

1-25-2021

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### Repository Citation

Huerta, M., Dahl, H., Vo, T. (2021). Success in STEM: Diversifying our STEM Workforce by Supporting our EnglishLearner Students' Mental Health and Academic Achievement. *Policy Issues in Nevada Education*, 4(1), 1-8. Las Vegas (Nev.): University of Nevada, Las Vegas. College of Education.

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# Success in STEM: Diversifying our STEM Workforce by Supporting our English Learner Students' Mental Health and Academic Achievement

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## Abstract

**Problem.** Nevada faces a shortage in STEM-qualified employees. Given that our English Learner (EL) community is one of the fastest growing communities in Nevada, policymakers have a vested interest in supporting these students in STEM careers. Unfortunately, EL science scores in Nevada are particularly low, implying they are not on a trajectory towards STEM careers. **Purpose.** This paper provides an overview of recent trends in Nevada policies addressing ELs, STEM, and counseling. It also provides an overview of evidence-based strategies for improving EL success in STEM. **Recommendations.** We recommend that Nevada educators and policymakers work to 1) Improve quality instruction for ELs by integrating language learning into STEM curriculum; 2) Involve school counselors to promote EL social-emotional needs and mental health; 3) Invest in professional development for STEM educators on how to specifically integrate language into content; and 4) Lower the student-to-counselor ratio in Nevada to the recommended best practice (i.e., 250:1).

## Introduction

One important element of sustaining economic growth in Nevada is to build a stronger science, technology, engineering, and mathematics (STEM) sector. Following the 2008 recession, the Nevada Legislature created the Advisory Council on STEM, which has developed and overseen a strategic plan for expanding the state's educational resources in STEM (SAC, 2017). The Advisory Council on STEM notes that Nevada has made progress in diversifying its economy away from tourism and hospitality towards STEM careers, adding 35,132 STEM jobs between 2011 and 2016 (SAC, 2017). However, the council also notes that Nevada still faces a shortage in STEM-qualified employees.

Given that our English Learner (EL) community is one of the fastest growing communities in Nevada, policymakers have a vested interest in supporting these students in STEM careers. English Learners (ELs) are students who are in the process of learning English as a second or other language. In Nevada, 17.1% of students are classified English Learners (ELs), and approximately 48% of ELs are likely living in socio-economically disadvantaged families (Sugarman & Geary, 2018). Notably, 67.6% of ELs in Nevada (52,898) speak Spanish

(National Center for Education Statistics, 2020). ELs have historically scored significantly below native English speakers in math, English language arts (ELA), and science on standardized assessments (National Assessment for Educational Progress, 2020). For example, on the National Assessment of Educational Progress (NAEP), a national standardized assessment used to track and compare student performance across states and over time, Nevada EL students consistently score below the proficiency cutoffs in ELA and math. On Nevada's state standardized assessment (the SBAC), EL students score low in all subjects, but EL science scores are particularly low (see Table 1). This information suggests Nevada students, but especially ELs, are not on a trajectory towards STEM careers.

There are likely several reasons for Nevada's lagging test scores among its EL student population. In fact, for vulnerable populations, including ELs, the COVID-19 global pandemic revealed previously documented inequalities in education and health disparities (Ku & Brantly, 2020). For example, ELs are less likely to have technology access to participate in remote learning making it difficult for them to achieve in core subject areas such as science and math (Meyer, 2020). In addition, since the rise of COVID-19, researchers have observed

**Table 1.** Averaged Percentages of ELs and Non-ELs Across Reported Grades Who Met or Exceeded State Standardized Assessments in 2016-17 by School Subject Areas in Nevada

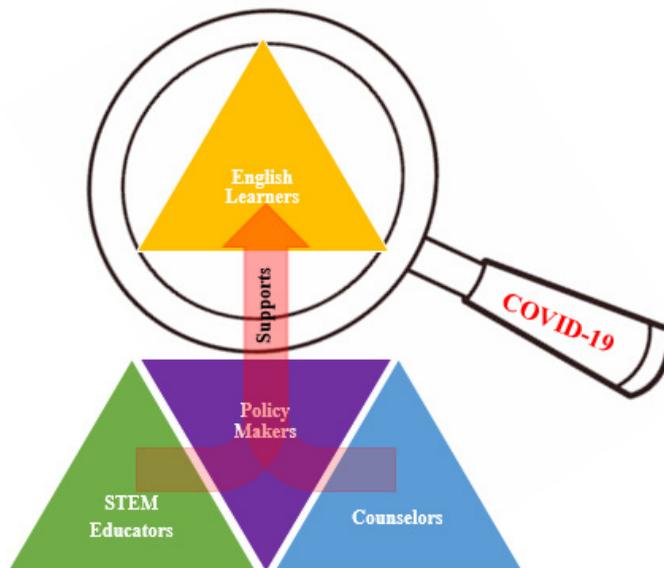
Subject Area (Grade levels reported and averaged)	EL Averaged % Meeting or Exceeding Standard	Non-EL Averaged % Meeting or Exceeding Standard
English Language Arts (Grades 3-8)	16.6	58.4
Math (Grades 3-8)	16.4	43.35
Science (Grades 5-10)	4.3	34.75

