Special Topics in English Learner Programming Monthly Webinar

English Learners in STEM Subjects: Highlights from the National Academies of Sciences, Engineering, and Medicine

Dec. 13, 2018

Anika Harris

Welcome

Welcome to OSSE's

Special Topics in English Learner Programming

Webinar for

December 2018!

English Learners in STEM Subjects: Highlights from the National Academies of Science, Engineering, and Medicine

Anika Harris, Professional Development Specialist

Objectives

This monthly webinar series will cover a wide array of topics pertaining to English learners (ELs), English language acquisition, and English learner program administrative and instructional activities.

This month's webinar features a summary of the U.S. National Academies of Sciences, Engineering, and Medicine's report ***English Learners in STEM Subjects: Transforming Classrooms, Schools, and Lives***.

Objectives

Specifically, participants will learn about the report's findings around English learners (ELs) in science, technology, engineering, and math (STEM) subjects including:

- Eleven considerations for educators, health providers, and families
- Research regarding identification, assessment, and instruction
- Four conclusions about educating ELs with disabilities

English Learners in STEM Subjects:

Background to the Report

Background to the Report

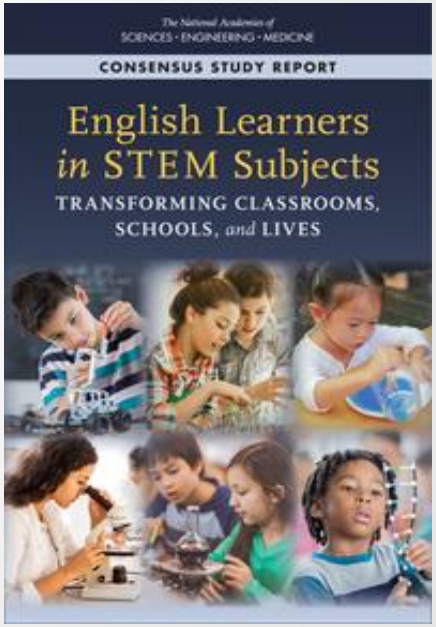
The United States National Academies of Science, Engineering, and Medicine (NASEM) is a private non-profit institution that provides independent objective analysis and advice to the US to solve complex problems and inform public policy decisions related to science, technology, and medicine.

The Academies operate under an 1863 congressional charter to the National Academy of Sciences, signed by President Lincoln.

English Learners in STEM Subjects Report

English Learners in STEM Subjects: Transforming Classrooms, Schools, and Lives was released by NASEM in October 2018. The report addresses how STEM is taught to ELs in grades pre-K - 12 with respect to:

- Promising approaches to support ELs in learning STEM
- The role of teachers
- Assessments in STEM
- Policies and practices
- Gaps in current research
- The role of families and community



https://www.nap.edu/catalog/25182/english-learners-in-stem-subjects-transforming-classrooms-schools-and-lives

Terminology

Within the report:

- **English Learners (ELs)** are defined as students ages 3 to 21, which is also the general age range for grades pre-k - 12.
- **Long-term ELs** are understood to be ELs who:
  - Are receiving services to develop English proficiency.
  - Have not been reclassified after 6 or more years.
  - May plateau in English language proficiency during middle or high school.
- **Newcomers** are understood to be ELs who recently arrived to the U.S.

EL Landscape

According to the U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Local Education Agency Universe Survey," 2015–16[1], **9.4%** of student population in the country is EL.

