Vision Statement

The College of Education will achieve prominence locally, nationally, and internationally as a leading source of significant knowledge and innovative models to inform and affect policy, practice, and research.

Did You Know?

The College of Education enrolls nearly 1/3 of all academic graduate students at the University of Nevada, Las Vegas.

Historically, the College of Education has been one of the largest producers of Ph.D.s in the University, graduating roughly 1/5 of all academic doctorates.

Committed to growing the teacher pipeline with highly capable, quality teachers in Nevada and beyond, the College of Education produces more newly licensed teachers than any institution or agency in Nevada.

Approximately 98 percent of students who graduate from the College of Education’s teacher preparation programs go to work in the Clark County School District.

College of Education graduates working in the Clark County School District’s highest needs schools are retained by these schools at a rate of 2.5 times higher than the district average.

With strong devotion to giving back to our Nevada community and contributing to economic development, the College of Education estimates $91 million was reinvested locally through federally/state funded projects, clinical experience and community partnerships in 2016-17.
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Preface

The College of Education at the University of Nevada, Las Vegas is in a particularly unique and promising position to affect and inform education locally, regionally, nationally, and internationally. The College produces more new educators for Nevada’s schools than any other provider—nearly as many as all other providers combined. Situated in the fifth largest school district in the U.S., the College is deeply and collaboratively engaged with the school district in research of and in urban settings. As the largest college of education in the state, the College’s faculty comprises the largest single, non-partisan source of information, models, and new ideas associated with educational practice, research, and policy, and understanding the unique needs of education in Nevada is a top priority for us. This publication is a concrete product that demonstrates these attributes.

The 10 papers that constitute this volume have been prepared with the intent of informing thoughtful policy development around particularly acute educational issues in Nevada. The faculty who prepared these papers sought to provide policy makers with trustworthy and meaningful summaries on which policy decisions can be made, and legislation can follow, that allows for sustainable, high quality education in Nevada.

You are invited to contact the College of Education’s communications and outreach coordinator should you seek further information or detail about any of the issues we have addressed:

Kelsey Hand
kelsey.hand@unlv.edu
702-895-4551

We hope that those who develop education policy, as well as those responsible for implementing educational policy, will find these papers and the availability of the researchers who prepared them to be of benefit.

Kim K. Metcalf, Ph.D.
Dean of the College of Education
University of Nevada, Las Vegas
Higher Education Funding in Nevada

Kim Nehls, Ph.D.
Holly Schneider, Ph.D.
Oscar Espinoza-Parra, M.Ed.
Elena Nourrie

Our nation’s rapidly evolving, technologically oriented economy is driving a surge in demand for skilled employees; two-thirds of all jobs created in the coming decade will require some form of postsecondary education. In response, the United States has established a goal of achieving a 60 percent postsecondary degree or certificate attainment among the nation’s labor force by 2025, equating to an additional 62 million Americans. Based upon the current trajectory, the U.S. will produce only 39 million such graduates, 23 million short of the goal. At the same time, funding constraints and other factors have resulted in a 20 percent decrease in total state appropriations to public baccalaureate-granting institutions. Innovative approaches to funding postsecondary education are required to meet America’s demand for skilled workers.

Nevada Facts & Statistics

- Nevada ranked 45th in the nation for per-capita higher education support in FY 2014.
- Between 2010 and 2015, per-student higher education appropriations in Nevada decreased by 34.5 percent. In response, tuition and fees at all public higher education institutions increased between 36 and 46 percent during that span.
- Recession-era budget cuts to the University of Nevada, Las Vegas reduced its faculty levels to 60 percent of peer institutions throughout the nation.
- Reductions in state allocations also caused reduced course offerings, program closures and degree eliminations at the University of Nevada, Reno, Great Basin College, Truckee Meadows Community College, and Western Nevada College.
- At the College of Southern Nevada, nearly 5,300 students were unable to enroll because funds to expand available classes and student services were insufficient.
- 23 percent of Nevada families earn $30,000 or less annually; they would need to invest more than 60 percent of that total to attend a four-year Nevada university.

U.S. Facts & Statistics

- The 2008 recession resulted in a 25 percent reduction in average educational appropriations.
- Since 2008, college affordability has declined in 45 states as institutions have replaced state funding with increased tuition and fees.
- Reliance on net tuition to finance higher education has increased from approximately 25 percent to nearly 50 percent during the past two decades.
- By 2020, it is projected that 62 percent of jobs will require postsecondary credentials.

Recent Actions in Nevada

- In fall 2015, Nevada System of Higher Education institutions collectively enrolled more than 106,500 students, an increase from the previous year.
- NSHE’s “Achieving the Dream” initiative provides broad-based assistance to community college students.
- Nevada successfully pursues external funding opportunities such as STEM workforce training programs and health care education grants.
- The state’s “15 to Finish” program encourages students to complete a full 15-credit schedule each semester for improved on-time graduation.

Considerations for Future Actions

Given Nevada’s desire to diversify and strengthen its economy while reducing reliance on public assistance programs, the following steps warrant evaluation:

- Analyze all state expenditures to identify opportunities to bring funding of postsecondary education up to the national average.
- Encourage full-time enrollment by providing block tuition policies that allow students to take up to 15 credit hours per semester at no additional charge beyond 12 credits.
• Provide predictable tuition policies that hold tuition constant for a full four years, or establish incremental increases that allow families to plan over multiple years.

Statewide Benefits of Future Action
• National average labor earnings of young adults with a baccalaureate degree are 60 percent higher than for high school graduates.
• Higher levels of educational attainment are associated with higher levels of employment in managerial and professional occupations.
• Higher-earning workers make greater tax contributions to the State of Nevada and have more spending power, which bolsters local economies.
• Postsecondary education is also correlated with increased labor productivity and analytical skills.
• Societally, higher education is linked to improved health, reduced infant mortality, lower public assistance use and higher voter participation.

Implications of Maintaining Status Quo
• The population of Nevada, currently reported at nearly 3 million, is projected to increase to 3.5 million by 2020. Without mitigation, this growth will only exacerbate the stresses on a system already ill-equipped to accommodate the current student population.
• Low rates of postsecondary education will inhibit Nevada’s ability to diversify economically and participate in the 21st century economy.
• Despite its favorable tax climate, poor educational rankings will reduce Nevada’s ability to attract business investment, especially from technologically oriented companies.

Introduction
Former President Obama, the Lumina Foundation, and other educational agencies have set a goal calling for 60 percent of the labor force to have a postsecondary degree or certificate by 2025. To reach this goal, 62 million Americans must graduate with a postsecondary degree or credential in the next decade. At current rates, the U.S. will produce only 39 million such graduates, leaving a gap of 23 million (White & Crane, 2016). While there are nationwide calls for increases in college-educated adults, at the same time there is a nationwide trend of disinvesting in public universities. Total state appropriations across all public baccalaureate-granting institutions declined from $54.5 billion in 2001–2002 to $45 billion by 2011–2012, a nearly 20 percent decrease (Jaquette and Curs, 2015). In order to bridge the graduation gap, states must invest in higher education to meet attainment goals, which reflect the need for a more educated and competitive workforce. Our rapidly changing economy is demanding high-skilled employees. According to the Georgetown Center on Education and the Workforce, two-thirds of all new jobs created will require some form of postsecondary education.

Nowhere is a greater fiduciary investment needed than within the state of Nevada. Only 28 percent of Nevada’s adult population has earned a college degree, the lowest college-degrees rate in the nation (U.S. Department of Education, 2012). If Nevada wants to continue to attract technology companies such as Switch and new industries such as Tesla, as well as provide quality support services in medicine, law, and education, research suggests that our state must increase its investment in higher education. Without state support for higher education, the cost of attendance is placed on students and their families, shifting the burden to the residents of the state through increased tuition and fees and privileging out-of-state students who can pay more in tuition (Jaquette & Curs, 2015). State support makes college more affordable and thus more attainable for all. Therefore, this policy paper will focus on two main areas: the condition of Nevada state appropriations for higher education, and the opportunities and benefits for investing in post-secondary education.

Figure 1 shows the interrelationships among the various entities involved in financing higher education in the State of Nevada.
The burden of educational costs is divided between students and institutions, with some emphasis on governmental support from local, state, and federal entities. However, state appropriations have declined dramatically in recent years, placing additional burden on students and institutions. Students and institutions are picking up a greater percentage of the funding for higher education.

### Past Funding in Nevada

The economic recession of 2008 invited austere declines in educational appropriations to public higher education institutions across the United States. Pre-recession in Fiscal Year (FY) 2008, the national average for state appropriations was $8,220 per full-time student (SHEEO, 2016). Following the recession, the United States average for educational appropriations hit a low point of $6,177 in 2012, a reduction of 25 percent. While reduced public-sector expenditures are an expected component of recessionary cycles, SHEEO indicated that the impact hit higher education harder than other areas of public funding.

Public institutions in the state of Nevada were directly affected by the recession and the resulting budget cuts. Impacts of the budget cuts on Nevada’s public higher education institutions were extensive: According to Nevada System of Higher Education’s (NSHE) 2013 Legislative Report, institutions across the state saw severe cuts in faculty, personnel, and support services, and many universities experienced program closures. The report indicates that these cuts placed University of Nevada, Las Vegas (UNLV) at 60 percent of the faculty compared to peer institutions. Further, the report revealed that Nevada State College (NSC) and College of Southern Nevada (CSN) saw increases in student enrollment paired with cuts in state support, which rendered them unable to offer certain classes and expand student services. In fact, by 2010, when CSN’s enrollment reached its peak, nearly 5,300 students were unable to enroll at the institution (NSHE, 2013). The budget cuts also resulted in program closures, degree and program eliminations, faculty and staff departures, and reduced course section offerings at the University of Nevada, Reno (UNR), Great Basin College (GBC), Truckee Meadows Community College (TMCC), and Western Nevada College (WNC). The significant decreases in funding, paired with increased competition over federal and state grants, also led to a loss of 43 research faculty at Desert Research Institute (DRI). Overall, the cuts made to funding public higher education in the state of Nevada sig-

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**Figure 1. How Higher Education is Funded**

![Diagram of how higher education is funded](http://www.higheredinfo.org/catcontent/cat8.php)

**Source:** NCHEMS (2016) [http://www.higheredinfo.org/catcontent/cat8.php](http://www.higheredinfo.org/catcontent/cat8.php)
Nehls et al.

significantly impacted students, faculty, and staff.

By Fiscal Year (FY) 2013, about 5 percent of tax revenues in Nevada were allocated to higher education, falling below the national average of 5.5 percent (SHEEO, 2016, p. 54). Data from FY 2014 placed Nevada at 45th in the nation for higher education support per capita and 44th in the nation for higher education support per $1,000 of personal income (SHEEO, 2016, p. 55). The result was an increase in student tuition and fees; the combined in-state tuition and fees in the state of Nevada increased by between 36 percent and nearly 46 percent at all public institutions between the 2009 and 2015 academic years (IPEDS, 2016). Published out of state tuition and fees increased between 15 percent and 23 percent over the same period, and greater emphasis was placed upon recruiting and retaining out-of-state and international students (Jaquette, Curs, & Posselt, 2015).

Jaquette, Curs, and Posselt (2015) developed institution-level panel models that revealed growth in the proportion of nonresident students was associated with a decline in the proportion of low-income students and a decline in the proportion of underrepresented minority students. This negative relationship was stronger at universities in high-poverty states and in states with large minority populations like Nevada. These findings yield insights about the changing character of public institutions of higher education, and raise questions about access and retention for the most vulnerable students in Nevada. There is a clear shift of tuition costs onto individuals and families living within the state who want to pursue higher education. Table 1 shows both year-over-year percent change and the six-year percent change.

Nevada’s increases to tuition and fees during the recession reflect a national trend. SHEEO (2016) reported, “Net tuition revenue per student tends to increase most rapidly during periods of recession, shifting more of the cost of higher education to students and families.” (p. 22). The Institute for Research on Higher Education (2016) also indicated a decline in college affordability in 45 states since 2008. The next section discusses the current impacts of these trends on higher education funding in Nevada and the United States.

Table 1. Percent Change in Nevada’s Published Tuition and Fees (NCHEMS 2016)

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<td>College of Southern Nevada</td>
<td>39.6</td>
<td>15.3</td>
<td>3.9</td>
<td>1.1</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Great Basin College</td>
<td>39.6</td>
<td>15.3</td>
<td>3.9</td>
<td>1.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nevada State College</td>
<td>45.9</td>
<td>23.3</td>
<td>5.7</td>
<td>4.5</td>
<td>0</td>
<td>0</td>
<td>-0.4</td>
</tr>
<tr>
<td>University of Nevada, Las Vegas</td>
<td>36.2</td>
<td>19.6</td>
<td>3.5</td>
<td>1.1</td>
<td>0.3</td>
<td>0.1</td>
<td>-0.2</td>
</tr>
<tr>
<td>University of Nevada, Reno</td>
<td>36.8</td>
<td>19.7</td>
<td>4.4</td>
<td>1.4</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>Western Nevada College</td>
<td>39.6</td>
<td>15.3</td>
<td>3.9</td>
<td>1.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Truckee Meadows Community College</td>
<td>39.6</td>
<td>15.3</td>
<td>3.9</td>
<td>1.1</td>
<td>0</td>
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</table>

*Rounded to the nearest tenth; IS** = In state; OS*** = Out of state (Source: IPEDS Data)
**Higher Education Funding**

Present Funding in Nevada

Despite signs of economic recovery, data from SHEEO (2016) indicate educational appropriations per student are still below the 2008 pre-recession high, having decreased by approximately 15 percent between 2010 and 2015. Over the same five-year period, higher education appropriations in Nevada decreased by 34.5 percent. Additionally, Nevada has become increasingly reliant on net tuition, with an increase of 39.8 percent between pre-recession 2008 and FY 2015 (SHEEO, 2016, p. 41). Even with the increase in net tuition, Nevada has seen a 17.7 percent decrease in total educational revenue per full-time student from 2008 to 2015. In fact, Nevada ranked second only to Texas in terms of decreased total educational revenue per full-time equivalent (FTE) from 2010-2015 (SHEEO, 2016). As of FY 2015, Nevada falls below the national average in both educational appropriations per FTE and total educational revenue per (FTE) (SHEEO, 2016). National trends indicate that reliance on net tuition to finance higher education has jumped from around 25 percent to nearly 50 percent in a little over two decades (SHEEO, 2016).

These trends have implications for college access and affordability, particularly for public two-year institutions, which have historically provided access to higher education as an affordable option for students. According to an analysis by the Institute for Research in Higher Education (2016), this is no longer the case in most states. Nevada is one of 16 states educating 40 percent or more of students in public two-year institutions. And in Nevada, 23 percent of families fall within the bottom income quintile, meaning that they earn $30,000 or less annually (Institute for Research on Higher Education, 2016). These recent increases would now require families in the bottom income quintile to invest nearly 40 percent of their income to enroll in these institutions. Therefore, nearly a quarter of the Nevada population is unable to afford even a two-year college education at these levels.

An additional 44 percent of Nevada’s undergraduates attend either UNLV or UNR, where low-income families can expect to spend an average of 62 percent of their income (Institute for Research on Higher Education, 2016b). These recent increases would now require families in the bottom income quintile to invest nearly 40 percent of their income to enroll in these institutions. Therefore, nearly a quarter of the Nevada population is unable to afford even a two-year college education at these levels.

Future Funding in Nevada.

The Georgetown Center for Education and the Workforce and the Institute for Research in Higher Education (2016b) project that 62 percent of jobs will require postsecondary credentials by 2020, yet in 2014 less than 30 percent of Nevada’s adults held an associate’s (two-year) degree or higher. The figures are more critical for people of color living in Nevada. For example, less than 15 percent of Hispanics and less than 25 percent of Blacks living in Nevada have earned a two-year degree or higher.

**Figure 2. Percentage of Nevadans with an Associate’s Degree or Higher by Race/Ethnicity**

Source: Institute for Research in Higher Education, 2016b

To reiterate, without state support for higher education, the cost of attendance is placed on the students and their families, shifting the burden to the states through increased tuition and fees. For families in the lower income bracket, as well as underrepresented minorities in higher education,
a postsecondary degree may become further from their reach if tuition continues to rise, especially at the state’s two-year public institutions, where these students are overrepresented (Baum, Ma & Payea, 2013). It is anticipated that the student share of total educational revenues will exceed 50 percent by the next economic downturn (SHEEO, 2016). The emphasis on fiscal support for Nevada higher education cannot be overstated: State support makes college more affordable, and thus more attainable for all individuals in the state.

In order to achieve the state’s attainment goals, a concerted effort is needed to execute state-level appropriations toward higher education. In his 2016 Education Commission report, McGuinness remarks that state governing systems must shift from managing institutions to providing strategic leadership. The governor, legislative leaders, and higher education leaders must align strategic plans with finance policy to support long-term goals of attainment. Leaders in Nevada must be intentional about supporting the missions of its public higher education institutions and ensuring the public has affordable access to these institutions.

Who is Attending College in Nevada?

Today’s colleges and universities try to encourage attendance by a heterogeneous, multifaceted student population that reflects the changing demographics of the nation and Nevada (Nevada Department of Taxation, 2016). Nevada has fallen behind the national average for all levels of college educational attainment while the number of people in the state with a high school diploma or less has increased (See Figure 3).

Chart 1. Educational Attainment of 25 to 64 Year Olds in 2005 – Nevada and the U.S. Average

The State of Nevada and the Nevada System of Higher Education recognize the value-added benefits and significant economic prosperity associated with having more college graduates enter the labor workforce. The primary objectives of NSHE (2016a) are to produce cultural, economic, and social benefits for the state by building educational programs that are interrelated to research, scholarship, and public service. Through the statewide higher education system, public colleges and universities in Nevada enroll a significant number of certificate, undergraduate, graduate, professional degree, non-degree, and workforce students. Eight public institutions located in different towns, cities, counties, and regions of the state comprise NSHE. The mission of NSHE (2016a) is to produce a college-educated population. Specifically, NSHE’s goal is to produce:

an educated and technically skilled citizenry for public service, economic growth and the general welfare contributes to an educated and trained workforce for industry and commerce, facilitates the individual quest for personal fulfillment, and engages in research that advances both theory and practice (p. 2).

As such, NSHE institutions are responsible for preparing college students to compete and succeed in the 21st century global economy.

The U.S. Census Bureau (2015) reported that Nevada had almost three million citizens residing in the state. By 2020, the State Demographer for Nevada (2016) projects that the population will exceed 3.5 million citizens. A recent publication by NSHE (2015), Expanding Degrees: NSHE’s Role in Building a New Nevada, reveals the statewide strategic goals to expand higher education access to its diverse student populations, and also the critical need to improve the quality of its academic offerings. In fall 2015, all NSHE institutions collectively enrolled 106,565 students, a system-wide increase from the previous year’s enrollment figures (NSHE, 2016b).

However, the low levels of postsecondary attainment mentioned earlier within different sectors of the Nevada population warrant concern about the significant financial losses for the state when the majority of the population fails to pursue higher education. Additionally, the majority of Nevadans are not reaping the economic, social, and individual benefits generated from achieving a bachelor’s degree or higher. In particular, the low
Higher Education Funding

college enrollment and graduation rates of low-income and students of color across all levels create further economic, educational, and social inequities in the State (U.S. Department of Education, 2015a; McMahon, 2009). Additionally, Nevada’s economic vitality and competitive advantage are dependent upon the number of college graduates the higher education system produces for the state. The significant number of Nevada residents who do not pursue an undergraduate education is troublesome for long-term economic vitality (U.S. Bureau of Labor Statistics, 2015). To further reiterate, student college matriculation and bachelor degree graduation rates vary considerably by students’ socioeconomic status, race and ethnicity, and gender (Perna, 2005).

Why is Higher Education Important?

First, the trends in employment rates by educational attainment demonstrate the differences in labor earnings among high school dropouts, high school graduates, and college graduates. In 2014, the national average labor earnings of young adults with a baccalaureate degree ($49,000) were significantly higher compared to high school graduates ($30,000) and adults without high school diplomas ($25,000) (The Condition of Education, 2016). Statistically, the employment rate is also significantly higher for college graduates than high school dropouts. In 2015, bachelor’s degree holders had a labor employment rate of 89 percent, in comparison to high school dropouts at 51 percent. These data suggest that college graduates are nine times more likely to be employed in the labor workforce as compared to those that did not finish their compulsory education. Unfortunately, Nevada ranks last in the nation when it comes to adults who have earned their high school diploma (See Figure 4 on following page).

During the next decade, more than half of all occupations in the United States will require some form of postsecondary education (BLS, 2015). Furthermore, the U.S. Bureau of Labor Statistics (2015) reported that, between 2014 and 2024, total employment is projected to grow by 6.5 percent, and the fastest-growing occupations will require postsecondary education for entry (BLS, 2015). In other words, the U.S. national projections for the next decade predict that new job openings will primarily require some postsecondary education, whereas existing replacement (i.e., lower-skill) jobs—which typically do not require formal education beyond high school—will decrease in number (BLS, 2015, 2014b). Also important to note is that, per labor statistics, the earnings of lower-skilled workers have not grown since 1980. This group has experienced the lowest employment rates in the last three decades and, most significantly, during the most recent economic recession (McMahon, 2009; BLS, 2015).

Numerous research studies have reported evidence that the U.S. unemployment rate is lower among university graduates in comparison to high school graduates or dropouts (Becker, 1993; McMahon, 2009; OECD, 2014a, 2014b). Further, much of the educational comparative and international research supports that higher levels of educational attainment are associated with higher levels of employment in managerial and professional related occupations (BLS, 2015, 2014b; OECD, 2014). Highly-educated persons living in Nevada are important to the state because higher-earning workers provide greater tax revenue to states, and individuals have greater spending power within the state (Perna, 2005). Additional years of educational attainment also increase labor productivity and earnings and improve problem-solving and analytical skills (Becker, 1993; Perna, 2005).

Lifetime Benefits of Higher Education

Higher levels of educational attainment generate not only economic returns for an individual, but also “non-economic benefits in the realms of cognitive learning, emotional and moral development, citizenship, family life, consumer behavior, leisure, and health for an individual and benefits in terms of neighborhood effects and growth in the national economy for society” (Perna, 2005, pp. 25-26). Often, prospective students and parents focus on the rising costs of attending college and the potential economic return of investment with little consideration of the non-economic, private, and public good benefits that are expected to accrue through a person’s lifespan.

The U.S. Bureau of Labor Statistics (2014a) provides evidence to the common question college students, parents, and families ask regarding the difference that a college education can make in securing a job and obtaining higher earnings. The data indicate that higher levels of education are associated with higher wages. Some of the short- and long-term economic benefits of
Figure 4. Percentage of Adults 18-24 with a High School Diploma

<table>
<thead>
<tr>
<th>State</th>
<th>Percentage</th>
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<tbody>
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<td>New Hampshire</td>
<td>77.8%</td>
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<tr>
<td>Delaware</td>
<td>77.6%</td>
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<tr>
<td>Idaho</td>
<td>77.3%</td>
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<tr>
<td>Alaska</td>
<td>76.9%</td>
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<td>Ohio</td>
<td>76.8%</td>
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<td>Missouri</td>
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<td>Indiana</td>
<td>76.5%</td>
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<td>Arkansas</td>
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<td>Washington</td>
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<td>Colorado</td>
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<td>Tennessee</td>
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<td>Kentucky</td>
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<td>Oklahoma</td>
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<td>Oregon</td>
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<td>70.5%</td>
</tr>
<tr>
<td>Georgia</td>
<td>70.0%</td>
</tr>
<tr>
<td>Arizona</td>
<td>69.2%</td>
</tr>
<tr>
<td>Texas</td>
<td>68.6%</td>
</tr>
<tr>
<td>Nevada</td>
<td>66.7%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, Decennial Census
baccalaureate degree attainment (and higher) include upward mobility in social and occupational status. In *Higher Learning, Greater Good: The Private and Social Benefits of Higher Education*, McMahon (2009) noted the significant relationship of postsecondary education to the economic vitality of individuals, families, organizations, societies, and nations. He found that higher education degrees provide direct and indirect market effects to society. The private and social returns benefit future generations and accumulate to society through different measures. These lifetime benefits include:

- Advancement of democratic principles (e.g., fair voting rights, greater participation in volunteer and civic organizations)
- Better management of diet and health (e.g., reduction in smoking)
- Wider participation in democratic processes
- Greater respect for diversity
- Higher levels of happiness
- An increase in women’s education and human rights
- Lower levels of infant mortality
- Reduction of the college skill deficit in the general population
- Reduction of economic and social inequality (Becker, 1993; McMahon, 2009; Skocpol & Fiorina, 1999; Stigliz & Greenwald, 2014).

The impact of higher education is not to be taken lightly: A college education produces sustainable benefits to the state economy and promotes and sustains democratic principles. It also produces long-term effects for future generations (Becker, 1993; McMahon, 2009; OECD, 2014). Several studies have noted that higher education yields direct and indirect economic benefits such as income, taxes, improvements in health, birth rate, and voter participation (Becker, 1993; McMahon, 2009; Stigliz & Greenwald, 2014). Becker (1993) posited that individuals with higher levels of educational attainment achieve a better life and gain a greater appreciation for literature and culture that are not necessarily monetary benefits but are essential qualities and traits for a civic and well-rounded life. Economic impact studies have found that colleges and universities produce lifelong learners with advanced skills, training, motivation, and knowledge to succeed in labor markets (Becker, 1993; McMahon, 2009). Additionally, higher education reduces the likelihood of college graduates to utilize welfare and public assistance than high school dropouts or graduates, which is another benefit to the state.

In summary, Nevada public colleges and universities produce cultural, economic, and social benefits and development for society through the accumulation of academic and community-oriented activities that college students participate in after their undergraduate years (Bergeron & Martin, 2015; Stigliz & Greenwald, 2014). Higher education serves as a vehicle for upward mobility and contributes both private and public benefits in society (Becker, 1993, McMahon, 2009, Stigliz & Greenwald, 2014). College graduates obtain non-economic, private and public benefits throughout their lifespan (McMahon, 2009; Perna, 2005). The educational preparation students receive in Nevada public colleges and universities produce economic growth and development for the State. Nevada colleges and universities produce college graduates that provide extensive benefits to local, region, and state economies. The NSHE (2015) report concluded that “For the State, public higher education grows as a critical asset, invaluable to every citizen and inextricably woven into the fabric of each community” (p.12).

The State of Nevada and the entire U.S. may be able to maintain its competitive advantage via its rich higher educational systems that prepare the next generation of leaders to compete and succeed in the 21st century global economy.

**Exemplary Models from Other States**

The Lumina Foundation is at the forefront of the goal for 60 percent of the labor force to have a postsecondary degree or certificate by 2025. On Lumina’s website, states are urged to develop a statewide plan to focus and sustain necessary changes in policy and practice to reach the state higher education attainment goal. Lumina cites exemplary models from other states that have strong, ambitious, equity-minded postsecondary educational attainment goals to drive increases in attainment. An analysis of the goals revealed several common characteristics:

- The goal is quantifiable. It includes a number or percentage increase that can be quantitatively measured over time.
- The goal is challenging. It requires “stretching” in that it cannot be easily achieved through population increases.
- The goal includes a long-term target date that is
tied to a specific date to demonstrate commitment and drive expectations.

- The goal addresses equity through closing post-secondary attainment gaps for underrepresented populations such as minority, low-income and working adult (age 25 and older) populations.
- The goal is codified in a way that it serves as the overarching framework for the state’s postsecondary strategic plan, budgeting practices and state policy initiatives, such as articulated in statute and/or the state’s strategic plan for post-secondary education.

A few of the exemplary state goals include Closing the Gap 2020: A Master Plan for Arkansas Higher Education, Maryland Ready: Maryland State Plan for Postsecondary Education, and Preparing Missourians to Succeed: A Blueprint for Higher Education. At this juncture, Nevada does not appear to have an attainable goal and plan for closing the postsecondary achievement gaps in the state, nor state backing or funding to make a plan possible.

The state of Indiana has developed a three-phase goal to increase the number of Indiana residents with educational degrees and credentials (See Figure 5 on next page). Indiana’s strategy is around three key areas: Completion, Competency, and Career. Nevada could adopt a plan like Indiana’s as a blueprint for success in this state.

