

# CHALLENGES AND POSSIBILITIES IN MULTILINGUAL SWEDISH CLASSROOMS

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*In recent years, the increased globalization has led to Swedish science classrooms, just as in the rest of Europe, involving a variety of languages and cultures, which places particular demands on science education. The use of the functionally scientific language is characterized by complexity, which often hinders students' learning in science. For students whose first language is different than the language of instruction, this can be a great challenge. In this presentation, we relate to two studies – (1) a web-based vocabulary test, and (2) an ethnographic study of a translanguaging science classroom – to illustrate how multilingual students' use of translanguaging can constitute a resource for science learning. The studies reveal that multilingual students move in loops between discursive and national languages in their conversations about the scientific content. The students commonly use their first language (Arabic) when moving toward an everyday discourse and use their second language (Swedish) when approaching the scientific discourse. Moreover, analyses show how the students often use both Swedish and Arabic to clarify semantic relationships between scientific words and concepts in translanguaging science classrooms (TSC). The students commonly express the subject-specific words in Swedish, while the descriptive, clarifying, interconnecting words and phrases describing the semantic relationships often are expressed in Arabic. In this way, both Arabic and Swedish become linguistic and cognitive tools when students learn science. With increased awareness of the complex subject-specific language and multilingual students' use of their entire linguistic repertoires in a TSC, increased conditions for the development of significant pedagogical tool can be created that can help science educators frame learning in linguistically and culturally diverse classrooms and give students greater opportunities to participate in the science instruction contexts, to influence their learning situation and to put students in a position as co-constructors of their own learning.*

**Keywords:** Multilingualism, The role of Language in Science Education

## BACKGROUND

The aim of this presentation is to point towards some salient features of the language in science classrooms that may hinder meaning making. However, recognition of these hindrances may inform classroom strategies that bring the hindrances within the bounds of possibilities.

Several scholars (e.g., Martin & Veel, 1998; Seah et al., 2014) have emphasized that language usage in school science contexts may be characterized by high lexical density, abstraction, and technicality. In addition, the language in science classrooms has specific characteristics related to the use of words, grammar, and semantic patterns that may be a particularly challenging issue (Lemke, 1990). At the word-level, language use in science can be grouped into three categories: (a) science-exclusive words, (b) words found both in science and elsewhere, but with different meanings, and (c) general academic words (Nation, 2013). Science-exclusive words are often labelled as scientific concepts and imply terms that are only used in science environments, such as *allopatric*, *exothermic reaction*, and *force*. Making meaning of these concepts is important and misunderstandings may occur, but students, teachers, and parents are aware of their importance and give them a lot of attention. Secondly, we have terms that are connected to science, but also have other connotations in other contexts. Words such as *adapt*, *cycle*, and *energy* can confuse learners since they have different meanings in everyday language; that is, they are homonyms. For example, students

could arrive at school on a *bicycle* but in the science classroom the word *cycle* is associated with *life cycle* or the *cycling of matter*. The third group of expressions are general academic words such as *converted*, *proceeds*, and *originates*. These words receive less attention in the science classroom and are often supposed to be learned in other subjects. However, general academic words are important in the science classroom since they are the “glue”, or connectors, between the concepts, and a scientific explanation is incomprehensible without the connectors that bind concepts. In other words, teachers must understand how language influences learning and develop strategies to enhance students’ successful appropriation of scientific language in the continuum between daily and scientific registers using interlanguage discourses (Olander, 2010; Schleppegrell, 2016). Many studies in science education reveal that students modify language in their movement between different discourses, benefiting the learning of science. In this way, an important prerequisite for learning science is to increase the students’ discursive awareness and mobility in relation to content and language (Karlsson, Nygård Larsson & Jakobsson, 2019).

In a multilingual science classroom, the interlanguage discourse receives an additional dimension, which further tends to increase the complexity for students who do not have the language of instruction as their first language. However, recent research shows that the use of translanguaging as a pedagogical strategy in science classrooms can increase multilingual students’ opportunities for participation and learning (Karlsson, Nygård Larsson & Jakobsson, 2019; 2020). In a translanguaging science classroom (TSC), students are supported to use all available language and other multimodal resources in order to enhance their learning opportunities (García & Wei, 2014).