increased anxiety, depressed mood, and stress in individuals, often seeing a need for immediate increase in mental health support (Drouin, 2020; Durankus & Aksu, 2020). Children and adolescents have been particularly impacted, having to attend to the impacts on their own mental health and added systemic factors (e.g., parent well-being, home insecurity) that may be occurring simultaneously. COVID-19 has brought to light how disadvantaged families and racial minorities, including ELs, are more likely to be impacted by the pandemic (Center for Disease Control and Prevention, 2020). They therefore need access to counseling resources to help them navigate their mental health, including anxiety, resulting from both home-based and school-based stressors.

In short, COVID-19 has magnified pre-existing issues surrounding EL learning and academic

success in STEM, which includes attention to both STEM instruction and mental health for successful learning. Figure 1 illustrates how COVID-19 has magnified the needs of ELs which are supported by STEM educators (for instruction) and counselors (for mental health). This type of critical integrated support (shown by the arrow) represents a nexus worthy of attention. Considering how to promote success for Nevada’s ELs along the intersections of STEM and mental health as magnified by COVID-19 is critical now and in the future. This paper will first overview recent trends in Nevada policies addressing ELs, STEM, and counseling. Then we discuss evidence-based strategies for improving EL success in STEM. We conclude by offering recommendations for how new Nevada policy can integrate best practices to improve EL STEM outcomes.

**Figure 1.** Supporting ELs as COVID-19 magnifies challenges to academic success and mental health



### **Trends in Nevada Policies Addressing ELs, STEM, and Counseling**

Policies have considered STEM learning initiatives or EL learning initiatives separately and have largely failed to consider the critical role of mental health in both of these areas. Current Nevada policies do not integrate EL supports, including mental health supports, within STEM initiatives or STEM supports within EL initiatives, and by treating these concepts disparately, these policies fall short of addressing the inequities that impact EL student success. In what follows, we briefly overview these policies.

**EL Policies.** In terms of EL learning initiatives, the Nevada legislature has been active in taking actions to address issues concerning ELs' math and reading underachievement in our state. For example, the Nevada legislature approved funding starting in 2013 (SB 504) to establish Zoom funding schools with high percentages of ELs. In 2015, the funding was increased to include secondary schools (SB405) and funding was extended in 2017 (SB 390). The services have increased academic achievement and improvements in English language proficiency for ELs (SB 390 Annual Report, 2017; Buckendahl, 2019). While helpful, Zoom funding did not target STEM education or address how teachers can effectively instruct ELs in STEM.

In terms of teacher preparation, the Nevada State Board of Education approved legislative language in July 2016 regarding the English Language Acquisition and Development (ELAD) endorsement for teachers. The language states all newly licensed teachers should take four foundational EL courses starting in 2020 (State of Nevada Department of Education, 2016). The results of this legislative language have yet to be observed and evaluated and they do not attend to how to teach ELs effectively in STEM. More recently, the development of the English Language Development Standards Framework (ELD Standards Framework) was presented to the Nevada State Board of Education in January 2020 (Office of Student and School Supports, 2020). Notably, the ELD Standards Framework highlights the important connection between language and content learning (e.g., in science, math, language arts). This connection between language and content language is encouraging, but again, how teachers will be given this

information and use it in terms of STEM education for ELs is yet to be determined. Notably, none of the aforementioned policies consider the importance of educators and school systems understanding the role of affective realms of learning such as anxiety which can impact ELs' language and content learning (Ariza & Coady, 2018).

**STEM Policies.** Nevada faces many challenges around supporting students within STEM (e.g., training, time, and materials for teachers; OSIT, 2018). In order to meet these challenges, a number of policies have been enacted to encourage K-12 students' STEM involvement. SB 241 (2017) rewards students who participate in additional STEM classes with a STEM Seal. Regional STEM networks have been created to connect and fund resources across NV. Governor Designated STEM schools have been established to further this agenda and SB 345 (2013) includes collecting and disseminating STEM resources. STEM educators, for both formal and informal contexts (e.g., in classrooms vs. in a museum) come in many forms within Nevada and are often supported by the Office of Science, Innovation, and Technology (OSIT), established by NRS 223.600 (2001).