**Conclusion and Recommendations**

NSHE institutions are accountable for preparing Nevada’s constituents to compete and contribute to the local and global economy. Insufficient college enrollment and graduation rates of low-income and students of color exacerbate social, educational, and economic inequities in the state. Increasing higher education funding could increase the number of students attending and graduating from NSHE institutions. Doing so will help ensure Nevada’s percentage of college graduates increases and improve the state’s current standing relative to the national average. The competitive and economic advantages are vital to the success of Nevada’s population at individual, community, and state levels. College education produces sustainable, long-term benefits to the economy, serves communities, promotes and sustains democratic principles, and affects change for future generations.

Due to the lack of funding, many states have abandoned the idea of institutions of higher education serving as a “proud tradition serving as an engine of social mobility” (Gerald & Haycock, 2006, p. 3). In stark contrast to original open-access objectives, the lack of state funding for colleges and universities in Nevada have instead perpetuated disparities between existing socioeconomic groups and “grown disproportionately whiter and richer even while the number of low-income and minority high school graduates in their states grow” (ibid). To account for reductions in state funding, leading institutions have adopted strategic admissions policies in order to attract wealthy, competitive, nonresident students (Jaquette, Curs, & Posselt, 2015, p. 636). In doing so, institutions ignore the needs of changing demographics within their respective communities. Further, students from communities surrounding such institutions experience discontinuity as they move between local high schools and postsecondary institutions.

Despite public research universities’ commitments to access, Jaquette et al. (2015) noted that declines in state support have compelled public universities to reconstruct financial aid policies and increase the number of admitted nonresident students. Reversing this trend will require collective commitment to the democratic focus of public higher education, including renewed financial support by state governments and heightened attention by public university leaders to the needs of their states and communities.

According to Greenstone and Looney (2011) of the Brookings Institution’s Hamilton Project, “[on] average the benefits of a four-year college degree are equivalent to an investment that returns 15.2 percent per year. This is more than double the average return to stock market investments since the 1950s and more than five times the returns of corporate bonds, gold, long-term government bonds, or homeownership. From any investment perspective, education is a real deal.” Numerous benefits are emphasized through the Education Pays (2013) series by the College Board. Individuals with higher levels of education earn more and are more likely than others to be employed. Federal, state, and local governments enjoy increased tax revenues from college graduates and spend less on income support programs for college graduates which provide a direct financial return on investments in postsecondary education. Further, college-educated adults are more likely to receive health insurance and pension benefits from
Figure 5. A State Agenda to Increase the Value of Higher Education in Indiana
Nehls et al.

their employers. Adults with greater education are also more active and lead healthier lifestyles, which reduce costs associated with health care. College education increases likelihood that adults will advance through the socioeconomic ladder and thus generate progressive change for the state.

According to the Institute of Higher Education Policy (1998), public economic benefits of higher education are prolific (See Table 2). These benefits include increased tax benefits, greater U.S. growth productivity, higher consumer spending, increased workforce flexibility, reduced reliance upon government support including TANF, food stamps, Medicaid, and housing assistance, reduced crime rates, increased civic responsibility, and increased community service.

Table 2. The Array of Higher Education Benefits Adapted from Institute for Higher Education Policy, 1998, p. 20

<table>
<thead>
<tr>
<th>Economic</th>
<th>Public</th>
<th>Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Tax Revenues</td>
<td>Higher Salaries and Benefits</td>
<td></td>
</tr>
<tr>
<td>Greater Productivity</td>
<td>Employment</td>
<td></td>
</tr>
<tr>
<td>Increased Consumption</td>
<td>Higher Savings Levels</td>
<td></td>
</tr>
<tr>
<td>Increased Workforce Flexibility</td>
<td>Improved Working Conditions</td>
<td></td>
</tr>
<tr>
<td>Decreased Reliance on Government Financial</td>
<td>Personal/Professional Mobility</td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduced Crime Rates</td>
<td>Improved Health/Life Expectancy</td>
<td></td>
</tr>
<tr>
<td>Increased Charitable Giving/Community Service</td>
<td>Improved Quality of Life for Offspring</td>
<td></td>
</tr>
<tr>
<td>Increased Quality of Civic Life</td>
<td>Better Consumer Decision Making</td>
<td></td>
</tr>
<tr>
<td>Social Cohesion/Appreciation of Diversity</td>
<td>Increased Personal Status</td>
<td></td>
</tr>
<tr>
<td>Improved Ability to Adapt to and Use</td>
<td>More Hobbies, Leisure Activities</td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There is an urgent need to create and adopt state higher education finance strategies that promote lower cost pathways, increased access, and higher completion rates to eliminate established equity gaps and meet the nation’s educational attainment goals. State funds may be allocated more effectively as leaders intentionally examine current procedures regarding state funding. Investment in higher education necessitates more alignment between allocation of funds and student financial needs. Such alignment derives from reevaluating the underlying business model of higher education (Snyder, Fox, & Moore, 2016, p. 39).

In the State Finance Policy Best Practices (2016), it is noted that tuition policies do not typically rest with state policymakers. However, states may utilize the following recommendations to help frame and develop tuition policies in ways that better align with student completion needs:

- Encourage full-time enrollment by providing block tuition policies that allow students to take up to 15 credit hours per semester at no additional charge beyond 12 credits, which will allow students to complete a credential on time; and
- Provide predictable tuition policies that hold tuition at a constant rate for a full four years or establish predictable increases that allow students and families to plan over multiple years.

Continual budget cuts will not sustain Nevada’s public institutions of higher education. Increasing deficits will further weaken public universities, diminish quality, eliminate resources, and restrict opportunities for students, families, faculty, staff, and stakeholders. Such deficits simultaneously weaken the potential to reach additional students and ultimately improve the state of education in Nevada.

References


High Quality Career and Technical Education: Implications for Nevada

Xue Xing, Ph.D.
Howard R. D. Gordon, Ed.D.

Within the next decade nearly half of the employment opportunities in Nevada are projected to be categorized as “middle-skill” jobs, positions that require more education and training than a high school diploma but less than a four-year college degree. Despite open positions, unemployment and underemployment will persist if these middle-skill workers cannot be cultivated in sufficient numbers. Career readiness is generally assessed on three categories: academic knowledge, technical skills, and employability skills. While the first two categories are self-explanatory, the other two warrant a brief explanation. Employability skills refer to the suite of abilities seen as critical to success by employers; examples include critical thinking, adaptability, collaboration, responsibility and communications. Career and Technical Education (CTE), which in the past was alluded to as “vocational training,” is designed to address the second and third facets of career readiness.

Nevada Facts & Statistics
- CTE programs in Nevada are organized into 15 career clusters and 75 distinct pathways.
- Within CTE-focused high schools, graduation rates (84 percent) were significantly higher than the overall high school graduation rate average.
- 91 percent of CTE high school graduates met performance goals for reading/language arts, while 89 percent met mathematics goals.
- 97 percent of CTE postsecondary students proceeded to the workforce, military or an apprenticeship.
- Projected demand in Nevada for middle-skill jobs through 2020 is equal to demand for high- and low-skilled employees combined.

U.S. Facts & Statistics
- Apprenticeship is widely considered the oldest form of CTE in the United States, dating from colonial times.
- The first dedicated vocational school opened in 1823, immediately sparking broad acceptance of the adoption of this educational model.
- A 2006 federal act authorized federal funding for CTE nationally; however, the allocation formula does not favor Nevada, which receives among the lowest annual allocations.
- The 2006 legislation was reauthorized in 2016 as the Strengthening Career and Technical Education for the 21st Century Act.

Recent Actions in Nevada
- Allocations from the federal fund for FY 2017 are overseen by the Nevada Department of Education, Office of Career Readiness, Adult Learning & Education Options.
- As of academic year 2013-14, Nevada had 55,076 participants in secondary CTE programs and another 27,265 in postsecondary CTE programs. For context, California has a combined 1.9 million participants in its secondary/postsecondary CTE programs.
- In 2016, the Nevada State Board of Education approved the Nevada CTE Quality Program Standards, establishing specific responsibilities for students, teachers, counselors and administrators for maintaining effective CTE programs.

Considerations for Future Actions
CTE programs have proven highly effective, both in terms of creating career-ready individuals and supporting the state’s goal of improving high school graduation rates. To build upon this success and address the current and widening middle-skill jobs gap, leadership is encouraged to explore a number of measures, including:
- Ensure the availability of adequate funding for CTE programs at both the secondary and postsecondary levels.
- Invest in the expansion of existing CTE programs based upon projected areas of demand.
- Increase emphasis on digital literacy skills within CTE programs.
- Develop assessments to measure career and college readiness before 12th grade.
- Create comprehensive CTE work-based learning methods based on successful models.
• Implement outreach programs that cultivate interest in CTE programs within Nevada middle schools.

Statewide Benefits of Future Action
• An increased pool of credentialed, mid-skill workers will close the existing middle-skill jobs gap, creating more and better-paying jobs for Nevada residents, developing our workforce and strengthening our economy.
• CTE is associated with higher graduation and employment rates, reducing dependence upon government assistance programs.
• Developing certified, qualified professionals with both technical and employability skills will position Nevada as an attractive locale for business investment.

Implications of Maintaining Status Quo
• Given the significantly higher graduation rates among high school students in secondary CTE programs, failure to expand the use of this model will inhibit overall progress in terms of overall graduation rates.
• The fields with the greatest CTE participation are technology & communications, health science, and hospitality & tourism. To the extent that enrollment in these programs does not increase to match increased business demand for professionals in these fields, a persistent skills gap is likely to remain and impair economic growth.
• The impending retirement of baby boomers, coupled with technological innovation, is expected to widen the middle-skill jobs gap; a lack of employees in relevant technical positions puts Nevada at a severe economic disadvantage.

Introduction
Academic preparation for college alone does not lead to students’ career readiness. The means recommended for preparing college-ready graduates, such as the Common Core State Standards (CCSS), rigorous courses, and selected tests aligned with those standards, fail to accommodate the varied nature of workplace and the different kinds of preparation required for successful transition into today’s workforce (Stone & Lewis, 2012). To differentiate from the “college readiness” that our systems had primarily focused on, the Association for Career and Technical Education (ACTE) defined the term “What Is Career Ready” in 2010, which has triggered nationwide discussions about college and career readiness. To be career ready, a graduate must have mastery of three major skill areas: academic knowledge, employability skills, and technical skills. Academic knowledge is essential to all functioning in today’s world, especially the occupational expression of academic knowledge (Stone & Lewis, 2012). Employability skills are seen as the most critical to workplace success by employers and include critical thinking, adaptability, problem solving, oral and written communications, collaboration and teamwork, creativity, responsibility, professionalism, ethics, and technology use. Technical skills are unique to specific occupational areas.

Career and technical education (CTE) plays a unique and value-added role in preparing students to master these skills and smoothly transit to adulthood and workforce. Research has shown that participation in CTE can effectively reduce high school drop-out rates by providing alternative delivery methods to increase students’ engagement and build student-adult relationships, especially for at-risk students (Association of Career and Technical Education, 2007). Career and Technical Student Organizations (CTSOs), as one core component of quality CTE programs, engage students in co-curricular activities, develops employability skills, and increases college aspirations and career self-efficacy (Alfeld et al., 2007).

The National Association of State Directors of Career Technical Education Consortium (NASDCTEc) has developed Common Career Technical Core (CCTC) standards for each of the 16 Career Clusters and their corresponding Career Pathways that define the knowledge and skills that should be mastered when students complete a program of study (https://www.careertech.org/CCTC). The CCTC standards also define career ready practices that apply to all programs of study, addressing the knowledge, skills and dispositions to become career ready. Some states raise the rigor of obtaining a high school diploma by requiring a CTE industry credential, licensure, or competency assessment.
**Historical Context of CTE**

CTE was previously known as vocational education. Apprenticeship is probably the oldest form of vocational education in the United States, starting from colonial America (Gordon, 2014). Apprenticeship provided basic elements such as: food, clothing, and shelter; religious instruction; general education as needed in the trade; skill training; and the “mysteries” of the trade. Apprenticeship at the time involved job training aligned with the needs of the society and provided an option for those who could not afford an education.

In the early 19th century, the American lyceum movement began, which contributed significantly to American adult education. In 1823, the first vocational trade school, Gardner Lyceum, opened in Maine. In 1824, a second school of this type, the Rensselaer School in Troy, New York was opened, providing teachers of science with the chances to apply scientific principles at farms and production-oriented workshops (Gordon, 2014). More schools were founded with increasing interest in agricultural and industrial education up to the middle of the 19th century. A political movement led by Professor Jonathan Baldwin Turner from Illinois College advocated the creation of agriculture colleges and the use of land-grants to fund a system of industrial colleges in every state, which later became the Morrill Act, signed into law by President Abraham Lincoln in 1862.

The first manual training school in St. Louis, Missouri was founded in 1879, which set the foundation for modern career and technical education. The 1917 Smith-Hughes Act provided the first federal funding for vocational education. After World War I, career and technical education received wide acceptance by the public and expanded to include adult education and training for re-entering the workforce. A surge in career and technical education during World War II occurred as technical skills were needed for defense purposes.

Career and technical education itself has evolved over the years. A 1990 federal law defined vocational education as preparation for “occupations requiring other than a baccalaureate or advanced degree.” Today, career and technical education should not be restricted to those occupations, but rather provide hands-on learning opportunities collaborating with non-vocational educators to prepare for both career and further education.

**CTE Funding**

The Carl D. Perkins Career and Technical Education Act of 2006 (Perkins IV) authorizes federal funding for CTE and provides formulas for distributing those funds at the secondary and postsecondary levels. At the secondary level, allocations to local educational agencies (LEAs) are based on the number of youth ages 5-17 who reside within an LEA’s boundaries and who live in poverty. At the postsecondary level, funds are distributed proportionately to institutions of higher education (IHEs) based on the number of students who receive Pell Grants or aid from the Bureau of Indian Affairs. In addition to federal funding, all states provide funds to support the delivery of education at the secondary and postsecondary levels, some of which are earmarked for the provision of CTE instruction. Many local CTE programs also generate their own funds in forms of monetary contributions, gifts of equipment and supplies, or in-kind donations from business, industry, and labor representatives. Table 1 shows the Perkins IV state allocations in fiscal years 2013-2015.

**Table 1: Perkins Basic State Grant – State Estimated Allocations**

<table>
<thead>
<tr>
<th>STATE/TERR.</th>
<th>FY 2013</th>
<th>FY 2014</th>
<th>FY 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>19,175,065</td>
<td>19,175,065</td>
<td>19,175,065</td>
</tr>
<tr>
<td>Alaska</td>
<td>4,214,921</td>
<td>4,214,921</td>
<td>4,214,921</td>
</tr>
<tr>
<td>Arizona</td>
<td>22,459,217</td>
<td>24,934,607</td>
<td>24,934,607</td>
</tr>
<tr>
<td>Arkansas</td>
<td>11,403,795</td>
<td>11,403,795</td>
<td>11,403,795</td>
</tr>
<tr>
<td>California</td>
<td>113,295,476</td>
<td>122,943,598</td>
<td>122,943,598</td>
</tr>
<tr>
<td>Colorado</td>
<td>14,273,168</td>
<td>15,944,320</td>
<td>15,944,320</td>
</tr>
<tr>
<td>Connecticut</td>
<td>8,596,623</td>
<td>9,466,507</td>
<td>9,466,507</td>
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<tr>
<td>Delaware</td>
<td>4,494,945</td>
<td>4,720,975</td>
<td>4,720,975</td>
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<tr>
<td>D.C.</td>
<td>4,214,921</td>
<td>4,214,921</td>
<td>4,214,921</td>
</tr>
<tr>
<td>Florida</td>
<td>56,063,464</td>
<td>61,726,876</td>
<td>61,726,876</td>
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<tr>
<td>Georgia</td>
<td>34,407,329</td>
<td>38,240,445</td>
<td>38,240,445</td>
</tr>
<tr>
<td>Hawaii</td>
<td>5,235,475</td>
<td>5,496,906</td>
<td>5,496,906</td>
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<td>Idaho</td>
<td>5,999,521</td>
<td>6,376,981</td>
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<td>38,934,174</td>
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<td>40,519,069</td>
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<td>Iowa</td>
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<td>Kansas</td>
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<td>Kentucky</td>
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<td>17,905,647</td>
<td>17,905,647</td>
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<tr>
<td>Louisiana</td>
<td>21,041,943</td>
<td>21,041,943</td>
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</tr>
</tbody>
</table>
State Approaches to Funding CTE programs

The U.S. Department of Education, Office of Career, Technical, and Adult Education (2014) released a report that described various approaches through which states funded CTE in the 2011-2012 academic year. The report showed that states’ strategies to financing CTE fell into three categories:

- Foundational funding only – general state funding that provide no earmark for CTE (local administrators must decide how funds should be distributed).
- Funding for area CTE centers – dedicated funds for area CTE centers that deliver CTE services to part-time students (do not include comprehensive high schools or community or technical colleges).
- Categorical funding – dedicated funding exclusive for CTE programs distributed to LEAs and IHEs to support career-related instructional services. These approaches include student-based, cost-based, and/or unit-based formulas.

At the secondary level, the report indicated that majority of states (37 states) earmarked categorical funds for CTE in AY 2011-2012, eight states only relied on foundational funding for CTE, and seven states depended on foundational funding for CTE and allocated dedicated funding just to area CTE centers. At the postsecondary level, the majority (30 states) of the 37 states with available information relied on foundational funding only to support
Xing et al.

CTE at IHEs in AY 2011-2012, five states provided categorical funding for CTE, and two states directed some categorical funds to area CTE centers. It is noteworthy that the absence of categorical funding for CTE at the postsecondary level simply means that CTE funding is not differentiated from the state’s basic aid for community and technical colleges.

Some states adopt a performance-based funding (PBF) approach to facilitating allocations dependent on student or program performance. Fiscal awards are given to providers that meet state-established benchmarks or targets. At the secondary level, Texas and South Carolina reported using PBF to allocate federal Perkins IV funds, while five states (Arizona, Florida, Kansas, Missouri, and West Virginia) used PBF to allocate state CTE funds. Among those seven states, some states condition funding for CTE programs based on LEA performance, while others based funding on indicators such as placement of CTE students into postsecondary education or employment, attainment of industry-recognized credentials, or CTE completion rates. At the postsecondary level, no state reported using PBF to allocate Perkins IV funds, while four states (Arkansas, Georgia, Minnesota, and North Dakota) used PBF to allocate state funds. Some states conditioned funds allocations based on the performance of the entire community or technical college system rather than specific CTE outcomes. Indicators to distribute postsecondary funds include graduation rates, credential, and/or degree attainment.

Carl D. Perkins Reauthorization and Nevada Fiscal Year 2017 Grant Process

On July 7, 2016, the House Education and the Workforce Committee voted unanimously and approved a Perkins reauthorization bill, the Strengthening Career and Technical Education for the 21st Century Act (H.R. 5587), sponsored by Reps. Glenn Thompson (R-PA), co-chair of the House CTE Caucus, and Katherine Clark (D-MA), marking the first comprehensive reauthorization of Perkins to be considered by Congress in a decade. On the same day, the House Labor, Health and Human Services, and Education Appropriations Subcommittee approved a fiscal year 2017 education funding bill, including the Perkins Basic State Grant at $1.118 billion and Perkins National Programs at $7.4 million.

The Nevada Department of Education, Office of Career Readiness, Adult Learning & Education Options recently released Perkins IV allocations for fiscal year 2017. Table 2 summarizes the distribution of funds and receivers.

**Table 2. Carl D. Perkins State of Nevada Allocations for Fiscal Year 2017**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Grant - Secondary Education</strong></td>
<td>5,140,883.01</td>
</tr>
<tr>
<td>Carson City School District</td>
<td>100,399.61</td>
</tr>
<tr>
<td>Churchill County School District</td>
<td>37,786.39</td>
</tr>
<tr>
<td>Clark County School District</td>
<td>3,925,359.50</td>
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<tr>
<td>Douglas County School District</td>
<td>55,747.60</td>
</tr>
<tr>
<td>Elko County School District</td>
<td>86,684.09</td>
</tr>
<tr>
<td>Eureka County School District</td>
<td>1,774.02</td>
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<tr>
<td>Humboldt County School District</td>
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<tr>
<td>Lander County School District</td>
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<td>Lincoln County School District</td>
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<td>Lyon County School District</td>
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<td>Mineral County School District</td>
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<td>Nye County School District</td>
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<td>Pershing County School District</td>
<td>9,534.18</td>
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<td>Storey County School District</td>
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<td>Washoe County School District</td>
<td>693,294.53</td>
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<tr>
<td>White Pine County School District</td>
<td>13,619.41</td>
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<td><strong>Basic Grant - Postsecondary Ed.</strong></td>
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<tr>
<td>College of Southern Nevada</td>
<td>1,446,360.36</td>
</tr>
<tr>
<td>Great Basin College</td>
<td>168,099.99</td>
</tr>
<tr>
<td>Truckee Meadows Community College</td>
<td>575,042.06</td>
</tr>
<tr>
<td>Western Nevada College</td>
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<tr>
<td><strong>Corrections Grant Allocations</strong></td>
<td>98,279.13</td>
</tr>
<tr>
<td>C.O. Bastian High School</td>
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<tr>
<td>Jacobsen High School</td>
<td>24,569.78</td>
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<tr>
<td>Nevada Youth Training Center</td>
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<td>Spring Mountain Youth Camp</td>
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<td><strong>Basic Grant Reserve Allocations</strong></td>
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<td>Tech Prep Reserve Funds</td>
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<td>Competitive Reserve Funds</td>
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<td><strong>Nontraditional Grant Allocations</strong></td>
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<tr>
<td>Nontraditional Employment/Training Grant</td>
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</tr>
</tbody>
</table>

**Note:** Amount in U.S. dollars; allocations to local agencies are contingent on State receipt of the full federal award. Source: Nevada Department of Education, Fiscal Year 2017 Perkins Allocations, last updated 4/4/2016.
CTE Course Taking Patterns and Clusters

According to students’ CTE course-taking patterns, students are categorized as CTE participants or concentrators. At the secondary level, a CTE participant is a student who has earned one (1) or more credits in any CTE course, whereas a CTE concentrator has earned two (2) or more credits in a single CTE program area. At the postsecondary level, a CTE participant is a postsecondary adult student who has earned one (1) or more credits in any CTE program area, whereas a CTE concentrator is an adult student who: (a) completes at least 12 academic and/or CTE credits within a single program area sequence that terminates in the award of an industry-recognized credential, a certificate, or degree; or (b) completes a short-term CTE program sequence of fewer than 12 credit units that terminates in an industry-recognized credential, a certificate, or a degree.

Both high school and college CTE career pathways are organized into 16 distinct career clusters. The 16 career clusters are: Agriculture, Food & Natural Resources; Architecture & Construction; Arts, A/V Technology & Communications; Business Management & Administration; Education & Training; Finance; Government & Public Administration; Health Science; Hospitality & Tourism; Human Services; Information Technology; Law, Public Safety & Security; Manufacturing; Marketing Sales & Services; Science, Technology, Engineering & Math; and Transportation, Distribution & Logistics.

Student engagement in career pathways can lead to higher graduation rates. For example, among the class of 2015 in Nevada, the high school graduation rate for CTE students (concentrators) is 13 percent higher than the overall graduation rate of 70.8 percent for all Nevada high school students. This trend has been consistent over the last three years, with an average of 12 percent higher graduation rates for CTE concentrators.

Table 3. Rankings of CTE Participants in Western States for Academic Year 2013-2014

<table>
<thead>
<tr>
<th>Rank</th>
<th>Secondary State</th>
<th>Participants</th>
<th>Postsecondary State</th>
<th>Participants</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>CA</td>
<td>970,235</td>
<td>CA</td>
<td>942,427</td>
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<tr>
<td>2</td>
<td>WA</td>
<td>305,383</td>
<td>WA</td>
<td>176,248</td>
</tr>
<tr>
<td>3</td>
<td>UT</td>
<td>102,758</td>
<td>AZ</td>
<td>123,515</td>
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<tr>
<td>4</td>
<td>CO</td>
<td>96,037</td>
<td>OR</td>
<td>65,827</td>
</tr>
<tr>
<td>5</td>
<td>AZ</td>
<td>94,269</td>
<td>UT</td>
<td>65,000</td>
</tr>
<tr>
<td>6</td>
<td>ID</td>
<td>83,026</td>
<td>NM</td>
<td>53,890</td>
</tr>
<tr>
<td>7</td>
<td>NM</td>
<td>58,594</td>
<td>CO</td>
<td>51,182</td>
</tr>
<tr>
<td>8</td>
<td>NV</td>
<td>55,076</td>
<td>NV</td>
<td>27,265</td>
</tr>
<tr>
<td>9</td>
<td>OR</td>
<td>46,642</td>
<td>MT</td>
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<tr>
<td>10</td>
<td>HI</td>
<td>27,017</td>
<td>WY</td>
<td>13,555</td>
</tr>
<tr>
<td>11</td>
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<td>HI</td>
<td>9,714</td>
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<td>ID</td>
<td>CO</td>
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<td>-----</td>
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<td>-----</td>
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<td>2,344</td>
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<td>34,133</td>
<td>5,322</td>
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<td>25,722</td>
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<td>Edu.</td>
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<td>14,058</td>
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<td>439</td>
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<tr>
<td>Fin.</td>
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<td>322</td>
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<td>Gov.</td>
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<td>351</td>
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<tr>
<td>Heal.</td>
<td>53,952</td>
<td>10,500</td>
<td>5,587</td>
<td>1,880</td>
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<td>8,130</td>
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<td>1,142</td>
<td>5,077</td>
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<td>5,831</td>
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<td>AZ</td>
<td>UT</td>
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<tr>
<td>------</td>
<td>----</td>
<td>----</td>
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<td>----</td>
</tr>
<tr>
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<td>1,491</td>
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<tr>
<td>Gov</td>
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<td>63</td>
<td>401</td>
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<tr>
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<td>4,700</td>
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<td>Law</td>
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<td>2,992</td>
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<tr>
<td>Man</td>
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<td>8,028</td>
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<tr>
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<td>67,468</td>
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</table>
Tables 4a and 4b display distributions of CTE concentrators in 16 career clusters among 13 Western states, ordered from the state with the largest number of concentrators to the state with the smallest number of concentrators at the secondary and the postsecondary level, respectively. Some states (e.g., CA, WA, CO, ID, NV, and AK) had more CTE participants and concentrators at the secondary level than at the postsecondary level, except New Mexico and Hawaii, which had more CTE participants but fewer CTE concentrators at the secondary level than at the postsecondary level. Other states (e.g., UT, AZ, MT, and WY) had more CTE participants and concentrators at the postsecondary level, while Oregon had more CTE participants but fewer CTE concentrators at the postsecondary level than at the secondary level.

Secondary and Postsecondary Profiles of CTE Participation in Nevada

For academic year 2014-2015, the largest CTE concentrator enrollment in Nevada at the secondary level was in Arts, A/V Technology & Communications (19.1 percent), followed by Health Science (13.8 percent), and Hospitality and Tourism (12.8 percent). At the college level, the largest CTE concentrator enrollment occurred in Health Science (18.2 percent), followed by Hospitality and Tourism (11.0 percent), and Finance (10.8 percent).

In Nevada, secondary level CTE is available through comprehensive high schools and career and technical academies (CTA). CTAs are comprehensive high schools that integrate core academic subjects with specific career training in selected career clusters. Postsecondary level CTE in Nevada is delivered through four community colleges. The Association for Career and Technical Education reported the following 2013-2014 student performance data of CTE students in Nevada:

- 84 percent of CTE high school students graduated
- 91 percent met performance goals for reading/language arts, and 89 percent met performance goals for mathematics
- 97 percent of CTE postsecondary students went on to the workforce, the military or an apprenticeship.

Note: Nevada students take end-of course exams in math and English language arts classes. High school juniors in Nevada must take the ACT College and career readiness exam to graduate, according to the Nevada Department of Education.

