RELATIONSHIP BETWEEN LANGUAGE AND STEAM LEARNING FOR ENGLISH LEARNERS

Irgasheva Umida Raimjanovna
University of Tashkent for applied science, Senior teacher of the department of languages
Gmail: umidairgasheva1978@gmail.com

ABSTRACT

The article proves the relationship between language and STEAM learning for English learners. English learners (ELs) develop science, technology, engineering, art and mathematics (STEAM) knowledge and language proficiency when they are engaged in meaningful interaction in the classroom and participate in the kinds of activities in which STEAM experts and professionals regularly engage. This article provides the views of the inextricable relationship between language and content. It articulates the ways in which ELs can be afforded opportunities in the lesson using STEAM technologies to draw on language and other meaning-making resources while engaging in disciplinary content. The role of language and culture in STEAM learning is explained in the article.

Key words: *conceptualizing, evaluating, engagement, encourage, multicompetence, content, structure.*

INGLIZ TILINI O'RGANUVCHILAR UCHUN TIL VA STEAM O'RGANISH O'RTASIDAGI BOG'LIQLIK

Irgasheva Umida Raimjanovna
Toshkent amaliy fanlar universiteti, Tillar kafedrasi katta o'qituvchisi
Gmail: umidairgasheva1978@gmail.com

ANNOTATSIYA

Maqolada ingliz tilini o'rganuvchilar uchun til va STEAM o'rganish o'rtasidagi bog'liqlik isbotlangan. Ingliz tilini o'rganuvchilar fan, texnologiya, muhandislik, san'at va matematika (STEAM) bo'yicha bilim va tilni bilish darajasini, ular sinfda mazmunli o'zaro aloqada bo'lganda va STEAM mutaxassislari muntazam qatnashadigan tadbirlarda qatnashganda rivojlanadi. Ushbu maqolada til va mazmun o'rtasidagi uzviy bog'liqlik haqidagi qarashlar keltirilgan. U intizom mazmuni bilan shug'ullanayotganda til va boshqa ma'no yaratuvchi resurslardan *foydalanish uchun STEAM texnologiyalaridan foydalangan holda darsda ingliz tilini o‘rganuvchilarga qanday imkoniyatlarni taqdim etish usullarini bayon qiladi. STEAM o'rganishda til va madaniyatning roli maqolada tushuntirilgan.*

Kalit so'zlar: *kontseptsiyalash, baholash, jalb qilish, rag‘batlantirish, ko'p kompetentsiya, mazmun, tuzilma.*

СВЯЗЬ МЕЖДУ ЯЗЫКОМ И ОБУЧЕНИЕМ STEAM ДЛЯ ИЗУЧАЮЩИХ АНГЛИЙСКИЙ ЯЗЫК

Иргашева Умида Раимжановна
Ташкентский университет прикладных наук
Старший преподаватель кафедры языков
Gmail: umidairgasheva1978@gmail.com

АННОТАЦИЯ

В статье доказывается взаимосвязь между изучением языка и STEAM для изучающих английский язык. Учащиеся, изучающие английский язык (EL), развивают знания в области естественных наук, технологий, инженерии, искусства и математики (STEAM) и языковые навыки, когда они вовлечены в содержательное взаимодействие в классе и участвуют в видах деятельности, в которых регулярно участвуют эксперты и профессионалы STEAM. В этой статье представлены взгляды на неразрывную связь между языком и содержанием. В нем излагаются способы, которыми EL могут быть предоставлены возможности на уроке с использованием технологий STEAM, чтобы использовать язык и другие ресурсы для создания смысла, занимаясь дисциплинарным содержанием. В статье объясняется роль языка и культуры в обучении STEAM.

Ключевые слова: *концептуализация, оценка, вовлечение, поощрение, поли компетентность, содержание, структура.*

INTRODUCTION

All children grow up in communities that use language to engage in cultural practices that have developed historically and are shaped in ongoing ways to achieve the goals and values of the communities. Each community has particular ways of conceptualizing, representing, evaluating, and engaging with the world, and initially children are socialized into the language and ways of being in their families and local communities. Over time, however, each person becomes a member of a larger set of communities and engages in new cultural practices that are sometimes complementary but may sometimes conflict with the practices of their home communities. For most children, these new communities include both in-school and extracurricular affiliations through which they engage in new cultural practices.