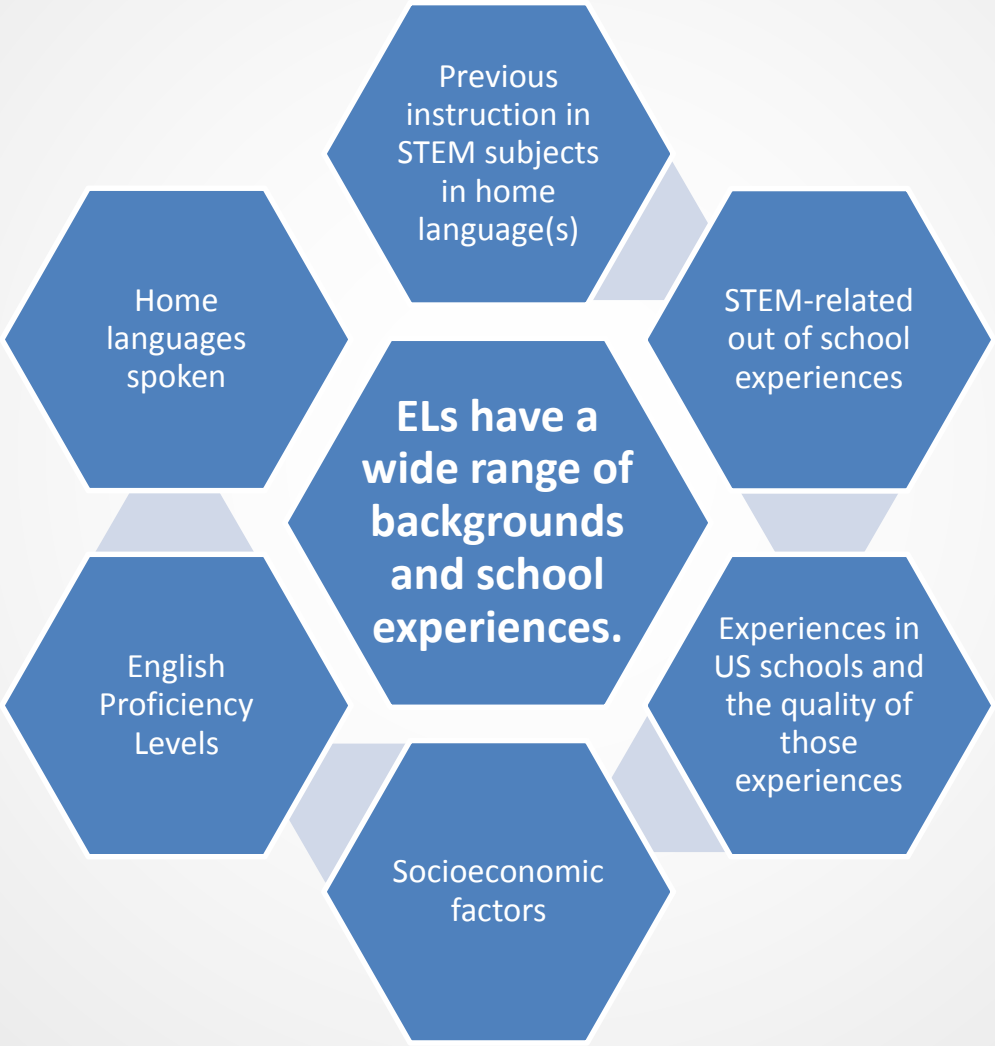
That 9.4% translates to 4.6 million ELs who bring more than 350 languages to this country.

The EL population in DC is similar to the percentages in large states like Alaska (11.5%), Washington (10.4%), Colorado (11.6%), and Kansas (10.6%). (Id.)

ELs comprise **11.1%** of the total student population in DC.[2]

1. See *Digest of Education Statistics 2017,* table 204.20.
2. OSSE Enrollment Audit 2017-18 school year

Heterogeneous Experiences of ELs



- Maybe have an overview list of the areas and main takeaways that will be covered? Not that you would discuss them each in this slide, but you could list which areas will be covered; then do each in details with separate section dividers. Eg:
- ***ELs and the Education System***
  - ***ELs need access to challenging grade-level STEM content, instruction, activities, and practices.***
- ***STEM Learning and Language Development***
  - ***ELs can engage in meaningful language use through STEM learning.***
- ***Instructional Strategies***
  - ***Teachers' positive positioning of ELs makes a difference.***

ELs and the Education System

- ***Conclusion 1:*** *"…Clear and consistent designations of English learner and English-proficiency status are needed to* ***reduce misperceptions of ELs' proficiency in STEM academic achievement, including misestimation of achievement gaps****..."*
- ***Conclusion 2:*** *"Frequently, ELs lack full access to school-based STEM learning opportunities."*
- ***Conclusion 3:*** *"When ELs have the opportunity to use all of their linguistic and non-linguistic meaning-making resources during STEM instruction, these resources can be helpful for communication and learning."*

English Learners in STEM Subjects:

Highlights from the Report

- Conclusion:
- Evidence/Example:
- Reflection on implications for schools:

Inclusion in STEM

Inclusion of ELs in STEM is a Systemic Issue

It is a myth that ELs cannot meaningfully participate in the STEM classroom because of their limited English skills or cultural differences.

However, it is a fact that poor EL performance in English language development and in content mastery is due to a lack of access to challenging course work.