The 2016 U.S. News Best High Schools ranking in Nevada included the following three technical academies:

- Advanced Technologies Academy (ranked No. 3)
- West Career and Technical Academy (ranked No.4)
- Veterans Tribute Career Technical Academy (ranked No. 8)

Figure 2. College vs. high school CTE concentrator enrollment by career cluster.
Business and Industry/CTE Licensure Requirements for Nevada

Business and Industry (Grade 7-Adult)

For Business and Industry licensure, a person must have at least a high school diploma or its equivalent and hold a valid license issued by the appropriate Nevada licensing board, as applicable (Nevada Department of Education, n.d.). In addition, five years of employment related to the endorsement area are required. Three of the five years may be met by completion of relative coursework or training in career and technical education. Each of the following will be considered equivalent to one year of full-time employment:

- 16 semester credits from an accredited or licensed postsecondary institution
- 250 hours of training from an accredited or licensed postsecondary institution
- 2,000 hours of part-time employment
- 1,000 hours of pre-planned employment (i.e. apprenticeship or on-the-job training)

For Business and Industry license first-time renewal, a person must provide proof of credit for 12 semester hours of coursework from an accredited postsecondary institution, including:

- Three semester hours in professional career and technical education courses;
- Three semester hours in a course involving career and technical education teaching methodology;
- Three semester hours in a course on applied or work-based learning; and
- Three semester hours in a course on pupil organization and management in career and technical education.

At least three semester hours of the required 12 hours must be earned within the first year of licensure. A list of approved courses can be found at the Nevada Department of Education website.

Secondary CTE (Grade 7-12)

To obtain a secondary CTE (grade 7-12) license, a person must pass the required testing (or equivalent in another state): Praxis Core Academic Skills for Educators, Principles of Learning and Teaching 7-12, and Praxis Content Area Test (if required for your desired area of licensure).

That person must also have at least a bachelor’s degree from an accredited college/university and complete relative coursework in career and technical education and specific coursework requirements for the desired area(s) of endorsement. The following comprehensive major and minor areas of endorsement may be added to a secondary CTE license:

- CTE Agricultural Education
- CTE Automotive Technology
- CTE Business Education
- CTE Child Care
- CTE Communications and Media
- CTE Construction Technology
- CTE Drafting and Design
- CTE Electronic Technology
- CTE Family and Consumer Science
- CTE Food Service
- CTE Health Occupations
- CTE Human Services
- CTE Industrial Arts
- CTE Manufacturing Technologies
- CTE Marketing Education
- CTE Technology Education

Career and Technical Education Standards

The National Board for Professional Teaching Standards (NBPTS) aims to advance the quality of teaching and learning and strengthens the pipeline of CTE teacher preparation (National Board for Professional Teaching Standards, n.d.). The NBPTS has been recognized as the “gold standard” in teacher certification. The essence of the NBPTS’ vision of accomplished teaching is captured in their five core propositions:

1. Teachers are committed to students and their learning.
2. Teachers know the subjects they teach and how to teach those subjects to students.
3. Teachers are responsible for managing and monitoring student learning.
4. Teachers think systematically about their practice and learn from experience.
5. Teachers are members of learning communities.

Role of CTE in Reducing the ‘Skills Gap’ and Engaging Millennials

Education today faces various challenges. Concerns about a lack of qualified employees in the U.S. workforce have exploded in recent years. On one hand, millions of aspiring workers remain unemployed and some report being underemployed; on the other hand, employers across industries find...
it difficult to fill open positions. The phrase “skills gap” is frequently used to refer to the difference between the skills needed for a job versus those skills processed by a prospective worker (ACT, 2011). Specifically, the “skills gap” for middle-skills jobs makes up the largest shortage of qualified workers in U.S. and Nevada labor market. These middle-skills jobs require more education and training than a high school diploma but less than a four-year college degree. Between 2010 and 2020, middle-skills jobs will constitute almost half of all job openings in Nevada (see Figure 3).

Figure 3. Job openings by skill level in Nevada, 2010-2020.

The impending retirement of baby boomers will only leave the gap wider and deeper. In addition, constant technological innovation has changed our work environment and will continue to create more new occupations. The landscape is shifting when millennials, the generation born between approximately 1982 and 2001, enter the workforce. Millennials have spent their entire lives with digital technology and nearly instantaneous information accessibility. How do educators prepare students for high-tech careers when they themselves may still be learning the technology? The required skills may be aimed at technology but are built upon higher-order thinking skills such as interpersonal communication, reasoning, and problem solving. The Organization for Economic Cooperation and Development (OECD) proposed that 21st-century skills include learning and innovation skills (e.g., critical thinking, problem solving, innovation, communication, and collaboration), information, media, and technology skills (e.g., information, media, and technology literacy), and life and career skills (e.g., flexibility, adaptability, self-direction, social skills, leadership, and responsibility). Information, media, and technology literacy are aligned with technology development, but learning and innovation skills and life and career skills are fundamental soft skills for all kinds of jobs.

CTE is the ideal path preparing workforce for middle-skills jobs and the key for preparing the workforce of the 21st century. CTE programs play a unique role in making the connections with local business in various sectors, facilitating conversations between teaching and community needs, setting clear expectations for the outcomes of programs, and integrating real-world experience for both students and teachers. CTE programs offer opportunities to access the knowledge, skills, and experience needed for students get ready for whatever career pathways they choose. CTE is seen as key to building a pipeline of opportunity-ready workers.

High Quality CTE Programs and their Characteristics

Distinguished from older models of vocational programs that contributed little to college prep or experiences beyond the classroom (Imperatore & Hyslop, 2015), high-quality CTE programs offer a promising solution to improve graduation rates, labor market earnings and, most importantly, prepare the workforce with skills needed for the 21st century (Holzer, Lane, Rosenblum, & Anderson, 2011). There is no single standard for levels of quality of CTE programs, and different states have different emphases. Researchers also provided their perspectives. For example, Symonds, Schwartz, and Ferguson (2011) proposed a blueprint of tomorrow’s high-quality CTE programs:

- Clear pathways to all major occupations should be delineated out when high school starts
- Work-linked learning should be available at the secondary level and beyond
- Employer roles should be expanded starting at middle school
- Mutual obligations from schools, employers, and government should be spelled out

James Stone, director of the National Research Center for CTE, concluded four key elements of high-quality CTE from research data (Stone, 2013): (a) rigorous programs/curriculum; (b) effective pedagogy, such as work-based learn-
Holzer, Linn, and Monthey (2013) highlighted eight characteristics of high-quality CTE programs that they believed as the most important:

1. Career-Oriented Educational Systems
   • CTE should be recognized as an integral part of the secondary school system at the district and state levels
   • A coherent education system that prepares both college and career ready students

2. Strong Options for All Students
   • High-quality CTE should be accessible to all people at different stages of life
   • No particular track should prevent students from changing plans afterwards

3. Rigorous Academic Curricula
   • CTE curricula should be consistent with the rigorous state standards in core content areas
   • Contextualized learning that integrates academic materials into projects or workplace should be emphasized
   • CTE programs can also provide direct pathways to higher education, such as dual and concurrent enrollment options

4. Rigorous Technical Skill Development
   • States and local districts can adopt/adapt/develop standards and curricula in collaboration with local businesses
   • CTE “program of study” must be carefully aligned with the skill requirements of particular occupations within the 16 career clusters

5. Employability Skills
   • CTE programs offer opportunities for work-based learning and work experience to develop skills such as communication, reasoning, problem-solving, and teamwork

6. Professional Development for Teaching Staff and Leaders
   • CTE teachers need support to integrate academic skills into instruction and develop pedagogical skills; Administrators, academic teachers, and counselors need greater understanding of the purpose and the course of study of each CTE program

7. Support Services for Students
   • Contextual remediation, small learning communities, career counseling and information, and involvement with CTSOs

8. Assessment and Accountability
   • At the program level, postsecondary programs should be held accountable for placement in the workplace or further education
   • At the federal or state level, departments of labor and educational institutions should collaborate and share data to accurately report the success of CTE programs at all levels

In October 2016, the Nevada State Board of Education approved the Nevada CTE Quality Program Standards (QPS) that specify responsibilities of the student, teacher, counselor, and school administration for establishing and maintaining highly effective CTE programs (Nevada Department of Education, n.d.). The QPS display rigorous and relevant expectations for program organization and delivery and, therefore, serve as guidance for school districts and charter schools to design, implement, assess, and improve CTE programs. The CTE QPS include the following areas:

- QPS 1.0: Career Guidance
- QPS 2.0: Program and Instruction
- QPS 3.0: Leadership Development
- QPS 4.0: Educational Personnel
- QPS 5.0: Program Planning and Promotion
- QPS 6.0: Facilities, Equipment, and Instructional Materials and Supplies
- QPS 7.0: Community, Business and Industry Partnerships
- QPS 8.0: Evaluation Systems and Accountability

These performance standards are further defined and measured by specific performance indicators in the site-based self-assessment instrument and on-site monitoring instrument.

Conclusions and Recommendations for Policy and Practice

Career and Technical Education (CTE) is an educational model that links secondary and postsecondary education to selected labor market indicators. Overall, CTE has been instrumental in solving some of the most critical problems affecting America’s educational system. A major educational goal in Nevada is to prepare secondary and postsecondary students through sequences of CTE courses leading to gainful employment and college
readiness.

Secondary and postsecondary funding in Nevada is becoming better aligned with the state’s goals and priorities. The total Perkins funds received for Fiscal Year 2015 totaled $9,650,599, about $70,000 more than in 2014. The distribution to secondary education was 68 percent, with the balance directed to postsecondary education (Advance CTE, n.d.).

CTE programs provide students with the knowledge, skills, and experience necessary to compete in today’s workforce, as revealed by several CTE success stories across the nation (e.g., see link http://gacte.org/2016/03/from-dalton-high-to-the-heights-of-philly/).

It is anticipated that the bipartisan bill, Strengthening Career and Technical Education for the 21st Century Act (H.R. 5587), will help more Nevadans acquire the tools they need to fill high- and middle-skill jobs. The bill was recently approved unanimously by the Education and Workforce Committee.

In Nevada, 21st-century CTE appears to be a powerful program that provides students with a robust combination of academic, technical, and employability skills. Nevada CTE data suggest that CTE completers are likely to graduate at a higher rate than the overall graduation rate for all Nevada students (Nevada Department of Education, n.d.). In essence, CTE is a viable and proven path to achieve career and college readiness for students in Nevada.

In the past, CTE programs consisted of seven program areas. However, today’s CTE programs are organized by 16 career clusters and 79 career pathways. In Nevada, CTE programs are organized by 15 career clusters and 75 career pathways. Thus, CTE prepares students for a variety of career choices.

As technology becomes the predominant factor for productivity in the American and global economies, a growing skills gap continues to emerge. According to Burke (2013), by 2020, 65 percent of all jobs will require a postsecondary credential. Therefore, CTE programs are more likely to provide change agents to reduce the skills gap and provide a pipeline of workers for the most demanding areas in Nevada, including skilled trades, hospitality and tourism, health occupations, and information technology.

High-quality CTE programs will likely have a positive impact on Nevada’s future competitiveness through student engagement by providing hands-on context and a rigorous academic course load.

Recommendations from the field suggest that education leaders in Nevada should consider:

• Ensuring the availability of adequate funding for CTE programs at all levels. In order to be competitive in the global economy, global-preparedness starts with education.
• Reevaluating where current funding priorities are less effective.
• Investing in the expansion of existing CTE programs. Further expansion is likely to strengthen community ties between schools and employers.
• Providing more emphasis on digital literacy skills.
• Creating assessments to measure career and college readiness before 12th grade.
• Closing the skill gaps by providing all students with access to CTE that delivers the knowledge and skills necessary to be competitive in the global workplace.
• Supporting high quality teaching in all content areas. Thus, strong emphasis on effective teaching methods for new teachers coming from business and industry.
• Encouraging more collaboration between core academic and CTE teachers in creating improvement plans.
• Working closely with business leaders to determine the state system for industry credentials.

Suggested Next Steps for Nevada

Nevada should consider developing comprehensive CTE work-based learning (WBL) methods of instruction. In the Commonwealth of Virginia, the following seven WBL methods of instruction are currently practiced and are listed from lowest to highest degree of engagement:
1. Job shadowing
2. Mentorship
3. Service learning
4. Internship
5. Clinical experience
6. Student apprenticeship
7. Cooperative education

In Virginia, students in grades 6-8 are
exposed to career exploration WBL methods (i.e., job shadowing, mentorship, introductory internship). Students in grades 9 and 10 are engaged in pre-professional development WBL methods (extended internship, service learning). In the third phase, grades 11 and 12 students are strengthening their career awareness through clinical experience, student apprenticeship, and cooperative education (also known as career preparation WBL methods) (Virginia Department of Education, 2014, pp.1-6).

References
Nevada Department of Education Office of Career Readiness, Adult Learning, and Education Options. (2015). Nevada career and technical education program descriptions. Carson City, NV.
Virginia Department of Education. (2014). Career and technical education work-based learning guide. Richmond, VA
Encouraging Young Nevadans to Choose and Complete STEM Degrees: A Choice and Retention Perspective on Science, Technology, Engineering, and Mathematics Workforce Development

Matthew L. Bernacki, Ph.D.
Harsha N. Perera, Ph.D.

In an economy increasingly characterized by and intertwined with technology, Nevada currently possesses an inadequate supply of employees trained in the areas of science, technology, engineering and mathematics (STEM). Projects such as the Tesla gigafactory and the telecommunications hub for Switch demonstrate the potential economic benefits associated with cultivating a population with these skills. The Nevada Legislature has taken important first steps in creating a foundation for effective STEM education and towards diversifying the Nevada workforce to build health and technology sectors. However, several challenges to broader STEM adoption remain. First, the number of students who choose STEM-related careers is relatively small. Second, because STEM curricula are particularly rigorous, late stage dropout is common. Programs that encourage and reward educational perseverance and support retention are critical.

Nevada Facts & Comparisons to the Nation
• Southern Nevada is ranked 97th among 100 metropolitan areas evaluated in terms of employees in STEM-related fields, with 3.6 percent of the workforce compared with 8.7 percent nationally.
• Rural areas of the state are particularly underserved. Of Nevada’s 16 counties and one independent city, only four have any STEM-specific school programs and, of those, only two counties (Clark, with 13, and Washoe, with 4) have more than one STEM program.
• However, all seven NSHE institutions provide at least some academic programs that can contribute workers to Nevada’s STEM workforce.
• STEM-related fields represent only 7.1 percent of Nevada’s Gross Domestic Product (National Average = 18 percent GDP).
• Nationally, completion rates for STEM-related bachelor level degrees are approximately 50 percent after as many as 6 years.

Recent Actions in Nevada to promote STEM Workforce Development
• SB 345 established an NSHE-based clearinghouse to provide Nevadans a comprehensive listing of STEM-related resources and opportunities, including the Nevada STEM Coalition and Nevada STEM Pipeline.
• This legislation also established programs to reward successful STEM students and educators, as well as expanding in-school STEM programming.
• A report commissioned by SB 345 (authored by Brookings West) provided recommendations for future actions, which afford actionable proposals that could be considered during the 2017 Legislative Session.

Considerations for Future Actions
Measures that could improve Nevada’s STEM education pipeline and fuel workforce development include efforts to
1. promote choice to pursue STEM (preK-12); and
2. continue to pursue degrees during the final phases before joining the workforce
Potential solutions to be implemented:

<table>
<thead>
<tr>
<th>Across Nevada</th>
<th>Promote public, private &amp; non-profit partnerships that remove cost barriers by making STEM-related informal learning centers accessible to social service recipients (food assistance, Medicaid); Science centers provide reduced/free admission to card holders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Programs:</td>
<td>Pennsylvania CHIP (NV STEM Coalition can coordinate)</td>
</tr>
</tbody>
</table>
Encouraging Young Nevadans to Choose & Complete STEM Degrees

Statewide Benefits of Future Action

- Salaries in technologically advanced fields such as telecommunications and energy are higher than for jobs in the service sector; higher incomes are correlated with increased contributions to the local economy and decreased reliance on public assistance programs.
- The growth and diversification of Nevada’s economy—which based upon national business trends are most likely to result from the importation of technology-related companies—are reliant upon a STEM-educated workforce.

Implications of Maintaining Status Quo

- With tourism providing 31 percent of the private workforce, Nevada is vulnerable to national events that impact tourism; diversifying our economy is critical, and building technology and health care sectors is particularly advantageous in terms of GDP.
- STEM-related industries generated approximately $6 billion in Gross Domestic Product during 2015, or 7.1 percent of the total output. This compares unfavorably with the national average 17.7 percent. Cultivating a qualified employee base is a prerequisite for recruiting lucrative business opportunities.

Introduction

An emerging leader in the science and technology sectors. In sectors of industry that require workers who possess scientific, technological, engineering and mathematical expertise and skills, business in Nevada is booming. Consider some recent victories for the Nevada STEM economy:

- The State’s successful bid for the Tesla gigafactory demonstrated Nevada’s appetite for and ability to grow the state’s emerging technology sector;
- Switch – the world’s largest data center company – continues to expand operations in Southern Nevada and break ground in the northern part of the state;
- robust growth in the number of tech start-ups in urban areas create an attractive climate that can invite even more entrepreneurs to incubate their ideas in the state; and
- an increasingly nuanced policy climate is now poised to leverage the Silver State’s abundant sunshine and persistent winds to establish Nevada as a clean energy leader.

Robust growth in these sectors has the potential to expand the Nevada economy, as long as Nevada can provide the human capital needed to make these businesses operate effectively. With the growth of these industries, the demand for workers who possess expertise and technical skills in STEM fields also continues to grow. In Nevada and across the country, there are concerns that the number of students choosing educational programs that prepare them for STEM fields is too small to meet this growing demand (Kuenzi, 2008). Channeling young people into the “STEM Pipeline” and retaining them through its phases have required the focused investment of numerous federal programs, spanning the Department of Education, the National Science Foundation, and others. In the most recent legislative session, State leadership focused on the Nevada STEM pipeline and provided an initial framework for supporting STEM education through the passage of SB 345. This bill (1) establishes programs to recognize and reward successful STEM students and educators, (2) provides mechanisms for the development and expansion of STEM programming in schools, and (3) creates panels to gather knowledge and develop a strategic plan for the state. In the two years since its passage, the strategic plan has been published (Lee, Muro, Rothwell, Andes, & Kulkarni, 2014), while work toward other initiatives is ongoing.

The passage of SB 345 positioned Nevada to develop its STEM pipeline, and the developments it initiated supplemented the efforts in K-12 districts and NSHE institutions to provide formal opportunities for students. Establishing the pipeline is a critical first phase. The next is to evaluate

<table>
<thead>
<tr>
<th>In Nevada K-12 schools</th>
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<tbody>
<tr>
<td>Supplement K-12 curricula with activities known to enhance STEM interest, efficacy, choice, outcome expectations, and engagement</td>
</tr>
<tr>
<td><strong>Model Programs:</strong></td>
</tr>
<tr>
<td>See Table 3 of full report</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In NSHE Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invest in data analytics packages that help identify students at risk of STEM dropout and target support effort</td>
</tr>
<tr>
<td><strong>Model Programs:</strong></td>
</tr>
<tr>
<td>UT-Austin; UNLV LearningTAGs project</td>
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<tr>
<th>Model Programs:</th>
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<tbody>
<tr>
<td>See Table 3 of full report</td>
</tr>
<tr>
<td>UT-Austin; UNLV LearningTAGs project</td>
</tr>
</tbody>
</table>
the intake of young Nevadans into such a pipeline, and to shore up leaks to ensure students who enter with dreams of a STEM career exit with the skills necessary to contribute to their chosen field.

This report takes the view that a Nevada STEM pipeline must not be built exclusively to provide education and training. Research has shown that it is equally critical to design experiences in formal and informal settings that encourage young Nevadans to choose to pursue STEM careers, and to persevere through the rigorous educational experiences that prepare them for the challenging careers they have chosen. In this volume, other papers focus explicitly on STEM Education in Early Childhood (Buchter, Kucskar, Oh-Young, Weglarz-Ward & Gelfer) and K-12 contexts (Vallett & Schrader), and on the training programs that produce STEM educators. This paper applies what is known about strategies that promote and maintain engagement in STEM to develop recommendations that (1) increase the number of students who will choose STEM careers and (2) decrease the number of students who give up on their STEM careers in the final years before they join the workforce.

The present report on the Nevada-specific STEM workforce development context draws focus on the scarce and uneven quality of and access to STEM opportunities outside of K-12 schools in Nevada (Note: we recommend only some activities that could be integrated into existing curricula of K-12 schools; STEM in schools is the focus of a separate policy paper; Vallett & Schrader). The report also highlights efforts by community colleges and four-year institutions that can increase retention of students, as well as ensure and accelerate their progression through to completion of STEM degrees and entry into the workforce. The final table provides recommendations for STEM workforce development strategies, and highlights both model implementation programs and potential pitfalls that are critical to avoid when implementing programs.

**Part 1: The demands of the Nevada STEM sector and prospective supply of STEM workers**

The demand for workers with the skills necessary to contribute in science, technology, engineering, and mathematically-heavy sectors continues to increase as Nevada gains prominence as a friendly place to conduct such business. Historically, however, these sectors have contributed a paltry amount to Nevada’s overall economic output, which is fueled primarily by mining and service workforces that require less training and fewer specialized skills. Even by recent accounts, when growth has increased, the workforce aligned to advanced industries in a metropolitan area such as Las Vegas lags well behind the national average (by 5 percent of the workforce; Table 1). This leaves Nevada’s urban areas languishing behind the nation, where a lower percentage of the workforce comprises the STEM-sector’s skilled workers, who often earn higher salaries and can make a larger impact on economic output. Building a STEM workforce has a substantially larger impact on economic growth than building the overall workforce as a result of their higher earnings. This makes development of such a workforce a priority, and one that can be realized as the number of employees needed continues to increase. Questions remain, however, about whether Nevada’s educational output can keep up with this demand, and whether those Nevada learners who will become the Nevada STEM workforce are prepared adequately.

**Table 1. Economic Growth in Southern Nevada compared to Major Metropolitan Area National Average**

<table>
<thead>
<tr>
<th></th>
<th>Las Vegas Metropolitan Area</th>
<th>National Average (Across 100 Metro Areas)</th>
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<tbody>
<tr>
<td>Total Jobs in Advanced Industries</td>
<td>30,810</td>
<td></td>
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<tr>
<td>Share of Jobs</td>
<td>3.6%</td>
<td>8.7%</td>
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<tr>
<td>Change in Jobs (2010-13)</td>
<td>+3.0%</td>
<td>+2.7%</td>
</tr>
<tr>
<td>Total Output (GDP) in Billions</td>
<td>$6.0</td>
<td></td>
</tr>
<tr>
<td>Share of Total Output</td>
<td>7.1%</td>
<td>17.7%</td>
</tr>
<tr>
<td>% Change in Output (Growth 2010-13)</td>
<td>+2.5%</td>
<td>+3.8%</td>
</tr>
</tbody>
</table>

**Source:** Brookings [Muro, Rothwell, Andes, Fikri, & Kulkarni, 2015]
Encouraging Young Nevadans to Choose & Complete STEM Degrees

K-12 Education in Nevada

Other policy papers will focus fully on the K-12 portion of the STEM pipeline and the educators who contribute to it. These papers demand attention, but a brief treatment of the state of K-12 education is warranted to understand potential implications for developing tomorrow’s STEM workforce.

The 2016 Quality Counts report (Education Week, 2016), an annual publication that provides metrics on education infrastructure and quality for all 50 states and the District of Columbia, ranked Nevada last in terms of its ability to provide a “Chance for Success” to Nevada learners (a D). School finance (46th; a D) and K-12 achievement (38th; a D) round out a bleak report card, which draws on achievement and funding data to show meager gains in the achievement of Nevada’s K-12 learners, and a poor outlook for learners as they reach adulthood. Most pivotal to the STEM workforce, which requires members to possess both a high school diploma and additional technical training or advanced degree, adult Nevadans’ educational attainment in the state lingers at 48th out of 51 entities evaluated. Only 31 percent possess a two- or four-year degree, a percentage which must be improved if the Nevada-grown STEM workforce is to be expanded.

Opportunities to engage with STEM during early and K-12 years

Activity calendars such as those found on the Nevada STEM coalition website tend to be littered with one-time events that provide brief exposure to STEM disciplines. Carnivals and festivals sponsored by recreation centers, 4-H clubs, and other community and corporate organizations provide students with a momentary exposure to STEM topics. However, sustained exposure and expert guidance are far more effective means of increasing learners’ interest and engagement. Historically, Nevada has dedicated insufficient resources to sustain exposure (Table 2).

Table 2. K-12 STEM Programming in Nevada by County

<table>
<thead>
<tr>
<th>Nevada Counties</th>
<th>Carson City</th>
<th>Churchill</th>
<th>Clark</th>
<th>Douglas</th>
<th>Elko</th>
<th>Eureka</th>
<th>Humboldt</th>
<th>Lauder</th>
<th>Lincoln</th>
<th>Lyon</th>
<th>Mineral</th>
<th>Nye</th>
<th>Pershing</th>
<th>Storey</th>
<th>Washoe</th>
<th>White Pine</th>
</tr>
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<tbody>
<tr>
<td>Extracurricular programs</td>
<td>3</td>
<td>1</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12</td>
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<tr>
<td>Camps</td>
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<tr>
<td>Science museums/centers</td>
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<tr>
<td>STEM-specific schools</td>
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<td></td>
<td></td>
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<tr>
<td>STEM-specific school programs</td>
<td>1</td>
<td>13</td>
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Source: K-12 portal on http://www.nvstempipeline.org/

As in most states, opportunities to substantially engage with STEM cluster in Nevada’s metropolitan areas. Compared to young people in the more sparsely populated regions of the state, those in Clark and Washoe counties have far more opportunity to repeatedly engage with STEM. With a denser distribution of students, Clark and Washoe counties are able to offer STEM-specific magnet school options. Schools in counties with urban centers are also more likely to have school-based programming during and outside of the school day, and have easier access to resources such as museums and science centers, which further enrich the STEM learning experience. When school is not in session, students in metropolitan areas continue to have greater opportunity through the provision of STEM-specific summer camps offered by schools and community centers. This extensive network of
opportunities provides the possibility of sustained exposure to STEM outside the classroom for those who are able to enroll in STEM-schools and school programming, and for those whose families can afford to enroll and transport young learners to afterschool and summer programming. Even in Clark and Washoe Counties, families with working parents or who face transportation challenges may have less access to these supplemental programs. For those who live outside Clark and Washoe County, opportunities are few. Carson and Elko provide supplementary STEM-specific school programming; otherwise, the only persistent resource available to young Nevadans interested in STEM is the FIRST Nevada Robotics program. This program might provide an ongoing opportunity for engagement with STEM, as long as students are drawn to robotics and can coordinate with others to create and fund a team (projected cost $5,000-$6,000 annually).

In summary, opportunities for STEM engagement outside the standard curriculum of K-12 schools are sparse and uneven across the state. Offerings are almost entirely limited to metropolitan centers and, within these communities, barriers to access include limited space within STEM-schools and challenges to access due to transportation and financial cost.

**STEM-specific Higher Education in Nevada**

All seven institutions in the Nevada System of Higher Education provide at least some academic programs that can contribute workers to Nevada’s STEM workforce. Of these, the largest institutions in Las Vegas (UNLV) and Reno (UNR) offer a host of baccalaureate, graduate, and doctoral training programs to meet needs for entry-level and advanced workers in the science, health care, and technology sectors. Nevada colleges supplement these offerings with associate-level degrees and certificates for technical work and preparation for advanced degrees (Appendix A).

**Part 2: Understanding factors that promote STEM career choice**

Understanding the motivational processes underlying students’ involvement in STEM education and careers is integral to developing a strategic and targeted approach to increase STEM participation. One framework useful in conceptualizing the motivational processes associated with students’ STEM involvement is the social cognitive career theory (SCCT) (Lent, Brown, & Hackett, 1994). The SCCT is predicated on Bandura’s (1986) social cognitive theory and several frameworks centered on career development, such as Krumbolt’s social learning theory of career decision-making and Hackett and Betz’s (1981) self-efficacy approach to career development, and motivation (Eccles, 1987; Locke & Latham, 1990). The SCCT comprises multiple conceptual models seeking to explain the motivational processes leading to the attainment of several socially-valued outcomes, including people’s academic and career-related choices, work and life satisfaction, well-being, and performance. As the present work centers on involvement in STEM pathways, the SCCT model of career and academic choice provides the most conceptually relevant framework within which to conceptualize the processes leading to students’ STEM-related academic and career choices.