Any particular student coming from a home community into a school context may present herself or himself in a variety of ways, including ways that may or may not be consistent with stereotypes of the home communities or different cultural groups. Expecting individuals to act or think in particular ways because of their group memberships limits those individuals' opportunities to learn and constrains their opportunity to thrive in educational settings. Schools are enriched through the diverse experiences and perspectives of children and families from different cultural communities, and ELs simultaneously bring unique experiences as individuals and as knowledgeable members of the communities to which they belong. All of these experiences, individual and collective, can provide resources for learning STEAM.

As learners add concepts and language, adding new concepts through language becomes progressively easier as the linguistic skills and abilities of the learner increase.

The learner possesses a broader and deeper foundation upon which to layer new concepts and language. Concept development is made more challenging for ELs to the extent that educators rely exclusively on the English language to develop concepts and may not recognize the added challenge of learning new concepts in a language that one is also learning.

LITERATURE ANALYSIS

To learn STEAM subjects, students will learn the requisite new patterns of language and expression only through opportunity for and engagement in STEAM disciplinary practices. The developmental pathways available to individual learners in STEAM classrooms are influenced by the opportunities they are offered to participate in the practices and discourses of STEAM fields. Participation in these practices and discourses increases learners' capacities to generalize and express abstract ideas, develop disciplinary habits of mind and dispositions, and achieve success in STEAM learning.

Learning STEM subjects requires support for learning to use the discourse patterns through which the knowledge in each subject area is presented and engaged with. All children require such support, including those learning in their mother tongues or first language (also referred to as L1). For ELs, success often hinges on engaging in classroom and out-of-school experiences that encourage them to draw on the languages and multicompetences they already control and to connect new concepts with the knowledge they bring from their homes and communities. When allowed to interact in varied ways to build from what they already know and to develop new technical knowledge at school, ELs can learn STEAM content and practices while simultaneously building their proficiency in English beyond STEAM. A lot of scientists worked on this research. Diane L. August, Filiberto Barajas-Lopes, Kara Jackson, J. A. Bianchini, Karen Thompson, Margaret Kelly and other scientists supported the important contribution to this topic.

RESEARCH METHODOLOGY

Language is experienced as sounds and wordings (words/phrases), but the primary *function* of language is to make sense of the world and share meanings with others. The use of language is to "make meanings" that fulfill goals in the social contexts where people interact. The meanings vary not only according to what is being done (the "content"), but also according to with whom the interactions take place (e.g., how many people are present, the status of the relationships, the roles taken on in the discourse, etc.) And it is not just in language that people interact. Along with language, nonlinguistic modalities—including gesture, visual displays (e.g., symbols, diagrams, graphs, tables), and other multimodal representations (e.g., in everyday life, maps, emojis, pictures, etc.; in STEAM subjects, artifacts of engineering design, computational modeling, etc.)— offer different affordances and limitations, potentials, and constraints for meaning-making.

It is important to recognize that the content taught in STEAM subjects is not separable from the language through which the content is presented. There is no language-free content; language use always presents some content, and most representations of content require some language use, even with multimodal resources for meaning-making.[1] This understanding of language means that to learn the language of STEM subjects, students must participate in STEM contexts and activities. For ELs, this means that they must be encouraged to draw on all of their multicompetences, which include all of their languages and their different varieties, as well as gesture, drawing, and other modalities for meaning-making.