Most of these policies include additional considerations for vulnerable populations of Nevada students. However, these programs and policies are solely focused on STEM content not on language learning and attending to affective learning factors (e.g., reducing anxiety) which are critical for ELs' achievement. For example, OSIT has a series of grants focused on providing students greater access to STEM resources but most do not attend to ELs' learning which include attending to language and mental health. While prioritizing growing content knowledge is important, students need additional language support (i.e., including culturally responsive teaching and learning) and increased resilience around learning (i.e., mental health support) in order to build capacity within STEM.

**Counseling Policies.** Current policies in the Nevada school system require that each public school employ at least one full-time school counselor and that each school has a professionally developed comprehensive school counseling program (Amendment 1088, 2019). This policy has been in response to the needs reflected at a national level, where 70-80% of students received mental health support from their school counselor (Atkins et al,

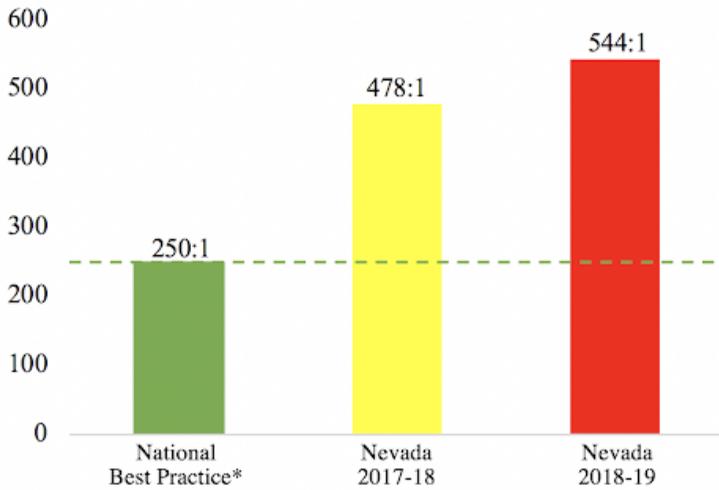
2010). Aligned with national best practices, Nevada school counselors are tasked with addressing the academic and social-emotional learning needs of the students as well as advocating for equitable access to rigorous education (Amendment 1088, 2019).

Unfortunately, student-to-counselor ratios for Nevada continue to widen (i.e., 478:1 in 2017-18; to 544:1 in 2018-19), over double the recommended best practice (i.e., 250:1; ASCA, 2020a). These widening gaps in student coverage make it more difficult for a school counselor to meet the increasing needs of EL students given the complex

context, only exacerbated by the COVID-19 global pandemic. Figure 2 illustrates these points, comparing trends in Nevada to national best practice. This figure notes that a lower student-to-counselor ratio would allow counselors more access to students, increasing the ability to provide additional mental health and counselor support to populations of need, such as ELs.

School counselors are uniquely positioned to recognize and respond to the mental health needs of EL students (ASCA, 2020b), making them critical for supporting EL student mental health and resilience during a global pandemic and beyond.

**Figure 2. Student-to-Counselor Ratio**



\*National best practice is the recommended student-to-counselor ratio. A lower ratio means counselors have more access to students and can provide additional mental health and counseling support.

**Evidence-Based Strategies for Supporting ELs STEM Success**

In STEM classrooms, ELs learning outcomes are enhanced when language and academic concepts are taught simultaneously. In addition, ELs learning improves when students are in supportive classrooms that attenuate anxiety and increase motivation to learn. The following section addresses cognitive (i.e., Language in STEM), and affective (i.e., mental health in STEM) factors that impact ELs’ STEM learning, prevalent in Nevada based on existing research. Finally, at the culmination of these topics, we present proposed best practices to support Els’ STEM learning.

**Language in STEM (Cognitive).** There is much science educators can do in terms of simultaneous

language and concept instruction. For example, science educators need to teach vocabulary explicitly, teach reading skills for non-fiction texts, value the students’ home language and use it to support learning, and allow opportunities for ELs to speak and write in class. Research has shown this type of instruction increases ELs’ and non-ELs’ content and language learning (e.g., Huerta et al., 2016; Jackson et al., 2019; Lara-Alecio et al., 2016; Lee et al., 2005; Lee et al., 2008; Llosa et al., 2016; Maerten-Rivera et al., 2016). It is also important for science educators to consider students’ background knowledge (e.g., what students know or don’t know about a topic; Bravo et al., 2014; Llosa et al., 2016) and provide instructional scaffolds such as overall classroom structures that

promote exploration (Lara-Alecio et al., 2016), visual supports, and collaboration among students so that they are communicating through speaking and writing, while also receiving feedback (Stoddard et al., 2013; Shaw et al., 2014).

STEM educators need extensive external classroom support to implement research-based effective EL STEM practices (Lee et al., 2008; Santau et al., 2010). For example, teachers in the aforementioned studies received intense professional development training ranging from two to five full-day workshops during the year and/or summer (e.g., Lee et al., 2016) to bi-weekly meetings throughout the school year (e.g., Lara-Alecio et al., 2012). Still, teachers were reported to not reach the level of practice the researchers were wanting (Lee et al., 2008; Santau et al., 2010). Science educators need intense and ongoing support to integrate language into STEM curriculum effectively.