The SCCT model of academic and career choice integrates demographic, dispositional, social-cognitive, affective, behavioral, and contextual constructs toward understanding the process through which people choose academic and career pathways. From this perspective, STEM academic and career choices are predicted by seven classes of variables: (1) person inputs (core dispositions, gender, age, ethnicity/race), (2) contextual affordances (environmental factors), (3) past learning experiences, and a set of beliefs and motivations, including (4) domain-specific self-efficacy beliefs (about ability related to STEM), (5) outcome expectations, (6) values and interests, and (7) goals and intentions. All these inform the learner’s decision to choose STEM (See Figure 1 on next page).

Proceeding further along the model, people are expected to choose STEM academic or career pathways when they set goals to pursue these pathways, which itself is influenced by the extent to which they are interested in STEM-related activities and tasks. Greater STEM interests, in turn, are expected of those who value and expect a favorable outcome from performing STEM-relevant tasks and who believe they are capable of performing these tasks. These efficacy beliefs, expectations, and values may themselves be informed by the STEM-relevant learning experiences that students engage in through formal and informal educational opportunities. In the temporal sequence of unfolding events, individuals’ core dispositions,
such as their consciousness or generalized anxiety, and demographic characteristics, including gender and race/ethnicity, are expected to influence their STEM learning experiences and contextual affordances that precede the choice behavior.

Decades of research on learning confirm the critical role that students’ motivations and beliefs play in their choices to pursue academic tasks like those that prepare them for STEM careers. Further, these factors also tend to predict students’ achievement once enrolled. Additional research has identified productive methods for encouraging beliefs and enhancing motivations that promote STEM choice and achievement.

**Figure 1. Environments and Factors that Influence STEM Career Choice and Retention.** The model is adapted to include elements of the Social Cognitive Career Theory of Lent, Brown, & Hackett (1994) and the STEM Pipeline, which spans informal settings, and formal settings spanning early childhood education through post-secondary education and training. Critical to STEM education and workforce development are issues of dropout from STEM programs and efforts to promote student retention, progression and completion.

**Strategies and Interventions Designed to Promote STEM Choices and Antecedents**

Given the need to increase the number of students who choose to enter the STEM pipeline, educators and policy makers would do well to focus on intervention and enrichment efforts designed to promote self-efficacy, expectations, values, interests, and intentions related to STEM. Table 3 includes a selection of programs that have been shown to successfully promote one or more of the motivations or beliefs that positively influence people’s decision to choose STEM educational and career pathways. Notably, many of the programs are centered on minority populations of considerable relevance to Nevada. All programs reviewed are supported by rigorous empirical bases and are largely predicated on a cohesive set of theories. More extensive overviews of programs are available in Rosenzweig and Wigfield (2016) and Valla and Williams (2012).

Importantly, many of these interventions tend to be designed in ways that they can be incorporated into a curriculum focused on content standards that guide instruction in STEM domains or extend STEM preparation in K-12 settings. By integrating activities like these into K-12 curricula, educators can continue to develop students’ skills and conceptual understanding while also encouraging students to choose coursework and post-secondary degrees that prepare them for STEM careers.

**Efforts to promote student retention, progression, & completion of STEM degree programs**

Students who progress through their elementary and secondary education and intend to pursue a career in a science, technology, engineering or math-related field must next complete
technical training or a post-secondary degree. Two-year degrees from community colleges can prepare them for technician-level jobs. Bachelor degree-level training at four-year institutions can prepare them for entry-level positions as engineers or computer scientists, and in some health professions. More advanced positions will require graduate, doctoral or professional training. The Nevada System Higher Education (NSHE) system offers programs that allow students to complete their desired training, though many students fail to complete their degrees. Nationally, completion rates from bachelor-level STEM degrees hover under 50 percent after as many as six years of study (Eagan, Hurtado, Chang, Garcia, Herrera, & Garibay, 2013). For students from under-represented groups – who comprise the majority of students at NSHE institutions like UNLV and community colleges – completion rates hover closer to 25 percent.

Table 3. Activities that can be integrated into K-12 and subsequent schooling to promote motivation to choose STEM fields

<table>
<thead>
<tr>
<th>Program (Authors)</th>
<th>Program Aim</th>
<th>Population</th>
<th>Time Commitment</th>
<th>STEM Disciplines</th>
<th>Academic &amp; Personal Enrichment Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Diaries Bernacki et al. (2016)</td>
<td>Increase motivation (i.e., goals and interest) for science classes</td>
<td>Middle school students</td>
<td>18 Weeks</td>
<td>Life sciences and physics</td>
<td>AC-Prep</td>
</tr>
<tr>
<td>Gateway to higher education Campbell et al. (1998)</td>
<td>Increase high school graduation rates, completion of gateway math and science courses, and college matriculation</td>
<td>High School minority students</td>
<td>One-month summer program + extended school day</td>
<td>Science and engineering</td>
<td>FT, PP, Ment., Tut, AC- &amp; Test-Prep</td>
</tr>
<tr>
<td>Intervention to enhance interest, self-evaluations, &amp; achievement Häussler &amp; Hoffman (2002)</td>
<td>Increase physics-related interest, self-concept, and achievement</td>
<td>Middle-school females</td>
<td>One academic year; approx. 60 one-hour lessons.</td>
<td>Physics</td>
<td>AC-Prep; IBL</td>
</tr>
<tr>
<td>Upward Bound Lam et al. (2000)</td>
<td>Increase high school GPA, high school math and science achievement, retention, and intention to choose STEM pathway</td>
<td>Underserviced high school students</td>
<td>One academic year + 6-week residential summer school</td>
<td>Engineering, math, science, computer science</td>
<td>FT, PP, Tut, CC, Test-prep, IBL, TT.</td>
</tr>
<tr>
<td>STEM program for Middle Schools Students on Learning Disability-Related IEPs Lam et al. (2008)</td>
<td>Increase interest in STEM careers and development of self-confidence in technical skills</td>
<td>Middle school students, including those with learning disability related individualized education programs</td>
<td>7 one-day workshops (academic year) + one-week of one-day Summer classes</td>
<td>Engineering, technology</td>
<td>IBL, PP, Ment.</td>
</tr>
<tr>
<td>Meyerhoff Scholars Program Maton et al. (2000)</td>
<td>Obtain advanced qualifications in STEM disciplines</td>
<td>Undergraduate college students (historically minority focused)</td>
<td>Undergraduate college years + initial six-week Summer residential program</td>
<td>Science, technology, engineering, math</td>
<td>CC, Tut, Ment, IBL, PP, PI</td>
</tr>
<tr>
<td>Stanford Medical Youth Science Program Winkleby et al. (2009)</td>
<td>Increase participation and success among underprivileged students in educational science pathways and professions</td>
<td>High school students (viz., under-privileged economically and ethnic minority students)</td>
<td>5-week summer residential biomedical program</td>
<td>Health/medical sciences</td>
<td>Ment., CC, IBL, Test-Prep, TT</td>
</tr>
<tr>
<td>High school bridge program Zhe et al. (2010)</td>
<td>Support intentions to choose engineering majors in college, explore STEM careers</td>
<td>High school students</td>
<td>10-week summer bridge program</td>
<td>Engineering</td>
<td>IBL, PI, Ment; TT</td>
</tr>
</tbody>
</table>

Note: FT = field trips; PP = complementary program for parents; PI = structured peer interaction; Ment = Mentoring; Tut = Tutoring (i.e., one-to-one remedial or non-remedial academic support; AC-Prep = academic preparation program (i.e., formal instructional activities that supplement typical coursework or curricula); Test-Prep = standardized and other test preparation (i.e., instructional practices and learning activities intended to enhance achievement on standardized tests); TT = Direct Technology Training; IBL = Inquiry-based learning; CC = college coursework.
To aid students’ retention, progression and completion of undergraduate programs, higher education institutions have attempted a variety of solutions that employ financial, psychological, data-driven, and counseling mechanisms. What follows are brief summaries of successful programs and program components in place at large state-institutions, some of which enroll populations similar to Nevada students who are commonly the first in their families to pursue advanced degrees, and who come from underserved high schools and under-represented minority groups.

“Wise” Messaging and Instructional Design to Improve Retention and Achievement

When top high school students with aspirations of advanced degrees matriculate into universities, many of them struggle to adjust to more the rigorous academic climate. Those who fail to acclimate to the rigor and culture of higher education frequently drop out as a result of their perception that they don’t really belong in their challenging major. In many cases, these students’ feelings that they don’t belong, or that they don’t “have what it takes” to learn and complete their degrees can be offset by what are now called “wise” interventions. These interventions are usually brief or infrequent, cost little to deploy, and are often stealthy in the way they influence learners. A recent summary (Walton, 2014) describes these messaging approaches, which reframe students’ perceptions of themselves, the university, and the learning process. Students typically complete brief writing activities that focus them on their strengths, principles they value, their past successes, and the idea that they too can learn through effort and perseverance. Researchers at multiple large, state-level academic institutions have pioneered different messaging approaches, and some universities have incorporated these activities into courses, to the benefit of their student achievement and retention rates. Effects of these programs include significant improvements in students’ GPAs and require as little as an hour or less of investment in reading and writing activities.

Adjustments to the Financing of College to Bridge Trouble for Students At Risk of Dropout

Georgia State University (GSU) in downtown Atlanta enrolls 33,000 students, many of whom are first generation students (40 percent), from lower income backgrounds (51 percent receive Pell grants), and under-represented minority groups (60 percent non-white; Georgia State University, 2016). Though these demographic characteristics each diminish the likelihood of on-time degree completion, GSU achieves graduation rates that outpace national averages for typical undergraduates, and more intensely, rates for under-represented and economically disadvantaged groups. GSU’s Promoting Access to Hope (PATH) program uses a combination of methods that overlap with the TIP program described above, including academic orientation, small learning communities for freshmen, and supplemental instruction, as well as novel components that bear closer inspection:
Bernacki et al.

academically aligned on-campus jobs, modest financial support to bridge periods of challenge, and early alerts that indicate potential academic struggles.

Unique to GSU is a financial mechanism that employs a modest funding source to achieve a pronounced effect on graduation rates. GSU’s Promoting Access to Hope (PATH) program provides small, temporary funding awards to help students who initially earned but subsequently lost their “Hope” scholarship of $8,000 per year towards their degree. These “Keep Hope Alive” micro-grants provide $500 each semester to these students, along with financial aid and academic workshops. Results of the Keep Hope Alive scholarship program indicate a 58 percent difference in the number of students who ultimately graduate, compared to similar students not in the program. Moreover, each component of the PATH program also contributes an additional 1-6 percent toward boosting graduation rates, for a 18 percent difference overall. Similar efforts to provide financial incentives (scholarships of as little as $4,000 improve retention by ensuring recipients agree to not work during the semester) have delivered improved retention (Marcus, 2014). The final component of GSU’s PATH program involves an early alert system that leverages student ID card swipe data to track program and course attendance and identify students in need of support. This example highlights intensive academic support programs, such as that in place at Temple University in Philadelphia, Pennsylvania, and the emerging culture of data-driven decision making in higher education.

**Intensive Academic Support**

In order to improve the retention of students from lower-income households who are often at greatest risk of dropping out, Temple University employs what is self-described as “intrusive, or even aggressive advising.” (Felton, 2016) University staff interact with students at risk of dropout to ensure these students are making use of the extensive resources that are generally provided at most universities but under-utilized by undergraduates. This intensive advising is at times quite successful, but it is also quite costly. To ensure resource-intensive support efforts are targeted at the students most apt to need them, Temple and many other universities are turning to data analytics to identify students at risk of dropping out of college.

**Data-driven Tools to Focus Funding and Effort to Improve Retention and Achievement**

UT-Austin, Georgia State, and Temple Universities are only a few examples of a trend in higher education to use data to predict student success and target university resources to improve student outcomes (Marcus, 2014). Predictive modeling efforts to address undergraduate retention are coordinated by the Gates Foundation, and involve for-profit institutions such as the University of Phoenix, as well as public and private universities (Fain, 2012). Universities employ different approaches to understanding and predicting their own students’ achievement, including both the adoption of commercially available tools and the development of home-grown prediction models that emerge from the universities’ own institutional research resources.

Companies such as Starfish and EAB solutions offer data modeling and prediction services to client institutions who provide access to data sources that can inform predictions of student outcomes like retention, progression, and completion. The alternative approach is to access local data and develop these models in house. A high-profile example of this approach is UT-Austin’s Dashboard, an algorithm that uses 14 demographic (family income, parent education) and academic (SAT, class rank) predictors drawn from university data systems to predict the likelihood of a four-year graduation (Tough, 2014). While these models can predict student outcomes rather precisely, the challenge begins anew when a university must determine the best way to leverage available funding to provide a package of supports most likely to help a student graduate on time despite the odds.

**Higher Education STEM Retention Efforts in Nevada**

Much like Georgia State and Temple University, NSHE institutions heavily enroll students who are eligible for Pell Grants, are often first generation students, and often come from underrepresented groups. Many of these students also struggle to complete their degrees. Each NSHE institution has devoted some energy into supporting students to ensure they proceed to completion of their degrees. Below are samples of efforts at a four-year institution, UNLV, and a two-year institution, Nevada State College, that reflect the current state of STEM retention efforts in Nevada.
**STEM Retention at UNLV**

UNLV has adopted a similar, though far less extensive, approach to those employed at undergraduate retention innovators such as Temple University and Georgia State University. Specific to STEM retention, UNLV takes a multi-pronged approach by utilizing existing university-level resources, combining them with college-specific efforts tailored to their students’ needs and data-driven methods to efficiently focus efforts on students most in need.

**University-wide efforts.** At the university-level, the Academic Success Center (ASC) serves as a resource where students can obtain academic advising related to their coursework that composes a STEM major. They can further seek out tutoring and writing support, as well as attend supplemental instruction, coordinated by ASC and faculty, outside their course. These services are offered to all students, and additional efforts are focused on first- and second-year students, student-athletes, and students who enter the university through special programs (e.g. Bridge programs that support those who need to develop study skills or accelerate their math coursework).

**STEM-specific Efforts.** Colleges such as the College of Engineering supplement university-level programming to meet the more specific needs of engineering students. These services include a local advising office that provides more precise advising on coursework and milestones that are critical for aspiring engineers. Additional services include supplemental instruction for engineering courses taught by experts in engineering domains and skill training embedded in introductory coursework designed to strengthen students’ learning skills. This web-delivered training is part of a federally-sponsored research grant and provides students with domain-general training that builds upon decades of educational research (NSF DRL 1420491; National Science Foundation, 2016). Students devote only a few hours out of class to training, which teaches them how to apply skills to their current and future STEM courses, and which has been shown to improve exam scores and course grades (Bernacki, Vosicka, & Utz, 2016; 2017).

Additional campus centers such as the Math Learning Center are designed to help students overcome specific barriers to completing their STEM degrees. Extending the engineering example, math coursework is a gatekeeper to on-time completion of all engineering degrees. If students do not arrive ready to enroll in Calculus I, their time to degree is extended by a full year. Unfortunately, the majority of those who enroll at UNLV are unprepared for calculus after completing high school and must complete the pre-requisite Algebra, and sometimes more basic mathematics coursework that lays the foundation for calculus concepts that are critical for engineers. The Math Learning Center triages this bottleneck by providing intensive tutoring, online coursework, mid-semester and compressed course progressions, and other tools to help students gain critical knowledge and skills and to do so quickly so they can accelerate their time to STEM degrees.

**Data-Driven Retention Efforts.** Like many higher education institutions, UNLV is also developing its ability to make data-driven decisions about directing effort toward students as they enter particular contexts where retention issues are most severe. The university recently began implementing a service called Academic Performance Solutions offered by EAB (EAB, 2016). Academic Performance Solutions “[are] solution[s] designed to empower financial and academic leaders with the department-specific performance and cost data they need to make more effective decisions.” When implemented at a university, the system identifies courses and progressions of studies that are critical predictors for specific majors. This allows universities to deploy their efforts in a more efficient targeted fashion to students at junctures where they are most likely to experience need.

In addition to university-level data solutions that try to pinpoint course progressions during which students will require additional support, UNLV is developing innovative course-level solutions for identifying and supporting students who will struggle to move forward in their STEM program. The same NSF-sponsored project that delivers learning training to students has supported the development of a data-driven “learning analytics” prediction model that can identify struggling students in real time – using their own learning behaviors – so support can be delivered (Dominguez, Bernacki, & Uesbeck, 2016; Kelly, 2016). Utilizing only university software and staff already in place, researchers and members of the Office of Information Technology are able to model students’ learning behaviors, use them to identify struggling
students, and work with instructors to deliver alert messages to students before they begin to perform poorly on exams. In early work, students who receive these messages outscore students who don’t receive messages by 5 percent on an exam they take just a week after receiving the message. One-third of messaged students identified as likely to earn a C or worse in a critical course where a B is needed ultimately achieved a B or better and were able to proceed on time toward their STEM degree (Kelly, 2016). This effort is in its infancy, but demonstrates a promising line of learning analytics innovation taking shape in Nevada that can improve the output of STEM degree-holders, if supported and leveraged appropriately.

**STEM retention at Nevada State**

While four-year institutions devote much of their effort to students once they arrive on campus, (primarily) two-year institutions often must help students bridge the transition from K-12 to higher education. Many students who enroll at NSHE institutions that primarily offer associate’s and some bachelor’s and graduate programs arrive in more of a transitional space where their STEM degree plan is less clear. These students require help navigating this middle space that family and community members have seldom explored. Nevada State College provides transitional support through their Nepantla Program Initiative (Ley, 2016; Nevada State College, 2016), which focuses efforts of high school educators, students, their family members, and college administrators to promote a culture where students see college as a pathway to economic success. These kinds of programs serve to broaden the pool of Nevada high school students who possess emerging skills and are willing to explore STEM careers, but lack information about how to proceed towards an appropriate STEM degree.

**Part 3: Recent Policy Recommendations and Existing STEM Workforce Development Resources**

To inform the discussion about policy initiatives to encourage STEM career choice, we begin with a set of recommendations made by Brookings West at the request of the NV STEM Advisory Council. Within their recommendations related to “Establish[ing] Proficiency,” the report suggests that Nevada must (1) Encourage student excitement about STEM and the careers available to those with STEM knowledge, (2) Design and implement STEM outreach efforts that are accessible to all students, (3) Develop a high-impact web portal to raise student awareness of STEM career pathways, and (4) Implement proven approaches to postsecondary remediation that accelerate students’ time to degree. These recommendations are sensible and, if implemented effectively, would likely increase the number of students choosing STEM careers and their pace of study to join these fields. However, each recommendation is sufficiently abstract that effective implementation is a significant challenge. Because scores of educational researchers devote their careers to determine the best ways to achieve these ends, this paper examines the “State of the State” pertaining to these goals, assesses the “State of the Science” on the ways these ends can be achieved, and suggests model approaches that have achieved these goals. Table 4 on the following page provides a summary, which is elaborated upon in the following pages. The final tables in Part 4 provide more specific and executable policy recommendations, which are organized into the contexts and in light of the leverage points known to promote student career choice.

**Part 4: Strategies to Encourage Students to Choose and Maintain a STEM career goal**

This report reviews programs that have positively influenced students’ decision to choose STEM careers and maintain their pursuit of a STEM degree through to completion of an advanced degree. In light of the current state of Nevada’s STEM workforce development efforts and what is known from educational research about successful methods of improving STEM choice and retention, a more specific set of recommendations that builds upon the recommendations produced by SB 345 appears in Table 5 in the appendix.

**Conclusion: STEM Workforce Investment Strategies and Returns on Investment**

Those with an appetite for investing in the Nevada STEM workforce must consider where in the pipeline their efforts should be directed, and how much patience will be required before their investment can demonstrate a return. Investing at the “intake” of the pipeline by targeting early childhood is critical, but legislators must bide their time during the many years that will elapse before
Encouraging Young Nevadans to Choose & Complete STEM Degrees

Table 4. Recent Policy Recommendations, Current Nevada Programs Aligned to Recommendations, and Research Base that Can Inform Policy Decisions

<table>
<thead>
<tr>
<th>Cracking the Code</th>
<th>State of the State</th>
<th>State of the Science</th>
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<tbody>
<tr>
<td>Strategy to “Establish Proficiency”</td>
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<tr>
<td>Encourage student excitement about STEM and the careers available to those with STEM knowledge</td>
<td>Access to STEM experiences is uneven by county, income level outside of K-12 schools</td>
<td>Design practices can maximize the value of informal STEM experiences for learners.</td>
</tr>
<tr>
<td>Design and implement STEM outreach efforts that are accessible to all students</td>
<td>Outreach is mostly episodic, especially in rural counties and low-SES areas of Clark/Washoe</td>
<td>Exposure can be delivered in formal and informal settings, but needs to be ongoing</td>
</tr>
<tr>
<td>Develop a high-impact web portal to raise student awareness of STEM career pathways</td>
<td>Portal is created, degree of impact on student awareness is unclear; offerings are sparse</td>
<td>Models show that well designed materials targeting both student and parent can increase interest and engagement with STEM</td>
</tr>
<tr>
<td>Implement proven approaches to postsecondary remediation that speed students’ time to degree</td>
<td>Few “proven” methods exist; some person-driven and data-driven effort underway, but are not systematic or extensive</td>
<td>Evidence is emerging that a portfolio of intensive academic &amp; support &amp; nimble financial mechanisms can improve retention</td>
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<td></td>
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<td>Data-driven models are increasingly effective at identifying students at risk so that resources can be focused efficiently</td>
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</table>

Children who intend to choose STEM careers actually enter them and interim results (e.g., number of math/science units taken in high school, entrance into university STEM field of study) should be monitored to ensure that investment and corresponding policies are having their desired effect. For instance, in Table 5, we recommend a relatively inexpensive strategy of providing drastically reduced admission fees to museums for holders of public assistance cards for Medicaid or food assistance. This can increase exposure to STEM for children in low socioeconomic status (SES) households, broadening and diversifying the pool of talented children who might one day choose careers in energy, health care, or other STEM sectors. Indeed, early exposure to STEM environments has been shown to increase intent to choose STEM fields of study, which, in turn, influences entry into STEM (Wang, 2013). This ultimate output would take a decade or more to evaluate, but the number of children attending science museums can be compared to prior years’ attendance, and an assessment of the initiative’s effectiveness can be made with respect to outcomes, such as intentions to choose STEM pathways.

Investment in higher education also requires some patience as the first cohort of students impacted by a STEM workforce program would graduate 4 years—or two legislative cycles—after enactment and implementation. Compared to K-12 focused initiatives, these programs can produce more measurable and immediate impacts on the workforce. For instance, the type of data-driven support systems we advocate in Table 5 had an immediate impact on graduation rate (up 6 percent within three years) and time to degree (a half-semester lower) and level of achievement for both typical and underrepresented STEM majors at Georgia State (Kamenetz, 2016). A statewide investment in learning analytics tools (and professionals who can wield them) can provide similar opportunities for improving retention, progression, and completion rates across NSHE institutions.
Appendix

STEM degrees offerings across NSHE Institutions

Note: A = Associate’s degree, B = Baccalaureate G = Graduate, D/P = Doctoral or Professional.
UNLV = University of Nevada Las Vegas, UNR = University of Nevada, Reno, NSC = Nevada State College, CSN = College of Southern Nevada, GBC = Great Basin College, WNC = Western Nevada College, TMCC = Truckee Meadows Community College.

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<tr>
<th>STEM Degree</th>
<th>A</th>
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<th>G</th>
<th>D/P</th>
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<td>Accounting and Information Systems</td>
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<td>UNR</td>
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<td>Actuarial Science</td>
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<td>UNLV</td>
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<tr>
<td>Advanced Manufacturing Emphasis</td>
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<td>TMCC</td>
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<tr>
<td>Aerospace Engineering</td>
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<td>UNLV</td>
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<tr>
<td>Agricultural Science</td>
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<tr>
<td>Architectural Design Technology</td>
<td>CSN</td>
<td>TMCC</td>
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<tr>
<td>Astronomy</td>
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<td>UNLV</td>
<td>UNLV</td>
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<td>Atmospheric Science</td>
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<td>UNR</td>
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<td>Automotive Certified Technician Emphasis</td>
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<tr>
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<td>CSN</td>
<td>WNC</td>
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<td>Biochemistry</td>
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<tr>
<td>Biochemistry and Molecular Biology</td>
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<td>UNR</td>
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<tr>
<td>Biology/Biological Sciences</td>
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<td>GBC</td>
<td>GBC</td>
<td>UNLV</td>
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<tr>
<td>Biomedical Engineering</td>
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<td>GBC</td>
<td>TMCC*</td>
<td>UNR</td>
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<td>Biotechnology</td>
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<td>Cardiorespiratory Sciences</td>
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<td>Cell and Molecular Biology</td>
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<td>UNR</td>
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<td>UNR</td>
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<td>STEM Degree</td>
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<td><strong>In NV Environments</strong></td>
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| Invest in digitizing existing STEM Collections at NV institutions so informal STEM learning experiences can be made available to residents of rural NV counties and Clark and Washoe residents with limited access. | Digital collections with appropriately designed, child-friendly interfaces can provide a resource that enhance learning and exposure opportunities inside and outside of classrooms. | Museum of Anthropology, University of British Columbia  
* Smithsonian Natural History Museum's digitization project  
* National Science Foundation’s $10M/yr investment to fund digitization efforts by non-federal collections | Multimedia design must align to known best practices in order for the learning environment to achieve its ends. This effort should be overseen by qualified experts in instructional and multimedia design. |
| Remove cost barrier by making STEM-related informal learning centers by providing free admission to those who possess social security cards (i.e., food assistance, Medicaid). | Low-SES Nevadans are commonly members of underrepresented groups in STEM; most do not attend STEM-learning centers due to cost. Free and deeply discounted access (~$2) via a card they possess utilizes an existing service model with no new infrastructure. | Ar-Reach.org using Pennsylvania Access Card (for Child Health Insurance Program & PA Food Assistance) | STEM-related informal learning centers in Nevada are mostly private and not-for-profit entities and may not wish to participate. |
| Evaluate the quality of existing STEM centers and museums to ensure they adhere to informal learning design practices & effectively engage youth | Public-private partnerships can enhance existing assets under the direction of experts on informal learning. Collaboration with researchers and designers have resulted in engaging public works projects as they are developed or redeveloped, including stadiums, museums, and parks. Additional costs are minimal and can maximize return on costs already committed to existing resources. | LIFE Center (Stanford University & University of Washington)  
* UPCLOSE (University of Pittsburgh Center on Learning in Out of School Environments) | Expertise in design of informal learning is critical to ensure the potential of existing Nevada resources are realized. Experts must be sought out and connected with public, private, and non-profits, who may need to be convinced to participate |
| Develop public-private partnerships to connect students with private groups who encourage STEM learning, like maker-spaces. | Makerspaces are accessible in urban areas, and actively seek to build up their membership, including families and children. These organizations often host kid-friendly events to encourage students’ interest in science/math/engineering/programming. | makerfaire.com  
* family events at the SynShop (Henderson, NV) | Makerspaces are numerous and not often connected to one another. Outreach and coordination may need to be organized by an existing Nevada STEM organization (e.g., NV STEM Coalition) |
| **In K-12 Schools** |                 |                  |                           |
| Supplement K-12 curricula with activities known to enhance STEM interest, efficacy, choice, outcomes expectations, and engagement | Activities can be incorporated into existing content-focused instruction to affect both learning and motivation. Practices are included in some STEM curricula (e.g., guided inquiry, simulations), but continuous exposure is needed to promote interest and engagement | See Table 3, which contains many potential activities | Curriculum aligns to content standards; instructional time & effort at a premium |
| **In NSHE Institutions** |                 |                  |                           |
| Continue to fund resources known to improve retention for students at risk of drop-out | Targeted deployment of human resources can address issues that increase likelihood of dropout (i.e., advising and student success centers) | Georgia State University, Temple University; University of Texas at Austin; | Mis- and over-identification of at-risk students can diffuse resources, wasting down support for those in need |
| Invest in data analytics packages that help identify students at risk of STEM dropout and target support effort | NSHE schools already possess the data needed to inform models, and employees with expertise to provide support students. Proprietary tools can help identify courses that induce dropout; within-course modeling & intervention can help students pass these courses. | Proprietary tools:  
* EAS Academic Performance Solutions  
* Course-specific Modeling & Support  
* LearningTAG’s Project (UNLV) | Proprietary tools require adaptation to account for the unique features of institutions and degree programs. Course-specific at-risk prediction modeling can be precise but requires collaboration between a data scientist, instructor, and information technology |

*Table 5. Policy Recommendations for Promoting STEM Choice and Retention*
References


Lee, J. A., Muro, M., Rothwell, J., Andes, S., Kulkarni,
Encouraging Young Nevadans to Choose & Complete STEM Degrees


Nevada STEM Pipeline (2016). Nevada STEM Pipeline. www.nvstempipeline.org/


Nevada K-12 STEM Pipeline

David Vallett, Ph.D.
P.G. Schrader, Ph.D.