Language is used in different ways depending on what is being done—making different language choices in doing mathematics than in doing science, for example—and who is being spoken to (e.g., a friend or family member versus a stranger) and the mode of communication (e.g., talking on the phone or writing a letter). Linguists use the term *register* to refer to this kind of variation in the ways that meaning making resources are drawn upon. *Register* refers to the different ways

[1] Bianchini, J.A. From here to equity: The influence of status on student access to and understanding of science. *Science Education*, 1999, *83*(5), P. 581.

people draw on linguistic and nonlinguistic resources as they engage in different kinds of activities, with different kinds of people, through different modes of communication. Students use multiple registers as they engage in classroom activities in the same ways, they use multiple registers as they engage in activities outside of school. Different words are used in mathematics than in science. But consider how different *modalities* present and enact meaning; for example, by writing rather than speaking, and how different wordings depending on the *relationship* of the speakers, for example, whether speaking one-on-one or with a small group. The registers used respond to the contexts participated in, so shaping contexts to enable students to expand their linguistic repertoires is an important goal of instruction in all subjects; adding new registers and developing existing registers is a main goal of schooling. The notion of register helps point out how teachers can engage learners in activities that build from everyday ways of interacting toward more formal ways of presenting disciplinary meanings, as well as how learners can unpack disciplinary meanings into language that connects with the language and meanings they bring to the classroom. The notion of register also helps teachers recognize students' subject-matter understandings even as their proficiency in English is still developing. Within the same classroom, different activities offer learners different affordances for drawing on language and the multicompetences they already are comfortable with and for learning new ways of making meaning that are subject-specific.

"Content" can be held constant as students who are learning English engage with the same concept in different ways across a set of activities designed to involve them in sense-making as they learn STEAM subjects. Els who are less proficient in English may be most confident in participating when encouraged to use a range of modalities and work in a small group setting with peers, while those with greater proficiency may participate in imperfect but comprehensible English and interact in whole class settings.

While different participation structures present different challenges and affordances to particular students, language will develop as students have multiple opportunities to engage with the same content and concepts over a unit of study. The particular ways to talk and write (discourse patterns) about the content will not be the same across the unit. Introducing and working with a concept initially, students may use everyday language and informal vocabulary and sentence structure. As they become more familiar with the technical aspects of the STEAM concepts they are learning and the STEAM practices they are engaging in, they move toward more disciplinary ways of talking about what they are learning, using technical language, sentence structure, and arguments more typical of written or formal discourse. This is how students develop new academic registers at the same time they learn new concepts, and teachers' awareness of the affordances of this register development over time can enable them to challenge ELs.

For example, in a unit of instruction about division with fractions, the activities that students can engage in move from hands-on interaction to reporting on the interaction and then writing about what was learned. In moving across these different activities, students work in different participation structures and use different modalities, even while the underlying "content," understanding and using the concept of division by a fraction in a word problem involving the *measurement* meaning of division (not the *partitive* meaning used in "fair share" problems), remains the same. A textbook represents yet another register with which students must engage; this register presents a mathematical generalization about the meaning of division by fractions in a sentence that distills several concepts into technical language accompanied by an equation in mathematical symbolic language. To understand this technical language, teacher and students are likely to engage in further talk and interaction that "unpacks" the technicality and uses more everyday register features to help learners see meaning in what is represented through mathematical symbols.

Through opportunities to engage with language in all these different forms of interactions, none of which is inherently "better" or "more appropriate" than any others in the abstract, learners are enabled to move between the language(s) and registers they bring to the classroom and the new registers they are learning to engage with as they participate in STEAM learning. With textbooks, through which students are exposed to the written language of the disciplines, stylistic differences in language are also well-documented.[2] This understanding of language suggests important implications for providing instruction and supports that will engage and challenge ELs and enable their success in learning STEAM content, concepts, and practices. The committee reports on what is known about how best to support high-quality instruction for ELs; with more evidence in science and mathematics than in technology and engineering. This understanding of language is also fundamental to preparing teachers to create learning environments and design STEAM instruction that is effective with diverse learners, including ELs. Chapter 6 reports on research that shows how teachers' knowledge about language and STEAM can be developed in preservice and in-service contexts. It is the committee's stance that through participation in such STEAM learning contexts that engage all learners in using all of

[2] Irgasheva U.R. Improving students' professional speech competence based on STEAM technologies in teaching English at technical universities. *Journal of Central Asian Social Studies, 2021, 2(02), Pp.81-87.*

their meaning-making capacities, ELs will develop English language proficiency along with subject area knowledge, understanding, and practices.

