learning (ELL) for successful mastery of science education content. Limited communication skills can be a significant stumbling block in the attainment of content area knowledge. The concepts and knowledge associated with the ability to perform successfully in the sciences are strengthened by best practices in ELL as well as integrated science curriculum and content. This paper discusses and illustrates best practices in integrated science curriculum and science pedagogy coupled with ELL strategies that strengthen content and language acquisition simultaneously. Learning is stimulated by supportive access to knowledge and information building capacity for achievement in ELL and science content. By providing specific examples of a blending of content and pedagogy through these best practices, a glimpse of effective learning in top performing classrooms is provided.

Rethinking emerging practices will translate to improved teaching and student outcomes. The attainment of knowledge in the content area rests on a clearly articulated set of goals and objectives related to the specific science subject matter. Blended with ELL strategies as well as cultural resources, dialog is stimulated and appropriate pedagogy results. Students are provided the latitude to move forward at a pace consistent with their abilities and take ownership for strengthening both language and science content. This paper provides specific examples from integrated science courses that support this methodology. Examples will be provided incorporating active, hands-on learning, digital learning and technology, inquiry-based learning, as well as content-based science activities designed to engage and strengthen ELL. Student achievement increases through investigation and inquiry that encompasses the structure and methods necessary for effective development of language skills and acquisition of science content knowledge. Multiple assessment measures will be suggested that provide usable feedback and guide evaluation.

Language learning and content knowledge are closely intertwined in their efforts to achieve mastery in both areas and help students find success and satisfaction. It is crucial for educators to work together closely to strengthen skills across the curriculum and engage with complex tasks to build knowledge. By incorporating appropriate methodology and active learning strategies, students become engaged and are captivated by learning that expands knowledge in a challenging and informative direction with strong implications for learning in the content area as well as developing English competency. Echevarria and Short (2011) point out that quality language objectives serve to complement a content lesson strengthening the content knowledge as well as the skills identified in content area standards. In this way, the academic language necessary for content concepts is reinforced.

Science educators are aware of this essential strategy and its strong implications for teaching students of varied cultural and language backgrounds. Engagement and exploration coupled with appropriate pedagogy cross cultural and linguistic lines and stimulate learning. This is clearly the case in the area of

science as it lends itself to the enthusiasm that comes with discovery and innovative creativity. Astute science educators are capable of incorporating cultural content into their science lessons and further captivating learners. For example, Cortazzi and Jin (1999) suggest three types of cultural information that can be used in language textbooks and materials. These include: Source cultural materials drawing on the learners own culture as the content, target culture materials using the culture of a country where English is the first language, and international target materials including numerous global cultures. By addressing these three areas of cultural information in combination with appropriate science and language learning methodology, accomplishments are significant in a variety of areas and content learning is strengthened simultaneously. Himmel (2012) describes a science lesson focusing on the cell cycle and explores the ways to identify academic language in a lesson. By mastering the science content and English language proficiency standards, students are able to explain the language of comparison, sequencing, recording ideas in a graphic organizer, and summarizing. As a culminating activity, students will be able to orally explain differences and similarities between cell cycles.

A study performed by Mehrabian (1971) found that the majority of transmission of information is non-verbal (body language (55%) and tone (38%)), while only 7% of meaning is transmitted through actual words. The inquiry-based approach takes the focus away from the traditional lecture format and transforms learning into action and application. Science conceptual and content mastery is improved through the utilization of the following platforms: labs, fieldwork, internship opportunities, service learning, and independent research experiences.

In the science disciplines, the manifestation of the lab requirement has been a long-standing commitment to experiential learning. Lab exercises involve personal observation and recognition of the subject matter or an emphasis on technical proficiency, which reduces the dependency on auditory learning. Communication of conceptual scientific ideas can be enhanced with specific content-based activities or digital learning through lab simulations. From understanding chemical structure, DNA replication, or predatory-prey dynamics, these simulations can model real-world processes so that all students can visualize this process without language barriers.

Field work involves taking students to a specific location that will aid in conceptual understanding or execution of a research experiment or project idea. This effort emphasizes the application of learned skillsets. By removing the constraints of the traditional classroom, language learners have the ability to learn by doing. This work also requires group collaboration where language learners have a greater opportunity to learn from their peers. Most scientific content involves ideas derived from observations of the natural world. Moving students outside of the traditional classroom setting can be the most ideal way to communicate these ideas.

Internship opportunities and service learning stress hands-on activities and require a personal commitment to project execution. By providing students with an inquiry-based approach to solving real-world problems, students working hard to gain proficiency in English speaking and literacy can gain understanding in a discipline through performance. These students take responsibility for their education and are rewarded with a sense of ownership at project completion.
Independent research projects provide another opportunity for students to gain experiential learning opportunities. By assigning the student a lead role in developing experimental design and executing research, learning becomes student-centered. Independent research ensures English language learners have more control over their learning environment, pace, and content. The educator role transitions to one of mentor and facilitator. Ambrose, Bridges, DiPietro, Lovett, & Norman (2010) suggest that “goal-directed practice coupled with targeted feedback” are essential tools for the educator and are critical to

learning. These research projects allow language learners to emphasize their strengths and promote communication among individuals with similar interests.
In addition, science educators need to limit lecture-based teaching formats. Educators have a responsibility to engage language learners, which will in turn strengthen communication across the board. Experiential opportunities and limited dependence on auditory learning in the classroom are necessary to enhance ELL performance. Learning is understood as an interpretive process where new information is stored with links to what is already known (Mastascusa 2011). Educators can tap into that shared experience to assist in the transmission of ideas. Paired scientific illustrations and peer-review during class are also good ways to minimize lecturing and reinforce conceptual and content knowledge. The creation of a learner-centered curriculum has the potential to modify the class environments to reach all students including language learners.

In conclusion, remarkable content and language skill acquisition outcomes are derived bolstering achievement by changing the trajectory of ELL and coupling best practices from both disciplines. Educators with expertise and preparation across disciplines will shed light on student accomplishments that are characterized by increased expectations and an emphasis on best practices. Unique value is further achieved when learning styles from diverse backgrounds and an enlarged world view is incorporated into the celebration of teaching and learning. The activities suggested above will reshape the commitment to a high quality learning experience for students characterized by active learning and a commitment to pedagogy and strategies that extend beyond the traditional classroom expectations and methods. The interaction between students and educators in the classroom and online will focus on a broader approach and increased expectations for practitioners. Formative and summative assessments will support instructional practice as students engage in complex tasks that build knowledge across the curriculum. As students demand increased attention and educators expand and cultivate awareness of approaches to combining ELL and content, all of our accomplishments increase on multiple levels and measurable gains are evident that transcend the traditional classroom.

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