During the past several years, Nevada’s elected leaders have placed considerable focus on diversifying the state’s employment base to protect its citizens from economic instability. One key to achieving this goal is participating in the STEM-related economy, which nationally is growing significantly faster than the nation’s economy as a whole. To some extent, early efforts have been successful. Tesla’s gigafactory, the proposed Faraday Future, DroneAmerica’s unmanned aerial systems, and the Switch telecommunications hub all represent significant progress in this area. The state is, however, constrained to a large degree by its relative lack of employees educated in science, technology, engineering and mathematics (STEM) curriculum. This is important because much of Nevada’s growth potential is linked directly to those fields. To address a significant projected shortage of STEM-educated employees, Nevada must construct a “pipeline” that recruits and cultivates students interested in STEM disciplines.

Nevada Facts & Statistics
- While Nevada encompasses more than 110,000 square miles, approximately 85 percent of its residents live in one of two major metropolitan areas. Thus, STEM-related programs outside the urban areas of the state range from sparse to non-existent.
- Within Nevada’s elementary schools, an average of only 15 percent of classroom time is dedicated to science instruction.
- Mathematics, on the other hand, is a focus item due to the adoption of the Nevada Academic Content Standards for Mathematics.

U.S. Facts & Statistics
- The President’s Council of Advisors on Science and Technology predicts a need for a million more STEM graduates nationally during the next decade to offset a decline in domestic workers.
- The National Science Foundation has made significant investments in STEM-related grants intended to improve students’ educational experiences and impact their decisions to pursue STEM-related careers.
- As a nation, failing to produce domestic workers fluent in STEM disciplines poses a threat to our economy as these industries will migrate to the workforce.
- Employment in STEM-related fields has increased at three times the rate of other jobs.

Recent Actions in Nevada
- GEAR UP, Gathering Genius, Math Science Partnership grants and NSHE-funded EPSCoR grants all include components that promote a stable STEM pipeline; however, all of these programs are externally funded.
- The Clark County School District has developed highly successful and sought-after robotics programs at its Cimarron-Memorial and Sunrise Mountain high schools.
- Full Options Science System materials have been adopted statewide, although not uniformly, as the primary resource for elementary science instruction in Nevada. However, the cost of kits is cost-prohibitive for some school districts and the product and associated curriculum could be more robust.
- Both Clark and Washoe counties have begun utilizing a nationally respected curriculum called Engineering is Elementary, developed by the Boston Museum of Science.

Considerations for Future Actions
Developing a stable STEM pipeline requires intervention early in the educational process, which must continue through postsecondary education to optimize graduation rates and application to the STEM workforce. Recommendations to expand and bolster this pipeline include:
- Expand professional development for K-5 teachers beyond mathematics, which are already adequately represented, to include science, technology (including computer science), and engineering curricula.
- Develop a more cohesive approach to education that more effectively balances emphasis on all four STEM disciplines and contextualizes learning in authentic
Nevada K-12 STEM Pipeline

experiences.
• Expand availability of STEM-related programs to encompass rural areas of Nevada.
• Initiate STEM instruction earlier, introducing and encouraging students to pursue areas of interest in order to recruit them into more advanced programs in high school.

Statewide Benefits of Future Action
• With job growth among STEM-related fields far outpacing overall expansion of the workforce, Nevada stands to reap considerable rewards from an investment in technologically literate employees.
• An attractive tax and regulatory climate make Nevada a legitimate contender in drawing new industries, as demonstrated by the Tesla gigafactory. Addressing the state’s real and perceived educational shortcomings would give it an increased competitive advantage.
• Diversifying the workforce with STEM jobs adds a more recession-resistant facet to the state economy.

Implications of Maintaining Status Quo
• While Nevada’s elected leaders have been embracing technology as a pathway to economic vitality and diversity since the late 1990s, the state still lags significantly behind the nation in terms of STEM-related employment and STEM literacy among students. Failure to effectively address the STEM workforce deficit will result in persistent under-achievement within this sector of the economy.

Introduction
Although Nevada is geographically expansive, covering 110,567 square miles, roughly 85 percent of its nearly 2.9 million residents live in one of two large metropolitan areas: Las Vegas, and Reno-Sparks, with approximately 2 million and 420,000 residents, respectively. The remaining residents are distributed across 96,500 square miles of remote, rural land. Although fewer in number, the needs of those in rural areas are no less significant when compared to those in urban centers. As a state, Nevada’s legislature is presented with the daunting challenge of defining policy and distributing resources in ways that benefit all citizens in the state and that prepare for the future of the state as a whole. To this end, Nevadans have made strides in diversifying the state’s economy, in part through policy and funding associated with Science, Technology, Engineering, and Mathematics (STEM) education and careers.

In Cracking the Code on STEM, A People Strategy for Nevada’s Economy, Lee, Muro, Rothwell, Andes, and Kulkarni (2014) observed that all “Nevadans deserve a healthy, diversified economy that offers them opportunities for prosperity and advancement. Bolstering STEM knowledge in the state—from kindergarten through postsecondary and beyond—will help ensure that Nevada can make good on its potential (p. 9).” This potential is embodied by recent opportunities in the high-tech STEM industry, including Tesla’s Gigafactory, Faraday Future, Tony Hsieh’s Innovation District, continued alternative energy electrical production, DroneAmerica’s unmanned aerial systems, and an unparalleled cyber-infrastructure that paved the way for Switch.

Although incomplete, this list of high-tech STEM industry leaders underscores Nevada’s need for a highly talented and skilled STEM workforce. A robust pipeline of STEM trained workers is imperative for Nevada, the Mountain-West region, and the United States’ emerging industries in STEM fields. Research has shown, and statewide experience has confirmed, that there are three key aspects to a healthy K-12 STEM pipeline. Specifically, policies must provide opportunities for: (1) early experiences for students that are designed to promote affect in STEM fields, (2) authentic and integrated experiences for students in STEM, and (3) the necessary knowledge infrastructures to train teachers to successfully and meaningfully integrate STEM in their classrooms.

Currently, there are numerous projects that address one or more of these goals. Nevada’s GEAR UP, Gathering Genius, Math Science Partnership grants, and NSHE-funded EPSCoR grants (among others) have some or all components that promote a stable pipeline to advanced STEM coursework and STEM careers. However, each program is funded by outside sources. Additional programs, such as the robotics experiences at Cimarron Memorial and Sunrise Mountain High Schools in Las Vegas, leverage high-interest topics during out-of-school time. Many of these focus on professional development for teachers in math...
and science, typically those supported with state funds; other programs focus on developing an understanding of engineering, or providing positive STEM experiences for underrepresented groups. This use of extramural funds to promote success in STEM creates an unstable environment, dependent upon the whims of funding agencies rather than local needs. Further, this approach is in opposition to research, which has shown that consistent and early exposure is instrumental and necessary for success in STEM. Finally, out-of-school projects tend to attract students, regardless of demographics, who already display an aptitude for and predilection to participate in STEM (Vallett, Lamb, & Annetta, 2016). Common issues among these programs include: sustainability, cogency, and breadth of impact.

As a result, this policy paper will outline key policy recommendations that are intended to maximize a stable and healthy STEM pipeline for Nevada students using permanent programs and sustainable approaches to funding. In situ, we will draw upon existing and successful, albeit soft-money, programs as models for STEM experiences in Nevada schools. Throughout, we will provide compelling evidence for policy changes in terms that are pertinent to key stakeholders throughout the state. Ultimately, we will highlight the need for such programs from a policy perspective in terms of economic success and diversity, as well as social responsibility to citizens of Nevada, particularly students who are typically at risk or underrepresented in STEM careers.

**STEM in the United States**

The sustainable preparation of STEM workers is complex. At each educational stage, students make decisions that benefit or limit their options when it comes to STEM majors and careers. Policy leaders and researchers have identified numerous variables and provided countless suggestions to increase the number, quality, and stability of workers in STEM careers. At a national level, for example, the National Science Foundation has made significant investment in STEM-related grants intended to improve students’ educational experiences and impact their decisions to pursue STEM-related careers. At local levels, districts have implemented after-school programs and activities in STEM, intended to stimulate students’ interest in the areas.

Ultimately, policy leaders, researchers, and educators have documented the need to transform STEM education to improve high school students’ achievement and motivation for STEM career selection. The President’s Council of Advisors on Science and Technology (PCAST, 2012) emphasized a need to produce a million more STEM graduates in the U.S. over the next decade to offset a decline in domestic workers. As a nation, a “new economy” based on technology and information has begun to replace our existing service economy. This shift adds value to products and processes and is the key to growing jobs and incomes (Aubert, 2004). However, workers must be technologically literate to compete in today’s careers. As a nation, we lose considerable footing on an international scale if we continue to fail to provide domestic workers in STEM. Similarly, the next generation of workers must be scenario planners, not just problem solvers.

Unfortunately, trends within K-12 and higher education science and mathematics preparation programs, coupled with demographic and labor supply trends, point to a serious challenge: Our nation must increase the supply and quality of “knowledge workers” with specialized skills, enabling them to work productively within STEM industries and occupations. Targeting baccalaureate and advanced degree holders already within STEM fields is not sufficient. Our nation’s economic future depends upon improving and increasing the labor pipeline into STEM fields. Targeted improvements focus on sub-baccalaureate students, as well as bachelor’s and advanced degree holders, youth moving toward employment, adults already in the workforce, employed in STEM fields, and those who would like to change careers to secure better employment and earnings (U.S. Department of Labor, 2007). However, in order for the next generation of America’s high school and college graduates to succeed, information and communications technology (ICT) must be the central medium through which current K-12 students learn, and learn how to learn. In addition, students must become familiar with the pivotal role that emerging digital technologies play in generating and applying new scientific knowledge to 21st century skills.

Rapid advances in information technology, educational informatics, and analytics are reshaping learning for students of the next generation. These students have grown up in a world
where technology is seemingly innate and contextually integrated into their daily experiences. Emerging practices and learning styles include fluency in multiple media and simulation-based virtual settings, communal learning, balanced experiential learning, guided mentoring and collective reflection, non-linear representations, and co-designing learning experiences that personalize individual needs and preferences (Dede, 2005). Vallett and colleagues (2015), in studying the within-group variation of the GRADUATE participants, noted increased participation in the design process was positively correlated with increased interest in school-based and informal STEM activities.

STEM in Nevada

In the United States, STEM jobs have grown three times faster than other jobs. In Nevada, this shift is made clear through examples and opportunities for qualified STEM workers. As early as the late 1990s, Nevada was eager to embrace new technologies as a pathway to economic vitality and diversity. At this time, millions of dollars in network infrastructure were installed to satisfy the nation’s growing Internet and WWW needs. Switch purchased the network in 2000 and built the most advanced, efficient, and highest-rated data centers in the world: SUPERNAP. Currently, Switch operates its headquarters and four data centers in the Las Vegas area, with an additional three planned in the south, and seven planned near Reno.

There are numerous other examples beyond Switch. For example, Ormat Technologies in Steamboat, Nev., provides alternative geothermal energy. At the time of this writing, the company advertised positions for qualified engineers and plant managers. Another long-term STEM employer is IGT (International Gaming Technologies), which manufactures casino-related technologies, including slot machines. Although the company was acquired, the freshly merged company kept the IGT name and its ties to Nevada. In addition to gaming, Nevada competed for and secured Tesla’s first Gigafactory, which completed the first phase early in 2016 in Storey County, near Clark, Nev. In addition to lithium ion batteries, Tesla announced that it would also manufacture drive units and motors for its electric vehicles. Beyond high-tech careers, energy, and gaming, it is important to remember that numerous traditional positions, like those in Nevada’s hospitals, require advanced training in at least one branch of STEM. Ultimately, careers that require training in STEM translate to approximately 15 percent of all jobs in Nevada (Lee, et al., 2014).

STEM Preparation in Nevada

The notion of a STEM pipeline as a metaphor for students’ preparation for STEM careers has been part of the national conversation for years. At its core, the analogy characterizes a steady flow of skilled workers, beginning in early childhood through elementary grades and culminating in successful STEM careers. At each phase of the pipeline, researchers have documented best practices, as well as barriers to success. From an educational perspective, research has established that early exposure, inquiry practices, meaningful connections to the real world, and faculty/student interactions are influential and determine whether or not students stay in STEM majors. Role models and experiences with scientists are instrumental in students’ continued interest and success in STEM fields. Across Nevada, there are examples of these practices and others.

Elementary Grades (K-5) Focus on STEM

In elementary schools, the vast majority of time is spent on literacy and mathematics due to Common Core State Standards (CCSS) and high stakes testing. An average of 15 percent of class time is spent on science, with focus groups conducted with elementary teachers revealing that, in some cases, as little as 20 minutes per week is allotted for science. Elementary teachers who are dedicated to science instruction, or less anxious about their overall performance on standardized tests, anecdotally spend significantly more time teaching science or integrating it into their instruction, while newer teachers or those with little content background are likely to avoid teaching science entirely at the elementary level. Technology and engineering likewise suffer from a lack of dedicated class time, a lack of clear curriculum for teaching those disciplines, and the perceived need for them to be taught alongside science instruction. Mathematics, since the adoption of the Nevada Academic Content Standards for Science (NVACS) (and probably since the advent of the No Child Left Behind Act high-stakes testing), has received a great deal of time and attention from elementary teachers and administrators.
Existing K-5 Programs

**Full Options Science System (FOSS).** Delta Education’s Full Options Science System (FOSS) serves as the primary resource for elementary science instruction statewide in Nevada. For example, CCSD allocated resources to fund FOSS kits and supplies in AY 2014-2015 on FOSS kits and supplies to replenish those kits. A total of 2,558 classrooms ordered those kits from the District.

FOSS, developed by Lawrence Hall of Science, combines hands-on investigations with the practice of science notebooks in an attempt to engage elementary aged students in meaningful scientific inquiry; the newest iteration being ostensibly aligned with the Next Generation Science Standards (NGSS). This aims to include science and engineering practices and crosscutting concepts, as well as the disciplinary core ideas, into integrated lessons and units that make explicit connections to the Common Core State Standards. Given the adoption of the Nevada Academic Content Standards (NVACS) that parallel these standards, FOSS kits would seem to be an important, if not the only, resource for many elementary educators teaching science. At first blush, this looks like an excellent program; expert review of materials by STEM educators in Nevada indicate that the FOSS lessons, however, need some adjustments in order to better foster student inquiry. Furthermore, while some districts are able to update their kits to match the NVACS, the cost (just under $1,000 per module for most) can be prohibitive for others.

**Engineering is Elementary (EiE).** EiE is a 20 unit curriculum for grades K-5 developed by the Boston Museum of Science, is intended to teach engineering aligned with the NGSS to elementary school students nationwide through a series of lessons built around a story that outlines the problem to be solved. EiE, featuring units for all science disciplines and topics, heavily leverages the engineering design process in an easy to implement format for teachers. Current use of EiE in Nevada is taking place in both Clark and Washoe Counties, and further supported through a $432,000 Great Teaching and Leading Fund (GTLF) grant awarded to the Southern Nevada Regional Professional Development Program (SNRPDP) to supply and train teachers in the use of EiE.

While some critical review of the materials is needed, EiE is popular nationwide, and the use of the design process and design thinking in students aligns with the research on building student interest and self-efficacy in STEM.

**Funded Projects**

The previously mentioned STEM education at all levels in Nevada is supported by grants obtained by both school districts and higher education, often in partnership. Federal dollars from the U.S. Department of Education flow through the Nevada Department of Education in the form of Math-Science Partnership grants. Recent grants partnering UNLV, SNRPDP, and CCSD (Project FOCCUS in 2014, and Project NEVADA-S in 2015) provided teachers statewide with professional development in the NGSS. The most recent iteration of that partnership also included NNRPDP, NWRPDP, and UNR (Project MANTA), aimed at creating a cadre of teacher leaders that are capable of carrying out professional development in their own schools in the K-3 and 6-8 grade bands. Other 2016 projects funded through MSP targeting elementary STEM include intuitive thinking in K-3 Mathematics (UNLV/CCSD), Nevada Math Project-Phase III (UNR), Developing Mathematical Modeling: Numbers and Operations and K-12 Developing Mathematical Mindsets: Number & Algebraic Thinking (WCSD). This collection of grant projects should benefit the STEM pipeline in Nevada by building capacity in K-3 teachers to successfully develop and implement science and mathematics lessons consistent with the NVACS and research-based pedagogical techniques, which in turn should have some positive impacts on student understanding, affect, and achievement in STEM. The Great Teaching and Leading Fund has also provided a significant amount of funding to organizations, largely school districts, interested in providing quality professional development in science to their teachers.

A National Science Foundation funded project through UNLV, Developing Integrated Elementary Science, Engineering, and Language Arts Curricula Aligned with Next Generation Science Standards (NGSS), seeks to address the ‘E’ in STEM as well as literacy standards and science education in elementary classrooms, again through improving teacher capacity to plan for and teach these topics.
Evaluation of Programs

As previously noted, the largest hurdle for elementary STEM is the focus on mathematics alone of the four disciplines, due in part to the emphasis on the subject for high stakes testing, but also due to a lack of content knowledge in elementary teachers. As a result, there is a great deal of professional development being carried out in Nevada to improve content knowledge and pedagogy in STEM amongst K-5 teachers, particularly in science, but also in mathematics and engineering. The effectiveness of these programs in providing quality professional development is readily available in the evaluation reports submitted to funding agencies at the end of the funding period, particularly in the case of MSP and GTLF grants, which have largely shown a significant impact on teacher content knowledge and teaching self-efficacy. What remains to be seen is how that translates directly to student achievement in areas other than math, and interest and attitudes towards STEM as a whole, due to the difficulties in obtaining meaningful assessment data from students and shifts in the state assessments.

Perhaps more importantly, teacher ability to teach STEM doesn’t necessarily translate into more time to teach or more time spent teaching STEM. One reasonable solution is to integrate STEM with literacy, or other STEM subject with mathematics, as suggested in the NSF grant mentioned above. In part, pre-service teachers are encouraged to do so through recently revised elementary science teaching methods courses at UNR and UNLV, although that leaves the vast majority of current Nevada teachers out of that process.

There are, however, elementary schools in Nevada that are focused on an integrated STEM experience for students, contextualizing traditionally taught mathematics and literacy in science, engineering, and social studies. The following account was obtained from the principal of an elementary school in Washoe County:

“Students at Agnes Risley have been busy scientists and engineers. Our kindergarten students are learning about weather patterns during each season and have planted a tree that they will be studying as it changes throughout the seasons. Our first-grade students are trying to help a young explorer communicate over a distance by modifying a device that she could use to communicate from her boat to the shore of a foreign country. Our second-grade students are embarking on a study of Earth’s landforms in order to help the people of a village in Nepal cross a flooded river during monsoon season. Third grade students are gearing up for their project to research climate and how their families can prepare for severe weather conditions. The fourth graders at Risley are studying energy transfer, have built alarm circuits, solar ovens, and are beginning to learn about the how sound and light travel through waves. Fifth grade students are investigating the energy flow of ecosystems. They will be taking a field trip to Oxbow at the end of the month to collect evidence of matter cycling through a habitat. Risley sixth graders are studying the cycling of Earth’s water and how weather impacts the environment and life on Earth.”

STEM in Washoe County School District (WCSD)

A further exemplar account was provided by WCSD’s new Assistant Superintendent, gathered from school principals:

“In the WCSD we support STEM education with Project Based Learning. Our students are working on solving real world problems using critical thinking, collaboration, and technology. Here are a few examples of what our schools are doing:

Alice Maxwell Elementary School

At Maxwell Elementary School, we are making sure that we have a STEM focus at our school. Each grade level has developed a year-long plan that has integrated science and social studies units. All grade levels are engaging in developing, implementing and refining STEM/PBL units. These units have an authentic audience and a real-world problem or project. Our teachers meet monthly to work with the STEM Implementation Specialist to build their capacity for integrated lessons. Maxwell also supports STEM at our school through designing and maintaining a STEM lab where teachers and students have access to materials and a dedicated place to work on activities with students.

Lincoln Park Elementary School

At Lincoln Park, I am supporting teachers to create integrated units of instruction. They are
teaching reading, math, and engineering through inquiry science and social studies. Students are exposed to more authentic situations to which they can apply their skills and knowledge when they learn through STEM units. The units also allow for practicing 21st Century Competencies, skills all students need in order to be successful both in and out of school. To successfully guide students through inquiry, however, teachers should have a strong understanding of STEM components. To build teacher capacity, I lead professional development around STEM content and pedagogy. I also refer the teachers at my site to conferences and classes that would inspire them to bring even more STEM into their classrooms. Further, I coach teachers one-on-one in teaching science, technology, engineering, and math for understanding and in using data-driven instruction. I also support teachers in finding and implementing new technologies. We are moving towards paperless classrooms where appropriate. Each of our classrooms has a set of iPads and an additional cache of laptops. Students and teachers are using iPad mirroring, share documents, Dropbox, online texts and research databases in the classrooms. All of the work we do at Lincoln Park around STEM is done with the goal of student achievement. We use formative and summative data to plan, implement, and reflect on our teachers’ and students’ work. We have found that teaching STEM components has made this work more exciting, effective, and powerful!

Kate Smith Elementary School

At Kate Smith, our teachers have participated in professional development around each of the Disciplinary Core Ideas and how they align vertically between the grade levels. Teachers have also had training in 3-Dimensional teaching and learning, creating units of study that integrate all subject areas based on grade level standards, writing in science, 21st Century Dimensions and how they integrate with the NGSS, and Project Based Learning. These are all aspects of STEM teaching and learning. Teachers are also required to teach at least one Practice-Based Learning (PBL) based unit, and about one-third of our staff has participated in the STEM/PBL team, enhancing their learning about PBL and STEM teaching. We continue to use the support of Bucks Institute to support teachers in building units and conducting Learning Walks to assess the progress of our school towards our goals. We have also reorganized teaching supplies for teachers to access so that they are more aligned with science instruction, including arranging our leveled book sets into themes based on the science and social studies standards, so that our teachers have easy access to any supplies they might need for STEM instruction.

Our students at Kate Smith participate in their grade level PBL units (examples include designing coolers to preserve a state of matter in 2nd grade, building weather resistant structures in 3rd grade, designing a dream home in 4th grade, designing solutions to lessen the impact humans have on the earth in 5th grade, and designing solutions to help the impact of global warming on animals in 6th grade), and we are working towards more integration of subject and content standards. We also have some after school STEM activities in conjunction with our TEAM-UP program. This year we have seven teams of students participating in WCSD’s Punkin Chunkin event where they built a catapult or trebuchet to launch pumpkins at the event. Students in all grade levels work through the engineering design process both in class and in the afterschool activities. We also take our 5th and 6th grade students to an outdoor science camp each year.”

Overall, while more time and emphasis in elementary STEM education is needed. Regardless of discipline, the focus of current programs is largely on science and mathematics, with two projects targeting engineering and none, at the moment, specifically targeting technological literacy in elementary students.

Middle Grades (5-8)

In middle school, STEM subjects, particularly science and technology, benefit from having their own designated course time. Teaching mathematics as its own subject area from the time the students enter school continues to be a major focus of school achievement initiatives. Science in middle school is granted its own devoted class periods (and often teachers), along with the introduction of rudimentary computer skills classes. This shift in time devoted coincides with a developmental peri-
od when many students are lost to the STEM pipeline due to negative changes in interest and affect (STEM Connector, 2013). Despite this increased amount of time devoted to STEM, a theme recurs from elementary grades here: a lack of integration across STEM disciplines. With the exception of engineering, which is now taught in conjunction with science in schools fully implementing the NGSS or state equivalent, STEM is broken into its constituent components when courses are created and curricula designed, and as a discipline integration is often severely lacking.

Existing Programs

GEAR UP. In Nevada, the Gaining Early Awareness and Readiness for University Programs (GEAR UP) initiative has provided several decades of support for students from underrepresented populations and low socioeconomic status (SES) as they transition to college and university work. In southern Nevada, GEAR UP invested resources in UNLV to train teachers in methods to incorporate STEM into their classrooms. By contrast to other STEM professional development initiatives, UNLV’s GEAR UP STEM programs provided teachers with hands-on, authentic experiences in a cohesive environment. Further, the entire professional development is provided to teachers as though they were students. The adopted inquiry perspective leverages argumentation while addressing Nevada’s content standards in math and science. The program successfully trained 80 middle school teachers from all parts of Nevada over three years. By extension, the project has influenced thousands of students since its inception.

Math Science Partnership. The Math Science Partnership grant program through the Nevada Department of Education is currently funding three projects that impact middle school students and teachers, two in mathematics and one in science. Project MANTA, in science, extends the cadre of teacher leaders able to deliver professional development in the NVACSS/NGSS to teachers in the 6-8 grade band, with approximately 25 of the 76 participants being middle school teachers. In addition, MANTA provides all science teachers in Nevada with access to the Public Consulting Group’s Pepper online coursework in NGSS awareness. The ReAlgebra PD Project (Edu2000 America, Inc.) and K-12 Developing Mathematical Mindsets: Number & Algebraic Thinking (WCSD) advance teacher, and ideally student, knowledge of more advanced mathematical concepts in algebra.

Great Teaching and Leading Fund projects granted to Nye, Washoe, Elko, and Douglas County School Districts, along with Doral Academy, Nevada Virtual School, and Carson City Schools, support NGSS implementation in their respective locations through teacher professional development.

Evaluation of Programs

Middle school level programs, though with slightly more focus on students than elementary as a result of GEAR UP, are still largely focused on developing teacher pedagogical competencies and content knowledge. The amount of funding available for middle school through some competitions is reduced from elementary, despite inclusion in MSP requests for proposals for the 2016-2017 grant cycle. From a professional development perspective, this makes sense, as middle school teachers are typically discipline specific, and more likely to have a background in a STEM discipline than elementary teachers. The programs themselves appear effective in improving teacher ability and content knowledge, but impacts on student achievement and interest in STEM have not been assessed. Like the elementary grades, STEM initiatives and programs for the middle grades, as well as coursework, tend to be isolated by STEM discipline rather than integrated, and the nature of middle school course schedules, as currently designed, is less conducive to integrated coursework than elementary grades.

High School (9-12)

Secondary STEM education, and the STEM pipeline, tends not to vary greatly from middle to high school in terms of structure. STEM coursework is focused mostly on math and science, with engineering now integrated into the science classes that are NGSS aligned, and typically a single or half-credit course required in computing of some sort. More importantly, students are allotted significant time to STEM courses; most states require three or four credits in mathematics for a diploma, although a significant number only require two credits in science. Elective courses, magnet schools, and after school programs add to a richer variety of STEM experiences for high school students than is available in lower grade levels.
Existing Programs
The Solar Energy–Water–Environment Nexus project, funded through the National Science Foundation’s EPSCoR program, has a workforce development program that has two separate initiatives for high school students. The first, run in southern Nevada through UNLV, brought together a group of middle and high school teachers to design integrated units on alternative energy topics, resulting in two mini-units that include field trips for students if implemented according to plan. The second, SCIP (Science Career Investigation Program in the north, STEM Career Investigation Program in the south), brings together high school students with guest speakers who are currently in STEM careers. SCIP has introduced high school students to scientists working with UNR, UNLV, and DRI, as well as the president/founder (and former designer) of Petroglyph Games, engineers from the Department of Environmental Protection, engineers from NV Energy, and the Southern Nevada Water Authority. Speakers for this program typically present for about 45 minutes to the students, who then ask questions regarding the topics. SCIP is run slightly differently in Reno and Las Vegas: participants in Reno take part in six sessions, while participants in Las Vegas can attend as many of the six sessions as they wish depending on interest.