Recent years have witnessed parallel shifts toward promoting the social and sense-making nature of both science learning and second language development. In science education, whereas traditional views focused on individual learners' mastery of discrete elements of science content, contemporary views emphasize that students engage in science and engineering practices (e.g., developing models, arguing from evidence, constructing explanations) to make sense of the world around them.[3]

The new vision of science education expects students to engage in science and engineering as scientists and engineers carry out their work. In the science classroom, students make sense of phenomena or design solutions to problems by engaging in three-dimensional learning. In doing so, they build their science understanding with more sophistication over the course of instruction. The *Framework* recommends organizing science learning around three dimensions: scientific and engineering practices, crosscutting concepts, and disciplinary core ideas.

The first dimension of scientific and engineering practices includes the following:

1. Ask questions (for science) and define problems (for engineering)
2. Develop and use models
3. Plan and carry out investigations
4. Analyze and interpret data
5. Use mathematics and computational thinking
6. Construct explanations (for science) and design solutions (for engineering)
7. Engage in argument from evidence
8. Obtain, evaluate, and communicate information

The second dimension of crosscutting concepts, which unify the study of science and engineering through their common application across fields include patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change. The third dimension includes disciplinary core ideas in four areas: physical sciences; life sciences; earth and space sciences; and engineering, technology, and applications of science.

ANALYSIS AND RESULTS

As lessons fit together coherently and build on each other over the course of instruction, students develop deeper and more sophisticated understanding of science

[3] Botirbekova G.A. The role of national Mentality and culture in learning language. *Middle European Scientific Bulletin, 2022, Volume 23, Pp.173-176.*

to make sense of the anchoring phenomenon for the unit of science instruction. As ELs develop deeper and more sophisticated science understanding over time, their language use becomes more sophisticated. To communicate the sophistication of their ideas, ELs use modalities more strategically (e.g., they may use dots to represent particles of smell, arrows to represent movement of smell particles, and different shapes or colors to distinguish between smell particles and air particles that are intermingled) and more specialized registers (e.g., they progress from "it stinks" to "smell is a gas made of particles too small to see that are moving freely in space and reaching my nose").

The specialized register allows ELs to be more precise as their science understanding becomes more sophisticated. Precision goes beyond science vocabulary (e.g., "particles") and privileges disciplinary meaning by focusing on how ELs use language to engage in science and engineering practices. For example, in constructing a scientific explanation of how smell travels across the room, ELs can communicate precise disciplinary meaning about the scale at which gas particles can be observed ("too small to see") and the movement of the particles ("move freely around in space") with less sophisticated language. As ELs use language in a variety of settings—individually, in pairs, small-groups, and whole-class settings—they learn to adapt their language to meet the communicative demands of different interactions ("check this out" in one to-one interaction when there is a shared frame of reference, "the food materials are decomposing and producing smell" in one-to-many interaction when language needs to be explicit). Overall, the science classroom presents a rich science learning environment that also promotes language learning for all students, including ELs, who benefit from sustained opportunities to *use language to do science*. The science classroom may be particularly beneficial to ELs when their contributions are valued for the merit of their ideas regardless of social status or linguistic accuracy. They communicate their ideas using a wide range of semiotic resources, including home languages, linguistic and nonlinguistic modalities of science disciplines, and registers starting from every day to specialized language to meet the communicative demands of different types of interactions in the science classroom. Language is a product of doing science, not a precursor or prerequisite for doing science and ELs need ample opportunities to do science. and applying knowledge for a particular purpose, it has been referred to as *knowledge-in-use*. In second-language development, whereas earlier theories saw it as the accumulation of discrete elements of vocabulary (lexicon) and grammar (syntax) to be internalized by learners, more recent thinking has taken a sociocultural turn, viewing language as a set of dynamic meaning-making practices learned through participation in social contexts [8]. Because this approach to language learning involves using language for a particular purpose, it has been referred to as *language-in-use*. Knowledge-in-use in science education and language-in-use in second-language development complement each other, such that science instructional shifts promote language learning with ELs, while language instructional shifts promote science learning with ELs.