**Mental Health in STEM (Affective).** STEM educators can also create environments that promote positive mental health. This includes strategies to lower anxiety and increase motivation in the classroom. For example, they can value the students’ home language, provide instructional scaffolds (e.g., opportunities for group and partner work; materials with visual supports to aid comprehension; learner-centered instruction; Ariza & Coady, 2018).

When it comes to external impacts on mental health (e.g., COVID-19 and related anxieties), however, science educators need the support of school counselors to promote positive mental health for ELs. School counselors could work with

ELs at the individual, group, and classroom level (Cook, 2015, Cook et al., 2012). At the individual level, identifying the specific needs of each EL student includes counselor engagement with caregivers as well as individual sessions with the student. At the group level, counselor developed interventions could specifically address areas of need for ELs (e.g., culturally responsive, anxiety, content-oriented). At the classroom level, the counselor could provide lessons that include anxiety reducing techniques for students when working with STEM concepts, thus promoting positive mental health. In terms of resources, the role of the school counselor becomes critical for student assistance in accessing community resources which are much needed for EL students and families (Ariza & Coady, 2018).

In addition to working directly with students, school counselors are in a position to assist ELs and STEM educators, recognizing the individual education and mental health needs of each student (Cook, 2015). Specifically, school counselors can assist STEM educators in gathering and analyzing relevant data, monitoring student progress, and integrating literacy concepts into the comprehensive school counseling program (Cook, 2015).

**Best-Practices in STEM for ELs.** Table 2 provides a quick reference guide to practices for working with ELs in STEM in terms of instruction that promotes learning. The guide is based on the EL research cited above and state-suggested recommendations around STEM learning (Advisory Council on Science, Technology, Engineering, Math, 2017).

**Table 2.** Research-based Ideas for Promoting EL Learning in STEM

Language	Culture	Classroom Environment
Teach vocabulary explicitly after lessons to reinforce concepts.	Understand and build students’ background knowledge.	Create classroom structures that promote exploration and opportunities to speak and interact (e.g., group and pair work; inquiry).
Teach non-fiction text reading explicitly.	Value the students’ home language and culture and allow it to be used for learning.	Create classroom structures which include scaffolds (e.g., visual supports; feedback).
Allow low stress opportunities for ELs to speak and write in class.	Allow students to tie personal funds of knowledge to academic language.	Create classroom environments which support students to communicate (e.g., supportive technology, additional time).

Table 2 highlights that attending to language, culture, and environment is important for promoting EL success in the classroom, including STEM classrooms. In terms of language, ELs benefit from attention to explicit vocabulary instruction, instruction on how to read non-fiction texts, and opportunities to speak and write in the classroom. In terms of culture, ELs benefit from teachers' eliciting (i.e., finding out what ELs know) and building (i.e., not assuming ELs know but providing context) students' background knowledge on different instructional topics. ELs will also learn STEM more successfully if they feel their home language and culture are valued and are used as tools for learning, including connecting what they know to what they are learning. In terms of classroom environment, ELs benefit from experiential learning in which they have many opportunities to speak and write with supports for that communication (e.g., group and pair work, visuals, feedback, technology).

### Recommendations for Policy and Practice

In addressing instruction and mental health issues surrounding EL learning and academic success in STEM, we rely on the research findings outlined in this paper. First, we recommend supporting policy that provides quality instruction for ELs, such as (a) integrating language learning into STEM curriculum to promote EL academic achievement within EL initiatives, similar to Zoom programs and the ELL Master Plan call for content and language integration (Clark County School District,

2019). We also suggest involving school counselors to promote EL social-emotional needs and mental health within initiatives, including using resources such as CASEL guide to school-wide social and emotional learning (CASEL, n.d.). Finally, we recommend policies and practice that advocate support for STEM educators and counselors working with ELs, such as (a) investing in professional development for STEM educators on how to specifically integrate language into content within initiatives and (b) lowering the student-to-counselor ratio in Nevada to the recommended best practice (i.e., 250:1) by hiring additional school counselors.

### Conclusion

ELs' STEM success depends on successful language integration into content with teacher and counselor support. ELs' STEM success also depends on attending to students' mental health ranging from ongoing simultaneous content and language learning to currently managing feelings regarding the pandemic. The COVID-19 global pandemic should and is pushing STEM educators and counselors to conceptualize a new learning landscape that is beneficial to all learners, including ELs. This work must be started in the midst of a pandemic and continue to move forward long after. This work conducted across stakeholders (e.g., students, STEM educators, counselors) is a nexus which can be leveraged to create new opportunities and support capacity building within Nevada through policy and practice.

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