State Funded Programs
State funded initiatives, using flow-through federal dollars, exist for high school STEM programs as well. While the most recent request for proposals for MSP excluded high school grade levels, prior years have funded professional development for teachers across the state in the NGSS and CCSS math standards. The GTLF projects funded for the 2016–2017 cycle also include full K–12 professional development in science.

A key feature of the STEM pipeline at the high school level that does not occur in lower grades is the existence of Career and Technical Academies (CTAs) in Clark County. The CTAs, while not entirely devoted to STEM, feature programs in engineering, web design and development, information technology systems, mechanical technology, biotechnology, digital media, IT management, environmental management, and animation and digital game development. It is arguable that CTAs aren’t necessarily appropriate, given the career focus, for grade bands lower then high school, but they provide the first real taste of the STEM pipeline beyond K–12 to school age learners, and the potential for authentic experiences in STEM, and they are the only programs that feature options dedicated to engineering and technology.

Evaluation of Programs
STEM initiatives for secondary students show promise in improving achievement, attitudes, and the likelihood that students will select STEM coursework and careers after high school. However, Vallett, Lamb, and Annetta (2016) determined that students who already show a strong interest and confidence in their ability to succeed in STEM are far more likely to engage in programs at the high school level. It is important, however, to note that more in-school and school sponsored opportunities exist for students at this level than earlier grades. Finally, as with other grade bands, STEM programs for high school students tend to focus on science and math, while excluding engineering and technology, and tend not to be integrated. Technology, in particular, suffers from a lack of emphasis, although the recent ‘Computer Science for All’ initiative from the White House, if funding is maintained, may help to ameliorate that deficit.

Full K–12 Programs
While few truly K–12 programs exist, there are two of interest that do take place within Nevada. The first is the existence of STEM magnet schools at all grade levels, fostering STEM pipeline interest and ability in students who apply for and attend those schools. The second, the Regional Professional Development Programs, are an invaluable resource in providing and supporting quality professional development in science and mathematics statewide and at all grade levels, particularly in smaller districts where the capacity of school and district employees to provide professional development may be limited by the number of employees in those roles. As with other STEM programs for students, magnet schools are limited in their effectiveness by the need for students to self-select into those sites by interest, and further complicated by the likelihood that members of under-represented populations, even when interested, are less likely to opt into magnet programs due to concerns regarding stereotype threat or a simple lack of the cultural capital on the part of parents seeking to gain their children’s admission.
**Recommendations**

While there is no ‘magic bullet’ for improving participation in the STEM pipeline, some trends do emerge from successful programs, both in Nevada and elsewhere:

**Teacher Professional Development.** Perhaps the simplest means of improving the STEM pipeline in Nevada is through investment in high quality professional development for teachers at all levels. It is clear from successful programs and research that early exposure is one key component of a healthy pipeline. Elementary teachers, in particular, require greater levels of content knowledge and understanding of STEM pedagogy to meaningfully engage students in the types of inquiry activities that leverage learners’ natural curiosity. Paired with improving teachers’ understanding of STEM content and pedagogy is a need to develop administrators’ understanding of what good STEM teaching looks like in the classroom. Regardless, policy makers may wish to consider training as a component of reimagined teacher training, part of continuing education initiatives in the districts, or both. Ultimately, leveraging existing systems like these and enhancing the state’s knowledge infrastructures in a way that is focused and organized, will promote the health of Nevada’s STEM workforce and economy overall.

**Cohesive Approach to STEM.** As evidenced by the reported amount of time spent on STEM subjects other than math, the emphasis on standardized test results over the past 17 years of education has greatly reduced the amount of attention given to STEM subjects. While one solution to this might be to suggest rigorously testing the remaining three disciplines, it is our recommendation that we instead focus on a cohesive approach to teaching and learning STEM. This, in turn, gives students practice applying STEM concepts, including mathematics, to real-world problem solving situations. Typically, problems in these situations depart from strict disciplinary boundaries. More importantly, a collective approach to STEM content also provides context for more abstract concepts in mathematics, while demonstrating conceptual links between subjects. This benefit of an authentic approach to problems in an integrated, cohesive way, is well documented in the literature.

In short, teaching practices that evolve from a cohesive approach to STEM are an answer to the ever present “why do we need to know this?” question.

**Increased Focus on Technology and Engineering.** In addition to a more cohesive approach, student engagement in the STEM pipeline would benefit from a greater focus on technology and engineering at the K-12 level. Many of the successful projects discussed above feature one or both disciplines in improving student interest in STEM, and the burgeoning STEM careers in Nevada require an understanding of science and mathematics, but feature technology and engineering tasks. This increased focus can neatly dovetail with a more cohesive approach to STEM, or take the form of new educational requirements like the suggestions of the Nevada Computer Science Taskforce.

**References**


President’s Council of Advisors on Science and Technology (2012). [statement redacted from Whitehouse.gov by current administration].

Research has demonstrated that the drive to explore, interact and observe in human beings begins in early childhood, long before middle and high school, and even before elementary school. At the same time, the nation’s economy is moving toward technologically based industries, creating growth in demand for workers proficient in science, technology, engineering and mathematics (STEM). The question is, how can Nevada cultivate a generation of adults that is prepared to thrive in the 21st century economy? The answer is, begin recruiting and training them to serve in Early Childhood Education (ECE) capacities. Despite overwhelming evidence in support of this approach, high-quality STEM programming has not yet been incorporated into ECE.

Nevada Facts & Statistics
• By 2018, STEM-related jobs are projected to increase to nearly 50,000, a 25 percent increase from 2008 levels.
• A report by the Brookings Metropolitan Policy Program in partnership with the University of Nevada, Las Vegas, Cracking the Code on STEM, a People Strategy for Nevada’s Economy, found that the K-12 education system is inadequate to address STEM educational outcomes.

U.S. Facts & Statistics
• During the first decade of the new millennium, the demand for STEM-related careers increased by 14 percent nationally.
• Advancing American students from the middle to the top tiers in mathematics and science is a federal educational priority.
• The National Science and Technology Council, along with the Committee on STEM Education, the National Association for the Education of Young Children, and the Next Generation Science Standards concur the exposure to STEM during early childhood is critical to establishing an optimal educational trajectory.

Recent Actions in Nevada
• In 2013, Nevada developed an economic diversification plan entitled, Moving Nevada Forward: A Plan for Excellence in Economic Development. This plan explicitly called for increasing STEM-related jobs so the state is positioned to participate in that high-growth facet of the economy.
• In the 2015 legislative session, $882 million was committed to education, including STEM instruction.
• SB 345 created an advisory council to address barriers within our state’s educational system, with the intent of improving STEM outcomes in K-12 and postsecondary institutions.

Considerations for Future Actions
Producing STEM programming in ECE is both uniformly supported by the education community and straightforward to execute. Recommended measures include:
• Require high-quality teacher preparation and professional development for ECE educators in STEM methodologies.
• Utilize STEM curriculum that aligns with Next Generation Science Standards (NGSS) and National Association for the Education of Young Children (NAEYC) recommended practices.
• Incorporate NGSS science standards as part of state early childhood standards and report these measures.
• Work with the Advisory Council on STEM initiatives within the Department of Education to include early childhood as a component of Nevada’s statewide plan.
• Utilize existing facilities outside of formal school settings to bring STEM content to students, especially those in low-income or high-need schools (ie.; discounts for young...
Introduction

The early childhood years, birth to age 5, have long been accepted as the most critical point in neurological or brain development (National Scientific Council on the Developing Child, 2007). Children are born curious, naturally exploring and interacting with their world (Piaget, 1952; Elkind, 1976). During the earliest years, infants and toddlers develop 700 neural connections every second. These biologically driven neurological processes and natural curiosity of how the world works make early childhood an optimal time to introduce children to scientific inquiry. This sensitive period of development must be utilized to start children on the right path to be successful in STEM (science, technology, engineering, and math) and other content areas because, once these neurological pathways are developed, they go through a pruning process in which synapses that are not used are eliminated (National Scientific Council on the Developing Child, 2007; Neurons to Neighborhoods, 2000: Shonkoff, 2000). This paper will examine current state policies and educational practices being implemented as they relate to STEM’s nexus with early childhood development. Recommended practices from early childhood professional organizations will be examined in addition to research on STEM education in early childhood. Lastly, a review of what other states are implementing will be provided.

State of Nevada’s Need for STEM

Nevada has recognized the critical need for highly qualified STEM professionals in supporting and diversifying Nevada’s economy. In 2012, Nevada adopted an economic diversification plan, Moving Nevada Forward: A Plan for Excellence in Economic Development (Nevada Board of Economic Development, 2012), which focused on increasing technology jobs in the state. While there has been some initial growth in technology-related jobs, current systems in Nevada have not been able to keep up with demand, as there still are not enough qualified professionals to meet the projected demand. This trend is exacerbated by projections that STEM jobs in Nevada will increase to 49,460 jobs by 2018, up from 37,220 in 2008 (Nevada Board of Economic Development, 2012). Because Nevada continues to struggle in producing a highly trained and highly qualified STEM workforce, Nevadans are losing out on economic opportunities (i.e., higher-paying jobs). Furthermore, this has the potential to negatively impact our state’s economic stability. Fortunately, this has not gone unnoticed by the Governor’s office as he addressed these concerns in the State of the State Address, and included $882 million in education funding to include and expand on STEM education, recognizing and committing education systems to the need for more...
STEM workers (Nevada Board of Economic Development, 2012).

These issues are not isolated to Nevada and can be found nationwide. The projected increase in need for STEM careers nationally from 2000-2010 is as follows: 14 percent in overall STEM fields, 16 percent in mathematics, 22 percent in computer systems analysis, 32 percent in systems software development, 36 percent in medical sciences, and 62 percent in biomedical engineering. The federal educational priority has been to advance American students from the middle to the top tiers in math and science (U.S. Department of Education, 2016).

In 2013, Nevada Senate Bill 345 was approved, taking effect July 1, 2013. This bill created an Advisory Council on Science, Technology, Engineering, and Math within the Department of Education. This council is to report their recommendations for curriculum and instruction in STEM in public schools to the State Board of Education, the Governor, and the Legislature. Appointed members include the Superintendent of Public Instruction, the Chancellor of the Nevada System of Higher Education, the Executive Director of the Office of Economic Development, the Director of the Department of Employment, Training, and Rehabilitation, and 13 appointed members that include classroom teachers in STEM content areas as well as school administrators. According to the Nevada STEM Coalition website, the target audience is K-12, higher education, and workforce development. At this juncture, early childhood has not been incorporated. This Council is tasked with creating a strategic plan to develop STEM educational resources to serve as a foundation to support the workforce and higher education, to identify students in the state who excel in STEM, and identify and award no more than 15 schools with exemplary STEM outcomes. In addition to this recognition, this council is also tasked with conducting a survey of STEM educational programs in Nevada and in other states to identify recommendations that could be implemented in Nevada.

In 2015 the Nevada legislature passed the Read by Third Grade Initiative, Senate Bill 391. This initiative will begin implementation in 2017 to promote effective literacy supports and instruction for students in kindergarten through third grade. STEM inquiry based curriculum can help support this initiative through increasing literacy and STEM outcomes, including children who are English language learners or at-risk for academic difficulties.

Waiting Until Kindergarten is Too Late

A report by Brookings Metropolitan Policy Program in partnership with University of Nevada, Las Vegas, Cracking the Code on STEM, A People Strategy for Nevada's Economy, identified the crisis in Nevada’s early childhood preschool-12th grade education system to adequately address STEM educational outcomes (Lee et al., 2014). Recommendations from this report include developing guidelines for STEM education programs, creating a preschool-12th grade competitive grant program, incorporating computer science in preschool-12th grade education, encouraging student excitement about STEM and STEM careers, and increasing STEM outreach efforts to all students.

These recommendations align with Next Generation Science Standards (NGSS) and National Association for the Education of Young Children (NAEYC) recommendations, as well as federal initiatives to include preschool in STEM education reforms (Committee on STEM Education and National Science and Technology Council, 2013). Early childhood is a critical time to begin quality STEM education, as research has suggested that this period of development to be optimal for setting children on a STEM trajectory, increasing the diversity of students who are interested in STEM and competent to be successful in STEM fields (Eshach & Fried, 2005; French, 2004; Gelman & Brenneman, 2004; Inan, 2007; Watters, Diezmann, Grieshaber, & Davis, 2000). It is clear that in order for the state to succeed in diversifying the economy by increasing the number and quality of STEM professionals, the current crisis in Nevada’s preschool-12th grade education system will need to be addressed (Lee et al., 2014). Simply put: waiting until kindergarten may be too late (Lee et al., 2014).

Achievement Gap

It is critical that effective inquiry-based scientific opportunities in STEM areas be incorporated to address the achievement gap, increase outcomes in STEM areas, increase the number of students and professionals entering STEM fields, and increase the representation of minorities, wom-
en, and low-income students in STEM majors and fields. The achievement gap in STEM continues to persist across grade, race/ethnicity, socioeconomic status, and gender (Lee, 2005; National Science Foundation, 2001, 2002, 2015; O’Sullivan, Lauko, Grigg, Qian, & Zhang, 2003). These discrepancies are found across virtually every study (Lee, 2005) and are prevalent from the very beginning of a student’s school experience. Studies have suggested the strongest predictor of people entering the science field is early interest and difficulties in science in school acts as a deterrent for students considering the pursuit of science in higher education or in their careers (Mbamalu, 2001). Addressing these difficulties in the early years and ensuring all children have access to quality STEM instruction can begin to address these discrepancies.

While all children need high quality science experiences, at-risk children experience disproportionately negative outcomes in all domains, with the greatest impact being in science (Greenfield et al., 2009). These children are more likely to be dual-language learners and less likely to have opportunities to develop science content knowledge (Sarama & Clements, 2009). In addition to these issues, research suggests that teachers in schools of low socioeconomic status (SES) student populations rely on memorization and rote practice as teaching methods rather than reasoning and problem solving (National Research Council, 2009). Teachers in higher SES programs tended to emphasize conceptual tasks, problem-solving and exploration (National Research Council, 2009; Stipek & Byler, 1997).

Current perceptions of science are not realistic. Science and scientists need to be representative of actual practices and young children need exposure to the work of scientists (Duschl, Schweingruber, & Shouse, 2007). Findings from the literature suggest a prevalence in the belief that, while science is something that anyone can participate in, individuals need to be born with some type of inherent characteristic in order to excel at it (Archer et al., 2010; Carlone, 2004). It appears that this belief carries over into later years, at which point teachers must address content-related gaps as well as student attitudes as they pertain to learning science (Morgan et al., 2015). For example, students interviewed describe an identity of an individual who excels in physics as, “someone who is ‘naturally’ smart, has ‘raw talent’, and is male” (Carlone, 2004 p. 405).

### Recommended Practices

Professional organizations such as the National Science Teachers Association (NSTA), NGSS, and NAEYC have acknowledged that it is essential to begin scientific inquiry in the earliest years (Eshach & Fried, 2005; French, 2004; Gelman & Brenneman, 2004; Inan, 2007; Watters, Diezmann, Grieshaber, & Davis, 2000). This is a significant issue as research has suggested that if educators wait until kindergarten, not only will they have lost the most critical years, but it may be too late for many children (Elkind, 1976; Piaget, 1952). For example, consider that currently 40 percent of US children are not ready to enter kindergarten (Hair, Halle, Terry-Humen, Lavelle, Calkin, 2006). By 4th grade, only 34 percent of students are at or above proficiency in science (U.S. Department of Education, 2011), and 40 percent are at or above proficiency in math (National Center for Educational Statistics, 2012) on the National Assessment of Educational Progress (NAEP). These data suggest current educational practices are not giving children the support they need in the early years so they can be successful in school, especially in the STEM content areas. The NSTA recently issued a position statement that was endorsed by NAEYC that provides a framework for how STEM in early childhood classrooms can set our youngest students on a trajectory to be successful in K-12 STEM.

### Scientific Inquiry Approach

The process of scientific inquiry in STEM areas should include children engaging in active exploration and participation in the scientific process through collecting data, coming up with questions to investigate, and testing scientific beliefs (Duschl, Schweingruber, & Shouse, 2007; Zeynep Inan & Inan, 2015). These processes include children participating in scientific inquiry through hands-on experiences, engaging with peers and adults, and using authentic tools of science. Science experiences for young learners should include hands-on experiences, inquiry based, and be driven by their interests (Inan, 2007; NAEYC & NCATE, 2001; NRC, 2001). This process encourages the youngest learners to see themselves as scientists and as consumers of science. The focus on developing and testing theories rather than arriving at the accurate scientific explanation is instrumental in supporting
curiosity, interests, and engaging in further exploration (NAEYC & NCATE, 2001; Duschl, Schweingruber, & Shouse, 2007).

Inquiry-based approaches have been shown to support student excitement and engagement, connect previous knowledge with new knowledge, promote cooperative learning, retention of material, and higher order thinking skills (Duran et al., 2009; Eshach & Fried, 2005). While the philosophies of inquiry-based instruction, constructivism, and hands-on learning are well established in early childhood literature, their application to STEM areas are relatively new. Research suggests that, while these processes are implemented in other content areas, teachers do not implement these methods in STEM instruction, instead relying on more traditional methods (Gilbert, 2009). These traditional methods of instruction such as memorization and rote practice have been found to be ineffective in teaching science to young children (Fleer, 2009; Wolfinger, 2000; Zoldosova & Prokop, 2006). This lack of quality STEM instruction impacts STEM education throughout a child’s education, including middle and high school (Mullis & Jenkins, 1988).

Despite recognizing this as the optimal time for intervention, research suggests that very little STEM instruction is occurring in early childhood classrooms. Teachers spend little time in science instruction and do not spend significant amounts of time in science-related areas of the classroom (Nayfeld, Brenneman & Gelman, 2011; Tu, 2006). Currently, there is an emphasis on language and literacy, with relatively little math in preschool classrooms. A study examining how much time was spent in STEM found that just 58 seconds of a 360-minute day—less than 0.3 percent of the students’ time—was spent on math. Science and exploring engineering were rarely part of the curriculum (Farran, Lipsey, Watson, & Hurley, 2007). Teacher engagement with children is a critical component of supporting STEM inquiry. In addition to preparing the environment, they support and extend children’s engagement by asking questions, providing language, and connecting previous experiences to current experiences. When teachers engage in these practices with young children, their investigations tend to be longer, more complex, and focus on comparisons (Nayfeld, Brenneman, & Gelman, 2001; Crowley et al. 2011). The lack of emphasis and time spent in STEM in early childhood programs needs to be addressed. STEM needs to be an integral focus in both curriculum and designing the learning environment.

**Educational Impacts of Early Childhood STEM**

Initial outcomes and results on the impact of quality early childhood STEM instruction are promising, further supporting the need to increase the investment and commitment to inquiry-based STEM instruction for our youngest learners. In addition to the benefits of inquiry-based learning, adding quality STEM experiences supports the development of scientific concepts that children continue to build on throughout their education (Eshach & Fried, 2005; Gilbert, Osborne, & Fenshama, 1982). This allows for students to understand and learn more abstract concepts in future learning (Reynolds & Valberg, 1991). In addition to the benefits to STEM areas, science instruction supports and enhances learning language, literacy, math, and executive functioning (Kuhn & Pearsall, 2000; Kuhn & Schaubal, & Garcia-Milla, 1992).

**Language and Literacy**

STEM in ECE has been linked to other educational benefits in addition to science, including language and literacy. Increases in vocabulary through scientific exploration exposes our youngest learners to a variety of vocabulary words directly related to what they experience in their everyday school and home lives (French, 2004; Strickland & Riley-Ayers, 2006). Exposure to rich vocabulary enhances language and vocabulary development, which is predicates of reading achievement. High quality science programs have been shown to increase receptive vocabularies for students of low socioeconomic status (French, 2004), as well as increasing overall scientific and other vocabulary (Gelman & Brennenman, 2004; Guo, Wang, Hall, Breit-Smith, A., & Busch, 2016). Engaging in science provides learners experience with text and is also associated with improved literacy (French, 2004; Gelman & Brennenman, 2004). Readiness in science has been found to be predictive of science and reading achievement in 5th grade, more so than reading readiness (Duncan, 2007; Grissmer et al., 2010).

**Embedding Learning Opportunities**

Play-based curriculum has been accepted in professional practices and is supported by
research as effective for early learning (Bowman, 1999; Ginsburg, 2006; Katz, 2010). These practices can be directly applied to STEM and the scientific inquiry process. By focusing on concepts and skills, children are encouraged to take the lead in exploring, asking open-ended questions, reflecting, forming theories, asking follow-up questions, and exploring more to further understand or develop a new line of inquiry. Blending this approach with direct instruction research-based learning trajectories is important as it includes a developmental sequence that expands children’s level of thinking related to the goal. Teachers arrange activities to support children moving along this developmental progression (Clements, 2013; Diamond, Justice, Siegler, & Snyder, 2013) These blended approaches align with NAEYC and the National Association of Early Childhood Specialists in State Departments of Education eight indicators of effective pre-K to grade three curricula.

The process of embedding learning opportunities can be described as, “addressing children’s target goals during daily activities and events in a manner that expands, modifies, or is integral to the activity or event in a meaningful way” (Johnson, Rahn, & Bricker, 2015, p. 82). Opportunities for learning, or teachable moments, are usually embedded across child-directed, planned, and routine activities as recommended in the literature (Johnson et al., 2015). The purpose of embedding learning opportunities and teachable moments is to provide children with a means to learn, not only during periods of planned teacher-led instruction, but also during times when they are engaged in activities of interest to them (e.g., playing on the playground) and/or activities that are a part of their daily functional routines (e.g., washing hands, putting a jacket on, requesting water to drink) as they occur throughout the school day (Hyun & Marshall, 2010; Johnson et al., 2015). Embedding STEM-related opportunities allows learning to occur both out of context, such as a science experiment led by the teacher, and within daily classroom situations such caring for the class pet. Teachers could scaffold questions to help students for example, children could learn that fish live in water but butterflies live on land. Children could then observe fish in their classroom aquarium and butterflies in the garden around their school. This brief interaction could become a unit of study that allows children multiple opportunities to engage in science inquiry and apply STEM concepts. Not all current teachers may have been trained to embed opportunities for STEM-related instruction throughout daily classroom activities, therefore ongoing professional development is essential.

**Practices to Support STEM**

Previous STEM research has identified the barriers to implementing high quality STEM education in early childhood. Barriers include a lack of instructional frameworks for early educators, a lack of curriculum, curriculum not being linked to state standards, and inadequate resources for teachers (Oakes, 1990). While some progress has been made, early childhood STEM content continues to struggle to overcome these barriers. With the introduction and focus of STEM educational frameworks (NGSS, NSTA, NAEYC), incorporating STEM opportunities in ECE can make significant impacts on STEM education and other content areas such as reading and literacy, closing the discrepancy of student achievement, and increasing the number of students entering STEM fields.

**High-Quality Teacher Preparation and Professional Development for Early Childhood Educators in STEM Methodologies**

Teacher quality is one of the most important factors in student learning (Science and Engineering Indicators, 2014). However, preschool teachers do not know how to support STEM learning (Clements, 2013). It is critical that early childhood professionals are highly trained, qualified and competent to support young children, as the period of early childhood is crucial for supporting scientific inquiry based on developmental sensitivity, natural curiosity, and encouraging children to participate in science (Clements, 2013; Clements, Agodini, & Harris, 2013; Worth, 2010;).

While less intensive STEM focused interventions have been shown to be effective in impacting classroom instructional practices (Henrichs & Le semen, 2014), meaningful impacts in the classroom setting require more intentional and coordinated efforts (Early et al., 2007; Zaslow, 2014). Current findings from the early childhood education literature base suggest that rigorous, high quality professional development delivered to in-service teachers in early childhood settings has been demonstrated to improve the quality of
science-related instruction (Piasta et al., 2014; Roehrig et al., 2011) and math-related instruction (Kermani & Aldemir, 2015; Marsicano et al., 2015; Rudd et al., 2009).

Research suggests that current professional development systems are ineffective and make little to no impact on teacher behavior or child outcomes (Bruder, Mogro-Wilson, Stayton, 2009; Farkas, Johnson, & Duffett, 2003; Guskey, 1986; Joyce & Showers, 2002; Odom, 2009; Snyder, Hemmeter, & McLaughlin, 2011). Traditional methods of professional development such as trainings, workshops, and conferences have been found to increase teachers’ awareness; however, these forms of professional development are not associated with teachers’ sustained use of research-based interventions (Artman-Meeker & Hemmeter, 2013; Barton, Penney, & Zeng, 2015; Odom, 2009). Despite their ineffectiveness in improving outcomes and increasing or sustaining teacher use of research-based interventions, they continue to be the predominant forms of professional development; in-service outside of work (33.6 percent), on-site staff development (28.6 percent), and consultation and coaching (15.6 percent) (Odom, 2009; Snyder et al., 2011).

Alternative, research-based professional development is critical. Delivery of high quality professional development has demonstrated significant improvement in student achievement for young children as measured on assessments (Brendefur et al., 2013; Kermani & Aldemir, 2015). Professional development should be ongoing, appropriate to the subject matter being taught, include opportunities for teachers to actively participate, and have some relevance to what is happening in the classroom (Garet et al., 2001).

A research-based early childhood STEM professional development should occur over time and incorporate multiple components. These components, based on a review of the literature, should include a science camp for teachers to observe activities and practices in classroom situations, see examples of different environmental arrangements, observe how to interact with children to support scientific inquiry, capitalize on teachable moments, and embed opportunities in daily routines and activities. In addition to a science camp for teachers, ongoing support for teachers would be available through a mentor. Technology can be used to support teachers by having a website so teacher can access recorded videos to review, modules to assist in understanding science concepts, and access to feedback with their mentor.

Utilize STEM curriculum that aligns with NGSS and NAEYC Recommended Practices.

Next Generation Science Standards (NGSS) are research-based standards for K-12 based on the assumption that children will arrive in kindergarten with the skills, knowledge, and dispositions that support their science achievement. With the introduction of CCSS and NGSS for K-third grade, it is important to remember early learning philosophy and research so young children are not expected to learn standards in ways that do support or enhance development. The NSTA Position Statement endorsed by the NAEYC (2014) and the NAEYC and National Association of Early Childhood Specialists in State Departments of Education’s Effective Learning Standards (2002) should drive the implementation of these standards. States could include an emphasis on developmentally-appropriate practices of both content and outcomes, train teachers to implement and assess these standards that support children’s development, and provide support to early childhood programs, teachers, and families through resources and professional development to understand the standards and how to implement them to support children’s learning. Reviewing these assessments or outcome measures can support data-based decision making and provide information that supports ongoing growth for students, programs, and teachers.

Technology

When used appropriately, technology has been demonstrated to be a useful tool that teachers can use to assist with facilitating instruction for young children (Boudreau & D’Entremont, 2010; Hine & Wolery, 2006; Lorah et al., 2013; Wilson, 2013). Furthermore, findings from recent studies conducted in preschool settings clearly demonstrate that technology can be used to teach young children STEM-related concepts (Schacter & Jo, 2016; Schacter et al., 2016). However, technology is not always utilized appropriately by teachers in early childhood settings (Oh-Young et al., 2015; Parette et al., 2013), perhaps because they did not receive training on how to appropriately use it for instructional purposes (Parette, Quesenberry, & Blum, 2010). Case in point, in a review of 23 ear-
ly childhood teacher preparation programs in the United States, Parette et al. (2010) found that 13 out of the 23 programs did not require teachers to take a course on how to use technology in the classroom. In addition, researchers found that only two of the programs actually offered a technology course geared toward early childhood teachers (Parette et al., 2010). Once again, professional development for in-service teachers is necessary (Parette et al., 2013), especially since not all individuals who join the teaching force in the State of Nevada fulfill the requirements to obtain their teaching licenses within the state.