CONCLUSION

The importance of discourse processes in science education builds from longstanding research examining the multiple ways language supports the creation of knowledge. In particular, sociocultural approaches brought more focused attention to the role of cultural tools such as language in mediating the processes of individual learning and cultural production and change. This perspective offers an important opportunity to see how scientific knowledge accrues and changes over time as well as how knowledge is created and negotiated through social engagement and discussion in classroom settings. As will be further articulated in the Mathematical Practices section below, classroom activities should be constructed to be developmentally appropriate approximations of scientific practices. Research on science practices often focuses on the establishment and evaluation of knowledge claims. These epistemic practices are central to learning the disciplinary knowledge and ways of being for various science fields. Such practices vary across disciplinary communities, ways of knowing, and power dynamics that also operate in the presentation of cultures.

Studies of student uses of knowledge in problem solving also entail engagement in scientific practices. This focus on everyday knowledge construction practices forms students' practical epistemology that can serve to help make sense of phenomena, to develop conceptual knowledge, and to learn about the nature of science. In each of these cases, examining student engagement in epistemic or scientific practices relies on a methodological focus on discourse processes because the ways that communities affiliate, build knowledge, and construct social practices are constructed in and through discourse.

This study showed how students' perceived status influenced participation and science learning. A number of studies illustrated how access to scientific knowledge was negotiated through discourse processes and tied to the ongoing social practices and norms of the classrooms. An important development in the study of classroom discourse emerged from a focus on teachers' and students' uses of evidence. The alignment of evidence in disciplinary-specific and genre-specific forms of language has entered studies of science education as argumentation. Studies of argumentation have explored different contexts, have drawn from multiple argumentation analytics for analysis, and have focused on different dimensions of science from conceptual learning to socio scientific issue. Argumentation has been applied across multiple science subject areas and entered into teacher education to prepare teachers to orchestrate uses of evidence among students.

REFERENCES

1. Bianchini, J.A. From here to equity: The influence of status on student access to and understanding of science. *Science Education*, 1999, *83*(5), Pp. 577–601.
2. Botirbekova G.A. The role of national Mentality and culture in learning language. *Middle European Scientific Bulletin, 2022, Volume 23, Pp.173-176.*
3. Irgasheva U.R. Interactive teaching methods in ESP. *Middle European Scientific Bulletin, 2022, Volume 23, Pp.168-172.*
4. Irgasheva U.R. Talabalar kasbiy nutq kompetentsiyasini takomillashtirishning pedagogik aspektlari. *Oriental renaissance: innovative, educational, natural and social sciences, 2022, 2(2), Pp.937-944.*
5. Irgasheva U.R. Formation of Professional Competencies of the Students in the Process of Studying the Educational Program “STEAM-Technologies in Education”. *November, International Journal of Discoveries and Innovations in Applied Sciences 1, 2021, Volume-6, Pp.76-80.*
6. Irgasheva U.R. Improving students’ professional speech competence based on STEAM technologies in teaching English at technical universities. *Journal of Central Asian Social Studies, 2021, 2(02), Pp.81-87.*
7. Irgasheva U.R. Ingliz tili darslarida talabalar kasbiy nutq kompetentsiyasini takomillashtirishda STEAM texnologiyalar ahamiyati. *Art word international journal 4 (1-1), 2021.*
8. Jalolov J. Chet til o‘qitish metodikasi. *O’qituvchi -2012. Pp.79-118.*
9. Mirzakarimova Z.D. The acquisition of a subjective color as a result of the meaning of the word. *Academicia. An international Mutidisciplinary Research Journal, 11 (2), 2021, Pp.1429-1441.*
10. National program of personnel training of the Republic of Uzbekistan // *Collection of normative documents of higher education. - T .: Sharq, 2001, P.19.*