"ELs develop STEM knowledge and language proficiency when they are engaged in meaningful interaction in the classroom that includes participation in the kinds of activities in which STEM experts and professionals regularly engage."[3]

3. English Learners in STEM Subjects, p. 2.

Inclusion in STEM

The NASEM report found the following common practices around ELs in elementary and secondary settings:

- Exclusion from rigorous science or math courses
- Placement in remedial courses
- Poor advising regarding course selection
- Little information known or shared about ELs in technology and engineering
- Students reports of being kept out of courses despite satisfactory or above academic records

Inclusion in STEM

Students can get inspiration from learning about people in STEM fields who look like them and have similar backgrounds.

Dr. Alfredo Quiñones-Hinojosa

Burçin's Galaxy, a double-ringed galaxy, was discovered by Burcin Mutlu Pakdi.

The Ghana Code Club is one of numerous code clubs in Africa that teach students computer coding after school.

Inclusion in STEM

According to the High School Longitudinal Study of 2009[4], a study of high school transcripts shows:

- about 5% of ELs have no math coursework compared to 2.4% of their native English-speaking peers
- about 5% of ELs are enrolled in advanced courses compared to 10% of their non-EL peers
- ELs are less likely overall to take science courses and, when they do, they enroll at lower rates in more difficult classes perhaps because of math prerequisites

4. https://nces.ed.gov/surveys/hsls09/

Instructional Practices for ELs in STEM

STEM classrooms that are favorable to EL learning intentionally plan around the following:

1) Modalities: the use of gestures, speech, writing, drawing, graphing, choice of language and code.
2) Content: beyond vocabulary, "content" acknowledges variations by subject in phrases, constructions, and ways of supporting claims. There is further differentiation in processes and activities by topic (i.e., algebra vs. geometry vs. trigonometry) and discipline (photosynthesis vs. genetics).
3) Relationships: language used when different instructional communication occurs, for example, informal language in a small group, a teacher supporting a student to use more content-specific language, or the language found in a textbook).

Instructional Practices for ELs in STEM

MYTH: ELs must learn English first, then take content courses.

FACT: Language is product of using language to participate in class (therefore, language should not be a barrier to taking the class).

FACT: "Disciplinary practices allow ELs to develop disciplinary knowledge while engaging in meaningful language use."

FACT: Exposure to content leads to "sophisticated understanding and capabilities."

FACT: Allowing ELs to use all of their language and content supportive resources during STEM instruction, their STEM learning and English learning improve.

Instructional Practices for ELs in STEM

MYTH: Teacher mindset is not related to EL success in STEM classrooms.

FACT: Teachers who hold a deficit view of ELs, yield poorer performing ELs.

- Teachers should position ELs as competent members of the STEM classroom.
- Teachers should providing meaningful STEM learning opportunities for ELs in order to increase their comfort working with diverse students.
- Teachers should engage with families of ELs in order to have an appreciation for their cultural and linguistic differences.

Instructional Practices for ELs in STEM

- Engage students in disciplinary practices
- Engage students in productive discourse and interactions with others.
- Utilize and encourage students to use multiple registers and multiple modalities.
- Leverage multiple meaning-making resources.
- Provide explicit focus on how language functions in the discipline.

Family Engagement

To promote ELs' educational success, continuous family-school connections are key.

Providing language support in the form of interpretation and translation can over come the frequently cited language and social barriers to making these connections.

When reaching out to families:

- Help them understand available STEM instructional programs and related opportunities
- Encourage them and/or their children to participate in such programs and opportunities

Classroom Assessments

STEM assessments should:

- Incorporate static visuals, i.e., graphics and pictures
- Incorporate dynamic visuals, i.e., video
- Divide tasks into multiple parts
- Position students in collaborative tasks

When writing test items, consider differentiating test forms by reducing the language burden. Removing superfluous language that does not change the meaning of the item.

Let's practice!

Classroom Assessments

1) As described by the NOAA space weather scale, which of the following is NOT an effect of a weak geomagnetic storm?

According to the NOAA space weather scale, what is an effect of a weak geomagnetic storm?

https://science.energy.gov/~/media/wdts/nsb/pdf/HS-Sample-Questions/Sample-Set-5/Round12.pdf

Classroom Assessments

2) Consider charges +Q and +4Q, separated by 3 meters. At which of the following points on a line between the two charges can a charge –Q be placed so that it will experience no electrostatic force?

See this line. +Q _____+4Q

Charges +Q and +4Q are 3 meters apart.

Put charge –Q between them so there is no electrostatic force.