## RESEARCH DESIGN AND RESULTS

In this paper, we relate to two different kinds of studies: (1) a web-based vocabulary test, and (2) an ethnographic study of a translanguaging science classroom.

### The web-based vocabulary test

Meaning making of words was estimated through four different web-based vocabulary tests given to 232 students. Each test had 15 words selected from a part of a textbook that the actual class would study two weeks later. One sentence was chosen, in which one word was made bold and the students were given four alternative suggestion as synonyms. The words belonged to all three categories of words mentioned in the background, for example (a) symbiosis, (b) current, and (c) build. In addition, the students were asked about their first language.

In summary, the results show that the words the students have problem with (more than 25 percent of the answers) come from all categories with (a) five words, (b) eight words, and (c) 11 words. However, in relation to words from category (b), the homonyms varied; for example, *branch* caused problems to many (60 percent) while *react* caused fewer problems (26 percent). As for category (c), the general academic words were the ones that caused the most difficulties to all students, especially to students with another first language.

### The ethnographic study of a translanguaging science classroom

To present a picture of students’ authentic language use in a translanguaging science classroom (TSC), an ethnographic data collection and research design were used (Karlsson, 2019). Every month for three years (2012–2015), the study observed several science lessons in a primary school. These lessons were documented using four video cameras and four audio recorders. The total lesson recording time was 117 hours.

In the study, Karlsson et al. (2019; 2020) found that multilingual students’ use of both first and second languages often appears when students relate and contextualize the abstract content to their everyday experience. For example, one of the students used both Arabic and Swedish to clarify a question about chlorophyll by relating the word to a joint experience from an excursion. The students move in a kind of *loop* between everyday expressions in their first language (Arabic), and more subject-specific expressions in

their second language (Swedish). Another pattern that emerged in the analysis of the students' joint negotiations about the scientific content is that the subject-specific words are often expressed in the second language, while the descriptive, clarifying, and interconnecting words and phrases are commonly expressed in the first language. From a semantic perspective, it becomes important for all students, and especially multilingual students, to have access to this kind of interconnecting words in their meaning-making processes. For example, to clarify the paradigmatic meronym relation (part and whole relation) between 'tree trunk' and 'tree', one student used both her first and second languages to express that the 'tree trunk' (in Swedish) 'is that which belongs to the tree' (in Arabic).

## CONCLUSIONS

The specialized subject-specific language in science can cause problems for learners generally (e.g., Serder & Jakobsson, 2016; Wellington & Osborne, 2001), but especially for multilingual students, as they face the dual task of learning a new language while learning the subject matter through this language (e.g., Seah & Yore, 2017; Turkan & Liu, 2012). However, the study of multilingual students' use of translanguaging in a TSC shows that translanguaging, as a pedagogical strategy (that allows and encourage different use of language and modes of expressions) can be an important tool in science education. If we assume that multilingual speakers do not use their different languages as separate entities (García & Wei, 2014), they had to use their entire linguistic repertoires to communicate. For example, the students use both first and second languages to move between daily and scientific registers (the daily register is often expressed in the first language, while the scientific register is often expressed in the second language). Furthermore, the students often use both Swedish and Arabic to clarify semantic relationships between scientific words and concepts. In this way, the students' use of translanguaging gives them increased opportunities to develop an understanding of the semantic relationships between concepts, as well as how they relate in larger thematic patterns (Lemke, 1990). The multilingual students' use of first language to express general academic words, which is often used as the connectors binding of the concepts, can be related to the results of the web-based vocabulary test that show that these words were the ones that caused the most difficulties to all students, but especially to students with a first language other than Swedish.

Finally, we wish to emphasize that a translanguaging science classroom where students have "access to the practice of generating and creating scientific explanations in their own voice" (Brown et al., 2016, p. 454) can give students greater agency and opportunities to participate in science education.

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