The American Academy of Pediatrics (2016) and the NAEYC (2012) recently published recommendations regarding the use of screen time, which includes educational applications as well as television and other screen time activities. Among these recommendations are that children two through five years of age should have no more than one hour a day of high quality screen media and that a parent or other adult should co-view with the child. In addition to cautions about utilizing too much technology and its impacts on development, NAEYC (2012) called attention to the lack of equity in access to computer technology for children in low SES programs. While more and more families have access to technology through cell phones, tablets, and computers, there remains a lack of equity and intentional integration of technology in early childhood curriculum to support educational outcomes.

**What Other States Are Doing**

**Curriculum.** Building Blocks (http://www.ubbuildingblocks.org/) is a curriculum funded through the National Science Foundation for pre-K to second grade that embeds mathematics into classroom centers using activities such as art, puzzles, block area, music and movement, and more. This supports making math relevant to their daily lives and experiences. Print, manipulatives, and computers extend and expand on children’s prior math learning. This curriculum aligns with other state standards and can be used as a supplemental curriculum to assist teachers in integrating assessment into their teaching and using the results to drive instruction.

**Tools of the Mind** (http://toolsofthemind.org/) is a play-based curriculum, based on the works of Vygotsky and divided by preschool and kindergarten, to develop executive functioning, numeracy, and literacy. Currently, it is being used with more than 30,000 children in Head Start programs, public and private preschools, and kindergartens with promising results.

**NASA Jet Propulsion Laboratory** through the California Institute of Technology (http://www.jpl.nasa.gov/edu/teach/) has curriculum and activities for grades K-adult. Each activity includes a lesson plan, materials, how to set up the experiment, background and key concepts, a Ted Talk or other video support, procedures, discussion questions, options for assessment, and extensions. All the activities are aligned with NGSS and Common Core standards. These activities can be adapted for younger learners as they are inquiry based and hands-on.

**Children’s Museum Partnerships.** Early Childhood Hands on Science (ECHOS) is a comprehensive science curriculum developed in 2010 by the Miami Science Museum through a federal Institute of Education Science (IES) grant. The lessons are arranged to lead young children toward a deeper understanding of science content using the scientific process. This curriculum is focused on children at risk for school failure, and uses teachers as facilitators of both content and the learning process. In 2014, Miami-Dade Head Start centers began professional development and family engagement through comprehensive teacher training on ECHOS curriculum, opportunities for student teachers to teach science in Head Start classrooms, and parent workshops on how to integrate science activities. Parents then have the opportunity to help teach ECHOS activities in Head Start classrooms for 36 paid hours. This program is currently in 33 classrooms, with 66 parent leaders, 30 student teachers, and 650 young children.

The Association of Children’s Museums (http://www.childrensmuseums.org/) reports that 81 percent of children’s museums in the United States have science exploration areas for even the youngest scientists, infants and toddlers. In addition to offering opportunities to explore directly, 40 percent run after-school programs, 60 percent develop curriculum materials, and 70 percent provide school outreach programs. Children’s museums are a great resource to increase and expand scientific inquiry in early childhood programs. Many states and cities offer free or greatly reduced admission to children’s museums, state museums, and other
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recreational activities (state and county parks).

**Children’s Media.** Peep and the Big Wide World, developed by WGBH Boston and 9 Story Entertainment in association with TVOntario, is an animated series for children aged 3-5 years about a newly hatched chick that explores his world. Each half-hour episode contains two segments that focus on science concepts and two live shorts of children playing and experimenting in their own world. The website provides additional games, videos, handouts, activities for families, and resources for educators to extend the show’s activities in their classrooms. Using an integrated approach, the Peep developers work with early childhood teachers, public libraries, museums, community-based organizations, and families to support children’s scientific inquiry.

Other popular children’s media have developed resources to support early childhood STEM, including Lego and PBS (Public Broadcasting Service). In addition to television programming and toys to support STEM-based play, Lego and PBS also have resources, materials, and training for early childhood education professionals and families. Once early childhood professionals have a strong background in teaching scientific inquiry to young children (NSTA, 2014), they can utilize these resources to support developmentally-appropriate practices and rigorous scientific instruction in their classrooms and support families in applying STEM inquiry in daily activities with their child.

**Early Learning Standards**

Nebraska, Illinois, and Massachusetts currently have early learning standards with a STEM emphasis for children birth to 5 years old. Nevada has published its own early learning standards, the Nevada Pre-K Standards (2010) for children 4-5 years of age. These standards include math and science as separate domains in addition to other academic and developmental domains. Many states have specific STEM learning standards/guidelines for early childhood, including children birth to 3 years of age.

Massachusetts has aligned its early learning standards to the Next Generation Science Standards (2013). In addition to aligning the birth to 5 standards, there is an emphasis on early childhood at the advisory level as early childhood representatives participate on the state STEM advisory council. Nevada could expand its early learning standards by publishing standards to include children birth to 5, emphasizing embedded science opportunities and the scientific inquiry process in everyday activities, and bringing an early childhood representative to our Governor’s STEM Council.

**Including Families**

Families play an integral role in expanding and building on their child’s learning, especially in STEM, as applying the concepts and asking questions outside of the classroom further support the scientific inquiry process and STEM concepts in their everyday world. In addition to access to children’s media and museums, Nevada is rich with places for families to explore with their children. There are many places in Nevada, such as the many State and National parks and monuments and museums, that are all readily available for children and families to explore and learn. Connecting families with these resources and providing information on how to support their child’s learning at these places could support STEM opportunities and scientific inquiry.

**Conclusion**

There are many resources in Nevada that can support and enhance STEM opportunities and outcomes in early childhood. Strengthening early childhood professionals’ skills through high quality professional development is critical to ensuring young children are starting off on a strong STEM trajectory and supporting other academic areas, such as language and literacy. Additional ways to support STEM could include having an early childhood representative on the STEM educational framework of Nevada including the Advisory Council on Science, Technology, Engineering, and Math within the Department of Education as a component of Nevada’s statewide plan. By collaborating and utilizing existing resources and increasing early childhood professionals’ skills through professional development opportunities, broadening access to high quality STEM curriculum, and connecting teachers and families to community resources, we can help support Nevada’s educational outcomes as well as the economic goals of a highly qualified STEM professionals and a diverse economy.
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Early Childhood Education Personnel Pipeline and Retention in Nevada

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Early Childhood Education (ECE) professionals, who provide services to children aged 0-5 in a variety of settings, have proven to be a valuable resource because of their ability to establish a solid foundation for children’s cognitive development, academic readiness and social emotional skills. Every dollar invested in ECE has been shown to produce a minimum 13 percent return after accounting for the public costs of such programs. However, recruiting, training and retaining these professionals has proven to be a significant challenge, resulting in a shortage of ECE personnel both nationally and within the state. The turnover rate at Nevada’s ECE centers is nearly three times greater than for K-12 teachers. A lack of continuity, coupled with inconsistent education/training requirements, threatens to undermine an approach that has demonstrated significant societal and economic benefits.

High-quality preschool is the key ingredient for the future success of schools and children. In order to support Nevada’s youngest learners, we need to invest in high-quality preschools and the educators who work there. Children who attend high-quality childcare and ECE programs have greater life stability, employment rates, individual employment earnings, and higher IQs, as well as reduced rates of poverty, reduced crime, and reduced arrest rates. Attendance also results in less government dependence and better health outcomes.

Nevada Facts & Statistics
- As of 2013, there were approximately 176,000 children under 5 years of age in Nevada, with more than three-quarters requiring some form of ECE care.
- In 2014, the turnover rate at Nevada’s ECE providers was 22 percent.
- The state’s ECE providers report that nearly two-thirds of their staff were employed in their current workplace for between one and three years, a high degree of transiency.
- Only 12 percent of Nevada’s center-based childcare programs and 2 percent of family childcare homes are nationally accredited.
- Quantitative research in Nevada revealed that 74.8 percent of respondents ranked access to quality ECE as “very important” in building a foundation for K-12 success.
- ECE employees earn a salary on par with food preparation and dry-cleaning workers, with only a 1 percent increase in wages from 1997 to 2013.

Recent Actions in Nevada
- Using grant funding, Nevada has increased its investment in ECE from approximately $6 million to $12.4 million.
- Nevada SB 515 provides all-day public kindergarten to Nevada’s children.
- The state’s “Read by 3” initiative invested $27 million in K-3rd grade reading initiatives.
- Nevada’s DHHS Division of Welfare and Supportive Services provides childcare subsidies to low-income families, as well as funding to improve ECE facilities.

U.S. Facts & Statistics
- National guidelines recommend that ECE costs comprise no more than 10 percent of a family’s budget; in Nevada, the percentage ranges from 18.3 to nearly 23 percent.
- Only half of ECE personnel nationwide have a post-secondary degree of any kind, with only one-quarter having a four-year degree.

Considerations for Future Actions
Nevada has demonstrated an understanding of the importance of ECE, dedicating additional resources to ECE professional development and cost reduction measures for families. However, particularly within rural areas, available resources are inadequate to meet communities’ needs. Additionally, while efforts to reduce the costs to families have been beneficial, they have done nothing to
address the issue of ECE staff retention. With that in mind, the following recommendations warrant consideration:

- Adopt more stringent educational/training requirements for ECE personnel, which benefits both the children under their care due to increased competence, and the staff members themselves through the ability of educated personnel to command higher wages.
- Provide tuition assistance to students in two- and four-year programs related to ECE disciplines, as has been effectively implemented in other states.
- Actively promote utilization of the Nevada Registry and other state resources as a professional development resource for ECE personnel.
- Develop and publish ECE learning standards for infant/toddler and 3-year-old children (Nevada has published Pre-K standards for 4-year-olds).

Statewide Benefits of Future Action

- Reducing costs of ECE programs relative to household income would improve residents’ quality of life and increase participation of women in the labor force by at least 1 percent.
- A high-quality ECE network provides communities a competitive advantage in attracting businesses and employees.
- Longitudinal research has demonstrated that ECE is correlated with increased cognitive abilities, better test scores in the K-12 system, and higher graduation rates.
- Access to ECE is associated with decreased absenteeism and tardiness among employed parents, as well as increased productivity.

Implications of Maintaining Status Quo

- Issues related to high school graduation rates, which are positively correlated with ECE participation, will remain persistent without this demonstrated mitigation measure.
- While Nevada’s Pre-K investment is a positive step, research has shown that the return on investment during early childhood is higher than efforts later in childhood, specifically among children living in poverty.
- The economic vitality of Nevada’s rural communities will continue to be inhibited by the absence of accessible, high-quality ECE programs.
- As of 2013, only 14 percent of Nevada’s 4-year-olds were enrolled in preschool, compared to 41 percent nationally, demonstrating a significant supply/demand gap.
- If left unresolved, the ECE gap will remain an issue of concern to Nevadans, 96.6 percent of whom agreed that ECE has an impact on a child’s success later in life.

Introduction

There is a critical need for quality early childhood personnel in the State of Nevada. Early childhood professionals include those who provide services to children under 5 years old in public or private preschools, home and center-based child care, Early/Head Start programs, home visiting, Individuals with Disabilities Education Act (IDEA) Part B 619 programs and Part C early intervention, and other related services (U.S. Departments of Health and Human Services & Education [DHHS/DOE], 2015). Depending on families’ needs, children spend anywhere from 10 to over 40 hours per week in early childhood education (ECE) programs (U.S. Census Bureau, 2013). ECE builds a solid foundation for cognitive development, academic readiness, and social emotional skills that are necessary for success in K-12 education.

High-quality ECE is the key ingredient for the future success of our school, community, and state outcomes (see Figure 1). In order for Nevada to support its youngest learners, we need to invest in the professionals who work in ECE settings. In addition to benefits for developing children, ECE benefits the economy in distinct ways. In the long term, children who attend high-quality ECE programs are more likely to attend college, have greater life stability, employment rates, and individual employment earnings as well as providing care so parents can seek out employment and education, (Campbell et al., 2012). Attendance also results in less government dependence and better health outcomes. Quality ECE programs prevent challenging behavior and the need for remedial education thus reducing special education, child welfare, and criminal costs, and reduces rates of long-term poverty (Bivens, Garcia, Gould, Weiss, & Wilson, 2016).

Figure 1.
However, ECE quality in general is low.

High-quality ECE is possible with using experienced and educated ECE professionals (Heckman, 2000), however ECE professionals commonly lack appropriate education, experience, inadequate respect and compensation for professionals, and produce high turnover rates. In order to attain quality and positive child and family outcomes, a progressive and intentional ECE personnel pipeline is necessary to produce an ECE workforce that is properly recruited, trained, and retained.

With the signing of Every Student Succeeds Act (2015), Nevada has more power in making educational and early learning decisions. Moreover, as Nevada increases the number of state-funded pre-kindergarten classes, there is a need for more ECE professionals. The purpose of this paper is to present the current state of ECE and ways to support the ECE professional pipeline in Nevada. We will discuss what decisions other states are making regarding the ECE pipeline as well as recommendations for the Nevada Legislature.

Present State of ECE in the State of Nevada

In 2013, there were approximately 176,000 children ages birth to 4 years living in Nevada, with approximately 78 percent of them needing some kind of ECE care (U.S. Census Bureau, 2013). In 2013, 14 percent of Nevada’s four year olds were enrolled in preschool, compared to 41 percent nationally (USDOE, 2015). Although there are many ECE programs across the State, currently only 12 percent of Nevada’s center-based childcare programs and 2 percent of family childcare homes are nationally accredited through entities such as the National Association for the Education of Young Children (NAEYC; U.S. Census Bureau, 2013). Nevada has begun using a Quality Improvement Rating System (QRIS) to assess, improve, and communicate quality in ECE programs. In 2014, 15 percent of Nevada’s centers participating in QRIS program with only 3 centers scoring within 1-2 stars while 45 centers obtained 1 star (5 stars equaling Highest Quality and 1 star equaling Rising Star). Quality programs include thoughtful physical environments, developmentally and culturally appropriate practices, and positive relationships between children and adults (Copple & Bredekamp, 2009). These components can not only enhance child development but also prevent toxic stress. Stress and anxiety prevent children from developing the appropriate neural pathways necessary for executive functioning, academic development, and ability to form positive relationships (Shonkoff & Phillips, 2000).

Due to what we know about the growth and development of infants, toddlers, and young children, if Nevadans want to capitalize on education, there should be an emphasis on investing in ECE in addition to K-12 education. Not only does research support investing in quality ECE through building pipeline of qualified ECE professionals, Nevadans themselves show support for this platform. The Nevada Institute for Children’s Research and Policy (NICRP, 2015) conducted an opinion poll with a representative sample of 384 adults living across Nevada. On a rated scale, Nevadans expressed quality teachers as their highest priority (30.5 percent) as well as funding for education (22.4 percent). Of the Nevadans surveyed, 74.8
percent stated that access to quality ECE is “very important” in building a foundation for K-12 success. At an even higher rate, 96.6 percent agreed that ECE has an impact on a child’s success later in life (NICRP, 2015).

Various funding systems are currently in place to support professional development for ECE professionals. The Child Care and Development Fund subsidy grants are available through Nevada’s DHHS Division of Welfare and Supportive Services (2016). In addition to childcare subsidies to low income families, ECE facilities can also receive state funds to improve their quality of care through professional development. However, the currently available resources do not meet the needs within our communities, particularly in rural areas, due to lack of resources, funding, and coordination among systems.

Nevada was chosen to receive intensive technical assistance from the Early Childhood Personnel Center (ECPC, 2016) through funding from the Office of Special Education Programs and through the Office of Early Learning and Development to assist states in developing an integrated comprehensive systems of personnel development (CSPD) for the ECE workforce. These two systems look to support an integrated professional development pipeline for all ECE professionals across special education, childcare, Head Start, early childhood mental health, child care, and others. Members of this committee work closely with the Nevada Interagency Coordinating Council (ICC) and Nevada Early Childhood Advisory (ECAC) Committee which are both designated by the governor to strengthen ECE state-level coordination and collaboration, conduct statewide needs assessment, and identify barriers and solutions related to childcare, home visiting, ECE, and special education. Additionally, Nevada has received assistance from the Technical Assistance Center on Social Emotional Intervention (TACSEI, 2016) and has 10 sites developing programs to support children’s social-emotional development.

Nevada increased its funding from approximately $6 million to $12.4 million across 90 programs with the High-Quality Preschool Development Grants from the Office of Early Learning and Development in the Nevada Department of Education (NDE, 2015). This means that from 2015 to 2019, approximately 1,560 preschool aged children will have the opportunity to go to pre-school in Nevada. Nevada Senate Bill 515 passed in order to provide all-day public kindergarten to Nevada’s children in the 2015-2017 biennium (Nevada Legislature, 2015). The “Read by 3” initiative in Nevada (SB 391) is an investment of $27 million in the academic success of students in kindergarten through third grade in reading.

Although children 3 and 4 years old have benefited from legislation in the past, Nevada’s youngest learners (i.e., infants and toddlers) have not profited from these efforts. Additionally, many communities have not participated in grant or technical assistant opportunities. The expansion of Nevada’s bills and future legislation would allow all children ages birth to five years of age to strive and be better-equipped entering Nevada’s K-12 education system.

**Economic Benefits of Early Childhood**

One thing we know is that starting high quality ECE earlier is better. The return on investment during early childhood are much higher than efforts later in childhood, specifically for children living in poverty (Lipsey, Farran, & Hofer, 2015; Whitebrook et al., 2014). For every dollar spent on ECE, there is a minimum 13 percent return on investment after accounting for public costs of programs (Garcia, Heckman, Leaf, & Prados, 2016; Heckman, 2000; NevAEYC, 2015). Similarly, an investment in universal, high-quality pre-kindergarten (i.e., pre-kindergarten for all eligible 3 and 4 year olds) from 2016 to 2050 is estimated to result in a $10 billion benefit per year of investment (Lynch & Vaghul, 2015). Increasing these efforts to children beginning at birth would further benefit society. The benefits of ECE programs far exceed the initial investment costs (Barnett & Nores, 2015; Duncan & Magnuson, 2013).

Longitudinal research consistently boasts benefits of high quality ECE. In the Abecedarian Project of 1972 and High/Scope Perry Preschool Study from 1962-1967 (Schweinhart et al., 2005), children from low-income backgrounds were provided full-time high-quality education from infancy until age 5. Long-lasting outcomes included higher cognitive scores on math and reading tests, higher IQs, higher graduation rates, and college attendance for its participants. Participants’ incomes were over 60 percent more than the control group and demonstrated positive lasting effects on employment rates, reduced rates of poverty, and crim-
inal activity through age 40 (Campbell et al., 2012; Schweinhart et al., 2005). High-quality ECE also boosts social-emotional skills, which are key to long-term outcomes (Garcia et al., 2016).

In a survey, 87.2 percent Nevada residents reported it was important for parents with young children to be able to work. Investment in ECE stimulates the economy by providing comfort for employees in knowing their children are receiving reliable, quality care and education. There are decreased rates of absenteeism and tardiness, and increased levels of productivity and positivity within businesses with established high-quality ECE programs (Whitebrook et al., 2014). Employment opportunities for families, especially those living in poverty, allow them to financially provide for their families, obtain health insurance, and gain respite from caregiving (Shonkoff & Phillips, 2000). Furthermore, a community’s ECE system has the ability to recruit businesses and employees to a community by providing high-quality ECE with positive outcomes for children, families, and the community overall.

While there is national support for pre-kindergarten and early learning initiatives for children ages birth to 5 year olds, there is also statewide support. Eighty-eight percent of Nevadans state there should be increased funding for ECE in order to improve the quality of ECE programs and to provide equal access to ECE for low-income families (NICRP, 2015).

**Costs of Early Childhood Education**

One of the biggest costs for families during their children’s first years is ECE. Although the USDHHS (2015) states that ECE should make up no more than 10 percent of a family’s budget, most ECE exceeds this amount. The annual average cost of childcare for infants in Nevada is $9,852 or 18.3 percent of a median family’s annual income (Economic Policy Institute, 2016) or upwards of $12,078 for an accredited center (Weiss & Brandon, 2010). The annual average cost of care for 4 year olds in Nevada is $8,118 or as much as $10,013 at an accredited center (Weiss & Brandon, 2010). Nationally, Nevada ranks fourth most expensive ECE for four year olds and eighth most expensive for infants (The Children’s Cabinet, 2015). A person earning minimum wage would need to work full time for 30 weeks out of the year just to earn enough money to pay for infant care. For a family with one infant and one 4-year-old, a common occurrence, ECE costs $17,970 or 50.4 percent more than the average rent in Nevada or 33.3 percent of a typical family’s income. In Nevada, infant care is more expensive than attending a 4-year public university (Economic Policy Institute, 2016). This leads to many parents selecting affordability and availability (i.e., location to work or house, open spots) over quality, or choosing to stay home to care for their children and not re-entering the workforce.

Universal pre-kindergarten has made ECE available to many children regardless of family income, a child’s ability levels or test scores, and other factors (Colker, 2009). If universal pre-kindergarten was implemented for all Nevada’s 3 and 4 year olds, more parents would be able to seek employment. Currently, 43.7 percent of surveyed Nevadans stated cost as the biggest barrier to quality ECE, with 94.5 percent saying ECE should be more affordable in the state of Nevada. Providing free or low-cost ECE would stimulate the economy while investing in Nevada’s future—with more generous subsidies and cost caps, parents would save money that was previously spent on ECE, improving families’ quality of life. Simultaneously, if ECE expenses were limited, the average rate of growth of women’s participation in the labor force would be 0.5 percent nationally, with higher outcomes in Nevada at approximately 1 percent (Herbst, 2010).

**The ECE Professional Pipeline**

Creating a strong ECE professional pipeline will allow Nevada to reap the many benefits of high quality ECE systems. This pipelines includes recruiting motivated, diverse individuals, training them appropriately at the beginning and throughout their careers, and retaining them by providing professional respect and compensation (see Figure 2). These factors interact and influence each other in continuous cycle. For example, the lack of professional respect and potential income impacts people’s investments in energy and money into ECE training programs. Additionally, as university programs focus heavily on school-based programs, those with formal ECE training often seek employment outside of ECE programs. These factors impact the quality of programs across the state and thus child, family, and societal outcomes.
A concerted effort to respecting ECE professionals across all early childhood settings is a major step to strengthening the ECE pipeline. By recruiting and supporting quality professionals to work with infants and toddlers, children with disabilities, in family homes, and in ECE centers, we strengthen the all children, families, and citizens.

Recruiting and Training ECE Professionals

Early childhood education is a unique occupation with an unparalleled demographic make-up. Nationally, 95 percent of ECE professionals are women. Overall, 39 percent of ECE professionals are non-white minorities, compared to 33 percent of other occupations. Typically, to enter the ECE workforce, only a high school diploma is required (U.S. Department of Labor, 2016). In 2011, 66 percent of Nevada’s early childhood providers earned a high school diploma or less (Nevada Senate Bill 522, 2015). Overall 53 percent of ECE personnel (i.e., teachers, assistants) had some level of college degree, 26 percent having a four-year degree, and 9 percent attaining a graduate degree (National Survey of Early Care and Education Project Team, 2013).

In Nevada, there are different state licensure requirements to work in childcare settings (e.g., private center-based programs, faith-based programs, family home care, Head Start/Acelero) compared to Department of Education licensure requirements to work in public ECE programs (e.g., state preschool, ZOOM programs, Title 1 pre-K, IDEA Part B 619, IDEA Part C early intervention programs). Child care licensure is administered through the Nevada Registry. It was adopted in April 2009 by the Nevada Legislature (R112-06 and R001-09) and fully implemented in December 2012. Child care licensure requirements include health and safety courses within 90 days of hire and ongoing continuing education. NDOE funded program teachers must hold an ECE Birth - Second grade license through the NDOE (NAC 391.089) or an Exceptional Pupils 0-7 Endorsement for Early Childhood Developmentally Delayed (NAC 391.363). Both these licenses require a bachelor’s degree or higher.

In general, professionals who work with older children are likely to have higher levels of education. Our ECE professionals who are caring for our youngest citizens are just as important as those professionals working in K-12. In a survey distributed to Nevadans, 92.5 percent of residents believe that it is very important that ECE teachers are supported in furthering their education (NICRP, 2015). Higher expectations for Nevada’s ECE professionals would benefit students because of ECE professionals’ increased knowledge and skills related to child development and education, and ECE professionals could be more equally compensated for their work. As stated by Nevada Ready!, aligning ECE with Nevada Common Core Standards aides in creating a more continuous educator pipeline (NDE, 2015); however, we need to ensure that the pipeline includes all ECE professionals and not just those working in pre-kindergarten programs. Nevada can ensure that ECE professionals have the knowledge, skills, and dispositions in order to address the need of learners ages birth to 5 (Copple & Bredekamp, 2009).

There are many vacancies at early learning centers nationally and in the state of Nevada. In settings in which teachers work directly with children, 48 percent of early learning centers reported one or more vacancies (Whitebrook & Sakai, 2003). This shortage in ECE professionals should receive similar attention to our K-12 professional shortage including similar accelerated training programs, ongoing professional development, and financial incentive and loan forgiveness.

The two main pathways for qualified ECE professionals are traditional 2- and 4-year university preparation programs within the Nevada System of Higher Education (e.g., UNLV, UNR, Nevada
State) and alternative routes to licensure programs (ARL). In the 2016-2017 school year, UNLV’s graduate programs had 112 ECE students and 61 early childhood special education (ECSE) students (University of Nevada, Las Vegas, 2017). The U.S. and Nevada are still experiencing ECE professional shortages and high turnover rates.

ECE professionals need to be recruited to the field and supported throughout their training. The Nevada Association for the Education of Young Children’s (NevAEYC, 2016) recommends increasing funding, wages, and resources dedicated to training and education in order to assist in retention of ECE professionals. In Indiana, former Governor Pence allotted $7,500 in tuition per year for students performing in the top 20 percent in education majors. New Mexico’s Governor Martinez proposed $15,000 scholarships for students enrolling in education. Sixteen other governors called for increased awareness and action plans regarding compensation and retention funding in education (Education Commission of the States, 2016). The Chicago Child-Parent Program calls for higher ECE professionals pay support towards obtaining bachelor’s degrees or ECE certifications and ongoing staff development to increase the retention of ECE teachers (Reynolds, Temple, White, Ou, & Robertson, 2011).

Retaining ECE Professionals

Even if professionals are actively recruited and trained, retaining them in the ECE field remains difficult. Low wages, high turnover rates, and lack of professional support encourage professionals to leave ECE settings, particularly in child care and infant/toddler programs.

Wages of ECE Personnel

The largest predictor of instability among ECE professionals continues to be wages (Phillips, Mekos, Scarr, McCartney, & Abbott-Shin, 2000). There are wage gaps between employees with varying education levels as well as program type (i.e., public pre-K, home visiting, infant/toddler care, private childcare, Head Start). Furthermore, community-based ECE professionals (e.g., child care, Head Start) earned between 60 to 67 percent of what public preschool teachers earned (see Table 1). Nationally, ECE professionals are more than twice as likely to live in poverty as other families in different occupations (Jiang, Ekono, & Skinner, 2016). Many of these professionals cannot afford ECE for their own children and are likely to rely on federal programs such as Medicaid, Supplemental Nutrition Assistance Program (SNAP), or Temporary Assistance for Needy Families (TANF). Minimal salary changes have taken place between 1997 and 2013. Childcare workers continued to be in the 2nd to 3rd percentile for mean annual salary on par with food preparation workers and laundry/dry-cleaning workers, with only a 1 percent increase in wages from 1997 to 2013 (U.S. Bureau of Labor Statistics, 2016).