Where is -Q?

https://science.energy.gov/~/media/wdts/nsb/pdf/HS-Sample-Questions/Sample-Set-5/Round12.pdf

Classroom Assessments

3) A bucket is filled with water to a depth of 20 centimeters. A layer of oil 30 centimeters thick with a specific gravity of 0.7 is poured on top of the water. Given that 1 atmosphere is 1.01 × 105 pascals and providing your answer in scientific notation with three significant digits, what is the absolute pressure, in pascals, at the bottom of the container?

The water in this bucket is 20 centimeters. Mr. Lee pours 30 centimeters of oil on top of the water. The oil has a specific gravity of 0.7.

1 atmosphere is 1.01 x 105 pascals. What is the absolute pressure, in pascals, at the bottom of the bucket?

Write your answer in scientific notation with three significant digits.

https://science.energy.gov/~/media/wdts/nsb/pdf/HS-Sample-Questions/Sample-Set-5/Round12.pdf

Accommodations in the STEM Classroom

Review existing policies regarding the use of linguistic accommodations in order to ensure:

- ELs can get the linguistic accommodations that best meet their needs during instruction and on assessments
- Those giving accommodations know how to administer them
- Accommodations are implemented with fidelity for all ELs

Considerations for Teacher Development

Teachers are not receiving adequate preparation to provide appropriate STEM-related learning opportunities to ELs.

Teacher educators have few opportunities to learn how to equip teachers to teach STEM to ELs.

Few opportunities or resources currently exist to learn how to integrate language into STEM learning or how to enhance curricula.

When content teachers and EL teachers have shared professional development, both groups benefit by learning about the knowledge and competencies that benefit ELs.

Considerations for Teacher Development

Professional development should:

1) reflect the needs of ELs, particularly:

- the way students think in the STEM classroom
- disciplinary practices and discourse
- the use of instructional materials.

2) Include resources for teachers, and LEA/school leaders that showcase research-based instructional practices.

Considerations for Teacher Development

STEM teachers should have opportunities to collaborate with teachers, both EL specialists and other STEM teachers, who successfully work with ELs.

STEM and EL teachers should collaborate to build language use in STEM instruction.

STEM and EL teachers should collaborate to support ELs' grade appropriate STEM content and language learning.

Additional Resources

Resources

The updated publication *Delivering Education Services to English Learners: Policies and Procedures for Administrators, Instructional Leaders, and Teachers in the District of Columbia* is now available for download.

The School Readiness Reflection Tool is found in Appendix E of OSSE's publication *Delivering Education Services to English Learners*.

OSSE's new EL website is www.osse.dc.org/page/english-learners-els.

On-site technical assistance and EL program support is available! Contact Anika.Harris@dc.gov or Jennifer.Norton@dc.gov.

Resources and Upcoming Activities

Download The National Academies of Sciences, Engineering, and Medicine's report, *English Learners in STEM Subjects,* in its entirety at https://www.nap.edu/catalog/25182/english-learners-in-stem-subjects-transforming-classrooms-schools-and-lives .

Doing and Talking Math and Science website: https://stem4els.wceruw.org.

WIDA's bulletin, *Focus On: STEM Discourse*: https://wida.wisc.edu/resources/focus-stem-discourse.

Upcoming Events

Recruitment for the State Title III Advisory Committee is open until **Friday, Dec. 14, 2018**. You can apply here: https://osse.dc.gov/node/1365741.

During the 2018-19 school year, OSSE hosts a monthly Special Topics in English Learner Programming webinar broadcast on the second Thursday of every month from 1-2 p.m. The next webinar will take place **Thursday, Jan. 10, 2019**. Register here: https://attendee.gotowebinar.com/rt/1800935569566896397.

OSSE EL Contacts

Assessment

Michael Craig

Assessment Specialist, Special Populations, Division of Data, Assessment, and Research

Michael.Craig@dc.gov

Data

Chandi Wagner

Education Research Analyst, Division of Data, Assessment, and Research

Chandi.Wagner@dc.gov

Professional Development and On-Site EL Program Assistance

Anika Harris

Professional Development Specialist, English Language Acquisition (K-12)

Division of Teaching and Learning Anika.Harris@dc.gov

English Learner Program and Policy Support

Dr. Jennifer Norton

English Learner Program Manager, Division of Teaching and Learning

Jennifer.Norton@dc.gov

OSSE STEM Contacts

Maya M. Garcia

Director, Science Technology Engineering and Mathematics

Division of Teaching and Learning

Maya.Garcia@dc.gov

Lauren Allen

STEM Management Analyst, STEM Integration

Division of Teaching and Learning

Lauren.Allen@dc.gov

Thank you!