<table>
<thead>
<tr>
<th>Table 1: ECE Wages Across Professionals</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE Position</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Elementary</td>
</tr>
<tr>
<td>Kindergarten</td>
</tr>
<tr>
<td>Public PK</td>
</tr>
<tr>
<td>Head Start</td>
</tr>
<tr>
<td>Community-Based ECE</td>
</tr>
<tr>
<td>Federal Poverty Level</td>
</tr>
</tbody>
</table>

Source: U.S. Department of Labor, 2016

There are differences in compensation and opportunity for promotion and leadership in ECE. Public school teachers earn more income with additional educational attainment as well as administrative positioning. However, in infant/toddler programs (e.g., home visiting, IDEA Part C) and community-based programs specifically, there is little incentive for obtaining advanced degrees and or taking on administrative or leadership positions. ECE centers that paid above a region’s median wage were 51 percent more likely to employ professionals with higher educational levels (Whitebrook & Sakai, 2003). Unfortunately, low salaries have resulted in educators leaving the field (Wisconsin Early Childhood Association [WECA], 2016) and do not attract highly qualified professionals. Furthermore, often those who leave the profession are often more highly qualified than those who remain in the profession (Barnett, 2003). With research supporting the importance of early learning, Nevada should place emphasis on the pay
Early Childhood Education Personnel Pipeline and Retention

and benefits for those with our youngest and most vulnerable citizens.

**ECE Personnel Turnover**

In order for children to have the highest benefit during their early years, they need interaction with consistent providers and educators upon entering kindergarten (Barrett, 2008). The national turnover rate of preschool teachers ranges from 25-50 percent per year, a higher turnover rate than many other occupations including K-12 teachers who report an 8 percent turnover rate (Miller & Bogatova, 2009; National Center for Education Statistics & U.S. Department of Education, 2014). In Nevada’s ECE centers, the reported annual turnover was approximately 22 percent. Nevada’s ECE center (i.e., childcare) providers reported that 63 percent of their employees were employed at their current workplace for between one and three years (The Children’s Cabinet, 2015). Turnover creates imbalanced child-to-adult ratio, additional stress on remaining employees, disrupts child-caregiver attachment, and impacts childcare quality, child outcomes, and safety (Whitebrook & Sakai, 2003).

Furthermore, the rate of job turnover appears to be a strong indicator of program quality (Cassidy, Lower, Kintner-Duffy, Hegde, & Shim, 2011). Teaching and working in ECE can be described as having, “high demands, low control, and low support” (Whitaker, Dearth-Wesley, & Gooze, 2012, p. 1). Educators are more likely to leave the profession when they experience more issues related to relationships with coworkers and supervisors, overall job satisfaction, wages, stress, health insurance, hours, sick leave and/or paid time off, professional development opportunities, education level, opportunities for promotions, and training opportunities (Bullough Jr., Hall-Kenyon, & MacKay, 2012). Not only does heightened stress negatively impact young children’s emotional responses and development but it also effects educators. The consequences of poor stress management impacts teachers’ mental and physical health, lowering their capacity to support young children in ECE programs (Whitebrook et al., 2014).

**Ongoing Professional Support**

If a teacher works within a school district (i.e. P-12), there are professional organizations, such as teachers’ unions who represent them for the budget, salary scale, health and retirement benefits, mediation sessions, and so forth. However, most of those working in ECE programs are not employed by a school district. Therefore, they lack organized representation that can advocate for positive work conditions, increased wages, and changes to professional standards.

Additionally, professionals should have access to affordable and time-sensitive professional development. By staying up to date on evidence-based practices as well as policy and practice recommendations, professionals can provide high quality education and care. Nevada has many professional development opportunities available to professionals including the Nevada Registry and Children’s Cabinet.

The Nevada Registry (http://www.nevadaregistry.org) is Nevada’s professional development registry for ECE. It disseminates information such as early childhood personnel career opportunities, professional development opportunities, and state training opportunities. All continuing education units (CEUs) must be approved through the registry in order to ensure quality. The Registry also provides career guidance through professional development plans to support EC professionals with their education and career ladders, as well as a requirement for T.E.A.C.H. EC professionals tuition grants and the QRIS.

The Children’s Cabinet (http://www.childrenscabinet.org) provides multiple supports for children and families including Nevada’s Child Care Resource and Referral (CCR&R) Department Supporting Early Education and Development (SEED). The Children’s Cabinet also provides data, ECE training opportunities, scholarship and grant opportunities, and information for individuals interested in becoming an EC provider.

The Early Childhood Special Education Information Hub (http://www.doe.nv.gov/Special_Education/Early_Childhood/) provides information for those working with young children with disabilities in ECE settings.

It is important to note that ECE professionals often work long and non-traditional hours making meaningful professional development challenging. Additionally, researchers indicate that integrated methods such as coaching and consultation as the most effective forms of professional development (Dunst, Trivette, & Hamby, 2010).
Suggested Solutions

In order to maximize learning opportunities, young children need access to high-quality professionals (Barnett, 2003; NAEYC, 2013). Although Nevada has many structures in place to support the ECE pipeline, there are many potential solutions that the Nevada Legislature could consider to maximize outcomes of children, families, professionals, and other citizens.

Certification Requirements and Stipends

Professional qualifications. First and foremost, we need to have high expectations of all our ECE professionals to provide the highest quality of education and care. Nevada could require all ECE professionals to obtain a license, certification, or credential. In particular, those caring for infants and toddlers should be required to have adequate education to promote crucial development during this sensitive period. Many states, such as Illinois, are implementing this process within their QRIS systems. These professional qualifications would ensure that professionals have a high level of education and experience upon entering the field, as well as continual education to maintain their quality. In order to achieve this, the State, with support from Nevada System of Higher Education (NSHE), QRIS, and CCRR agencies, could develop programs such as alternate route to licensure (ARL), similar to opportunities for school-based professionals.

Financial support. Additionally, allocating funding for stipends for professionals to enroll in additional college courses, attend conferences, and participate in professional development coaching would be beneficial. For example, California made available $11 million to be used by teachers, ECE site supervisors, and directors to pay for tuition and to purchase books (CDOE, 2013). The CDOE suggests that these stipends not only improved retention, but also ended up saving money because fewer funds were used for ECE professional recruitment and training. Although stipends increase the likelihood of ECE professionals advancing their education, they may need additional support (e.g., funding, scholarships, grants) to be able to afford the cost of tuition and books to meet certification requirements (Nevada System of Higher Education, 2016).

Nine states have developed plans to increase funding for early learning in order to improve the quality of early learning. For example, Georgia Governor Deal proposed a $358 million Pre-K budget including $26.2 million for salary increases for teachers, and a 3 percent merit pay increase for teachers. Missouri Governor Jay Nixon requested that the education funding formula be expanded to include ECE (Education Commission of the States, 2016).

Professional knowledge. ECE programs should be aligned with current recommendations in the field including NAEYC and Division for Early Childhood (DEC) practices as well as state standards. Currently, the State has approved and published Pre-K (4-year-old) Standards. Infant/Toddler Early Learning Guidelines for the State of Nevada remain in draft form. Furthermore, there are no published standards that include recommendations for 3-year-old children. A multidisciplinary committee of diverse professionals should approve, publish and disseminate these standards. Providing professional development and including standards in personnel preparation programs could ensure appropriate professional knowledge. Assessing professionals fidelity in implementing these standards and recommendations would further the overall quality for ECE. As Nevada is one of the most diverse states with a growing population of dual language learners as well as children with disabilities, ECE professionals must be trained to appropriately nurture the development of all learners.

ECE Professional Recruitment

Early Head Start and Head Start employs a family-centered recruitment model that may remedy pipeline challenges. Parents who have taken part in the program work towards appropriate licensure and certification to serve as assistant teachers. Nevada could recruit more professionals by “growing” professionals from within the community. Parents and family members could be recruited to become ECE professionals as teaching assistants or lead teachers based on their interests, opportunities for education, and career goals. This model could be replicated for IDEA Part C early intervention, home visiting, family home child-care, and preschool programs. This model could be particularly effective in rural areas in which professional recruitment is especially challenging.

Connecting Systems of State Support
Integrating existing systems would better coordinate professional recruitment and training. Similar to other states, ECE programs are spread across Departments of Human Services and Education including many different offices as well as community partners (e.g., Nevada Registry, CCRR, United Way, QRIS, child welfare, Nevada Ready!, home visiting, Part B 619, Part C, Title I, Early Head Start, Head Start, private ECE centers). It is necessary to coordinate across these systems as recommended by the USDHHS, DOE, NAECY, and the DEC. Blending and braiding support, funding, and communication systems would be beneficial by providing professional growth plans, professional development, and additional support to ECE providers. Additionally, professional collaboration is beneficial to child and families’ outcomes particularly for children living in poverty and children with disabilities.

**Nevada System of Higher Education Support**

An alternative solution would be allotting funds to NSHE to develop ECE program coordinator positions for each university with an ECE or ARL program. It is difficult for faculty members and tenure-track faculty to effectively coordinate effective ECE programs in addition to existing research, writing, teaching, advising, and service responsibilities. Having dedicated faculty to ECE program coordination will allow for better student recruitment, fieldwork placement and supervision, and federal personnel preparation grant opportunities. This designated role could increase the accountability of ECE programs, could increase the number of qualified applicants in ECE programs, and in turn would increase the number of qualified and educated professionals transitioning into the ECE workforce. Additionally, encouraging collaboration among early childhood, special education, and English language learning departments is vital to meeting the needs of all children and families in Nevada.

**Conclusion**

There is a critical need for quality early childhood personnel in the State of Nevada. The returns on investment during early childhood are much higher than later childhood, specifically for children living in poverty (Garcia et al., 2016; Whitebrook et al., 2014). Children who attend high-quality ECE programs experience life long benefits and are likely to avoid costly consequences (Bivens et al., 2016; Schweinhart et al., 2005). By investing in the ECE pipeline, Nevada will increase positive child, family, state, and community outcomes.

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Recruit, Prepare, and Retain Teachers of Color in Nevada

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Shaoan Zhang, Ph.D.
Chelsea Desalvo
Malayka Cornejo

Over the course of the past four decades, the face of America has changed dramatically. In 1972, whites represented 78 percent of the student population nationally. Today, no ethnic subgroup holds a plurality. In Nevada, the diversification of communities has occurred at an increasingly accelerated rate, already surpassing demographic patterns projected for the nation in 2050. At the same time, the ethnic diversity of the teaching corps has remained relatively static. Between 2011 and 2015, the percentage of non-white teachers increased only four percentage points, to a total of 18 percent. This incongruence, known as the “diversity index,” has implications for the education of K-12 students, as research has demonstrated better learning outcomes for both white students and students of color in ethnically diverse teaching environments.

Nevada Facts & Statistics
• In the 2012-13 academic year, students of color comprised 63 percent of the statewide student population, while teachers of color represented only 19 percent of the corps.
• Within the Clark County School District (CCSD), whites represented only 26.2 percent of the student body in academic year 2015-16, but 72.9 percent of the teachers.
• Nevada’s diversity index is among the largest in the nation (Nevada: 42 vs U.S.: 30).
• Given the acute and persistent shortage of teachers in Nevada and the state’s demographic composition, non-whites represent a large, relatively untapped potential pool of teachers.

U.S. Facts & Statistics
• Diversity gaps are not inherently indelible; several other metropolitan areas in which whites represent a minority within the student population have diversity indices less than half of Nevada’s.
• National research reveals improved academic outcomes among students instructed by teachers of similar ethnic and cultural backgrounds.
• Teachers of color are also perceived as “role models” by non-white students, resulting in higher academic performance and attendance.
• Quantitative research indicated that middle and high school students of all races, including whites, preferred a diverse pool of teachers.

Recent Actions in Nevada
• The University of Nevada, Las Vegas has implemented alternative licensure programs, which enroll a larger percentage of teacher candidates of color.
• The UNLV Office of Research and Economic Development funded a research project, Where Are Our Teachers of Color?: Resilience and Diversity in K-12 Education to conduct research from perspectives of teachers of color in CCSD regarding recruitment, preparation, and retention of teachers of color.
• The Nevada Department of Education provided a grant enabling the development of the Abriendo Caminos/Opening Pathways initiative, which encourages CCSD students of color to consider teaching as an educational plan in high school.
• CCSD offers professional development opportunities to increase the cultural competence of teachers from all ethnic backgrounds working with students of color.
• CCSD also implemented a multi-pronged initiative to address the teacher shortage that includes, among other things, fast-track certification options and monetary hiring incentives for teachers committing to work in lower-performing schools.

Considerations for Future Actions
To reduce the diversity index, lawmakers may consider a number of measures, including:
• Increase funding for the recruitment, development and retention of teachers of color.
• Expand upon the successful Zoom and Victory schools promoted through SB 405 and SB 432 to include support specifically for current inservice teachers of color as well as for early recruitment of teachers of color from local high schools.
• Improve working conditions within K-12 schools, which are correlated with teacher attrition.
• Recruit preservice teachers of color from within the pool of currently unlicensed staff in K-12 schools.
• Enhance the level of interaction between white teachers/administrators and teachers/students of color.
• Build upon programs to recruit, support, train and mentor teachers of color.

**Statewide Benefits of Future Action**

• Based upon data from other metropolitan areas with smaller diversity indices, a greater level of teacher diversity is correlated with improved student performance and higher graduation rates.
• Non-whites represent a significant and largely untapped human resource to address the state’s ongoing teacher shortage, which is particularly prevalent within urban areas that have higher percentages of students of color.
• An ongoing challenge for Nevada in attracting major employers and diversifying the economy is the national reputation of its primary and secondary educational system; measures that improve student performance and, by extension, the state’s ranking will support the state’s broad economic goals.

**Implications of Maintaining Status Quo**

• Education Week’s *Research Quality Counts 2016* report listed Nevada last in the nation for “student chance of success” and 38th for K-12 achievement.
• The relative lack of teachers of color within Nevada is a self-perpetuating cycle, because students of color perceive teaching to be a role reserved for whites and elect not pursue that field of study.

**Introduction**

The greatest challenge facing K-12 educators in the state of Nevada is to provide an effective and equitable education to all students from all backgrounds regardless of race, ethnicity, gender, disability, home language, and socioeconomic status. This is not a new challenge, but one that has continued to grow along with the diversity of the student body (Banks 2006; Grant & Sleeter, 2007; Hodgkinson, 2001; Ladson-Billings, 2009). In 1972, only 22 percent of the school population were students of color; by 2001, this population had increased to 39 percent (Hodgkinson, 2001, Villegas & Lucas 2002, quoted in Dedeoglu & Lamme, 2011, p.469). As of 2014-2015, white students are now a minority in K-12 schools, with no single racial or ethnic group in the majority (Institute of Education Sciences, 2016, Table 7, p. 48). Compounding the challenge of student demographic diversity, the nation’s teaching force is only slowly becoming more diverse. In 2011, 86 percent of America’s teachers were middle-class white females (Dedeoglu & Lamme, 2011, p.469; Feistritzer 2011, p. 11). The most recent numbers have barely improved—currently, 82 percent of the teacher corps is white (U.S. DOE, 2016).

The difference between the percentage of students who are students of color and the percentage of teachers who are teachers of color is known as the diversity index or diversity gap. Boser (2014) reported that, in 2012, with a diversity gap of 42 (61 percent students of color versus 19 percent teachers of color), Nevada was well above the national average (30). This was the second-largest diversity gap in the country, with only California showing a slightly larger diversity gap of 44 (Boser 2014). In the succeeding three years, the situation has worsened. The Nevada Education Data Book 2015 reported that students of color comprised 63 percent of the total student population statewide in 2012-2013, while 81 percent of the teacher corps was white (diversity gap of 44); Clark County in the same period reported 70 percent students of color, and 76 percent of the teacher corps white, for a diversity gap of 46 (Takahashi, 2012). Most recently, Clark County School District (CCSD) reported 73.8 percent students of color populating that district as of 2015-16 (Clark County School District Fast Facts 2015-16). However, the percentage of teachers of color is only 27.1 percent, yielding a diversity gap of 46.7.
Comparing to other large school districts nationwide, the diversity gap in Nevada, especially CCSD, is significant. For example, Miami-Dade County Public Schools is the fourth largest school district with a total student enrollment of 370,656 as of August 30, 2016. The school district’s Statistical Highlights 2015-2016 shows that students of color comprised 92.7 percent in 2015 and the teachers of color comprised of 78.1 percent in the same time period, yielding a diversity gap of 14.6. Figure 3 demonstrates the student and teacher ethnic distribution comparison in Miami-Dade County Public Schools in 2015.
Houston Independent School District, the eighth largest school district in the United States, has a total student enrollment of 215,225 in Year 2014-2015. Students of color comprised of 91.8 percent in Year 2014-2015 and teachers of color comprised of 70.6 percent in the same time period, yielding a diversity gap of 21.2. Figure 4 shows the student and teacher ethnic distribution comparison in Huston Independent School District in 2014-2015 (District and School Profiles, 2014-2015).

*Others includes American Indian, Alaskan Native, Asian, Pacific Islander, and Multiracial Categories.*
This “diversity gap” must be addressed for several reasons. One reason is that research clearly shows the benefits of having a more diverse teacher corps, not just for students of color but for white students as well (Ingersoll & May, 2011; Villegas & Irvine, 2010; Waters, 1989). A second but no less important reason is that citizens of color have as much right to aspire to education as a career—and to experience success in that career—as members of the majority do. Yet the persistence of the diversity gap indicates that those aspirations are being dashed, perhaps even before they are fully formed, which does not speak well to our society’s commitment to equal opportunity in either education or livelihood. In short, there are compelling reasons to work to shrink the diversity gap rooted both in practical and philosophical ground. Doing so, however, first requires recognizing the benefits of greater participation in the teacher corps of teachers of color, as well as understanding the nature and causes of the gap. We can then evaluate past and current efforts to shrink the gap, and consider what else needs to be done.

The policy paper “The Teacher Pipeline: Recruitment and Retention” (McCarthy & Quinn, 2015) lays out the needs and recommendations for K-12 teacher recruitment and retention in Nevada in general. Working from the research and implications laid out by McCarthy & Quinn, we focus specifically on teachers of color and their needs in terms of recruitment and retention. We begin by noting the benefits to multiple constituencies of a teacher corps that includes teachers of color, discuss the nature and causes of the persistent diversity gap in K-12 schools, and then provide an analysis of the efforts that have been made to improve the situation to date, as well as the factors that have limited the success of those efforts. We end with a brief discussion of the implications for Nevada policy makers.

**The Benefits to Shrinking the Diversity Gap**

Research indicates that having teachers of color in the K-12 workforce benefits all students, including white students. In addition, they have the potential to serve as a resource for schools as a whole, as well as the surrounding community.

**Benefits to Students of Color**

Sleeter (2008) pointed out a number of problems resulting from a primarily white teaching force, including difficulties such teachers have forming constructive relationships with students of color, holding low expectations of students of color, interpreting students’ lack of engagement as a lack of interest in learning, and blaming students’ academic problems on an inability to learn (p. 559). Sleeter (2008) further observed that, due to the combination of low expectations and cultural mismatch, white teachers are more likely to refer to students of color to special education programs than white students and, conversely, are more likely to refer white students to gifted programs than students of color. Reinforcing Sleeter’s work, Villegas and Irvine (2010) found that teachers of color have more favorable views of students of color, including more positive perceptions regarding their academic potential (p. 181-182). Research shows that students of color view schools as more welcoming places and perform better on a variety of academic outcomes if they are taught by teachers of color who are likely to have “inside knowledge” (Ingersoll & May, 2011) due to similar life experiences and cultural backgrounds (Villegas & Irvine, 2010). Villegas and Irvine (2010) identified three research-based rationales for increasing the supply of teachers of color: (1) teachers of color serve as role models for all students; (2) teachers of color can improve the academic outcomes and school experiences of students of color; and (3) more teachers of color are needed to reduce the acute shortage of educators for high-needs urban schools (pp. 176-186).

**Benefits to White Students**

According to former U.S. Secretary of Education King, “research suggests that students of color benefit from having teachers of color who can serve as positive role models and illustrate the potential of what they can be. But we also know that society benefits when all students, regardless of their background, grow up seeing diverse adults in positions of authority” (King, 2016). King’s second point is an important one: All students need the opportunity to experience a multi-ethnic teaching force in order to unlearn racist stereotypes they might have internalized in other settings (Waters, 1989; Villegas & Irvine, 2010) and understand people from different backgrounds. Moreover, based on data from the Measure of Effective Teaching study, Cherng and Halpin (2016) found that middle and high school students of all races preferred a di-
verse pool of teachers. Thus, it is important to have a diverse population of teachers in our schools to meet the needs of all students.

**Causes of the Diversity Gap: The Leaky Pipeline**

Knowledge of the nature and causes of the diversity gap nationwide date in some cases as far back as the 1980s, as researchers have identified a range of factors contributing to the gap as well as its intractability, all of which are visible in Nevada school districts as well. One main issue lies in problems with the teacher supply pipeline that has too few students of color enter and complete college (Ingersoll & May, 2016). Students of color face numerous obstacles on the road to becoming teachers (Ahmad & Boser, 2014; Dilworth & Coleman, 2014). First, they must overcome the inequality that begins at a young age because students of color are more likely to attend substandard K-12 schools and least likely to attend a university (Nuby & Doebler, 2000). As Ladson-Billings (2005) observed, “if high school completion continues to be a barrier for students of color, it is unlikely that we should expect to see more students of color in college or university preparing for teacher certification” (p. 230).

In Nevada, for example, the four-year adjusted cohort graduation rate in 2012-2013 was 70.7 percent; however, the graduation rate for Black students that year was 56.7 percent, followed by American Indian students at 58.7 percent and Hispanic students at 64.4 percent (Figure 5).

![Figure 5. Nevada Graduation rates by Ethnic Group (SY 2010-11 through SY 2012-13)](image)

Even after students of color decide to become teachers, they face further barriers built on top of those they experienced during their K-12 schooling, including lower scores on teaching entry tests, economic factors such as the high cost of schooling and lack of scholarships (Achinstein, Ogawa, Sexton, & Freitas, 2010; Ahmed & Boser, 2014; Ingersoll & May, 2016; Irvine & Fenwick, 2011), and inadequate college preparation and guidance (Sleeter, Neal, & Kumashiro, 2015). This means students of color go to universities and eventually teacher preparation programs at a lower rate. Table 1 shows one way of demonstrating the leaky pipeline for students of color in Clark and Washoe Counties by showing the decreasing percentages of students of color in the Nevada education system from K-12 schools to the university programs in Las Vegas and Reno (Table 1). Sources of the data in Table 1 include NSHE Nevada K-12 Population by Ethnicity Demographics, University of Nevada, Las Vegas College of Education Internal Data, University of Nevada, Reno Center for Student Cultural Diversity Annual Report 2015, CCSD Fast Facts 2015-2016.
The existence of a leaky pipeline is not unusual nationwide. However, comparing to the two large school districts, Miami-Dade County Public Schools and Huston Independent School District mentioned earlier, the extent of the leaky pipeline in Nevada, especially Southern Nevada, is greater (See Table 2 and Table 3).

### Table 1. CCSD and WCSD K-12 through University Student Demographics (Year 2015)

<table>
<thead>
<tr>
<th>K-12 through University Student Demographics (Year 2015)</th>
<th>White</th>
<th>Minority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clark County</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCSD K-12 Students</td>
<td>27.6%</td>
<td>72.4%</td>
</tr>
<tr>
<td>High School Class of 2015</td>
<td>31.1%</td>
<td>68.9%</td>
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<tr>
<td>UNLV Students (Total)</td>
<td>41%</td>
<td>59%</td>
</tr>
<tr>
<td>College of Education Undergraduate Students</td>
<td>47%</td>
<td>53%</td>
</tr>
<tr>
<td>Undergraduate Enrollment in Teacher Licensure Programs</td>
<td>57%</td>
<td>42%</td>
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<tr>
<td>College of Education Graduate Students</td>
<td>56%</td>
<td>44%</td>
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<tr>
<td>Graduate Enrollment in Teacher Licensure Programs</td>
<td>53%</td>
<td>41%</td>
</tr>
<tr>
<td><strong>Washoe County</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WCSD K-12 Students</td>
<td>45.7%</td>
<td>54.3%</td>
</tr>
<tr>
<td>High School Class of 2015</td>
<td>49.5%</td>
<td>50.5%</td>
</tr>
<tr>
<td>UNR Students (Total)</td>
<td>63.6%</td>
<td>36.4%</td>
</tr>
<tr>
<td>College of Education Undergraduate Students</td>
<td>68%</td>
<td>32%</td>
</tr>
<tr>
<td>Undergraduate Enrollment in Teacher Licensure Programs</td>
<td>71%</td>
<td>29%</td>
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<tr>
<td>College of Education Graduate Students</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>Graduate Enrollment in Teacher Licensure Programs</td>
<td>71%</td>
<td>29%</td>
</tr>
</tbody>
</table>

### Table 2. Miami-Dade County Public Schools K-12 through University Student Demographics

<table>
<thead>
<tr>
<th>K-12 through University Student Demographics</th>
<th>White</th>
<th>Minority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Miami-Dade County Public Schools</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miami-Dade K-12 Students</td>
<td>7.3%</td>
<td>92.7%</td>
</tr>
<tr>
<td>High School Class of 2015-2016</td>
<td>7.7%</td>
<td>92.3%</td>
</tr>
<tr>
<td>Florida International University Students (Total)</td>
<td>11%</td>
<td>72.3%</td>
</tr>
<tr>
<td>College of Education Undergraduate Students (2014-2015)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Undergraduate Enrollment in Elementary Teacher Licensure Programs (2014-2015)</td>
<td>9.7%</td>
<td>90.3%</td>
</tr>
<tr>
<td>Undergraduate Graduation in Elementary Teacher Licensure Programs (2014-2015)</td>
<td>10.2%</td>
<td>89.8%</td>
</tr>
<tr>
<td>Graduate Enrollment in Teacher Licensure Programs</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 3. Houston Independent School District K-12 through University Student Demographics

<table>
<thead>
<tr>
<th>K-12 through University Student Demographics</th>
<th>White</th>
<th>Minority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Houston Independent School District</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Houston Independent School District K-12 Students (2015-2016)</td>
<td>8.45%</td>
<td>91.55%</td>
</tr>
<tr>
<td>High School Class of 2014</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Houston University (2015) (Total)</td>
<td>27.6%</td>
<td>62.8%</td>
</tr>
<tr>
<td>College of Education Undergraduate Students (Fall 2015)</td>
<td>30.3%</td>
<td>69.7%</td>
</tr>
<tr>
<td>Undergraduate Program in Teacher Education (2015)</td>
<td>26.2%</td>
<td>73.7%</td>
</tr>
</tbody>
</table>
After teachers of color enter the profession, they continue to face adversities such as low salary, lack of respect from both staff and students, and the institutional racism that exists at both the K-12 and university levels (Irvine, 1988; Jackson, 2015; Achinstein & Aguirre, 2008). The result is that, in addition to entering the teaching profession at a lower rate, teachers of color tend to leave the profession at higher rates (Cochran-Smith et al., 2012; Kraft et al., 2013). These barriers, according to Sleeter, Neal, & Kumashiro (2015), work together to reveal a larger system working to maintain the whiteness of the teaching profession.

Nevada is not unique regarding the diversity gap, but it is something of an outlier. The state legislature has instituted policies aimed at recruiting and retaining teachers needed for the state. Nonetheless, as described in the introduction to this paper, the diversity gap in Nevada is the second-largest in the country. In May 2016, Durish, Dietrich, and Sposito of the Nevada Department of Education addressed the Interim Legislative Committee on the teacher shortage, recruitment, and retention, identifying the following issues contributing to the diversity gap in Nevada (p. 3):

- Statewide teacher shortage and insufficient pipeline: Nevada’s traditional and alternative routes to licensure do not produce enough teachers to fill vacancies.
- Inadequate preparation: Underexposure to high-need school classrooms; lack of content knowledge and evidence-based instructional practices; poor preparation for teaching student subpopulations.
- Recruitment and hiring practices: Applicants uninterested in serving high-need students and/or schools; collective bargaining agreements that do not allow for differentiated pay.
- Inadequate resources: There is a lack of effective instructional leadership; inconsistent data-based induction, mentoring, coaching, and team collaboration to meet individual teacher needs aligned to student needs; longer hours, more demanding work, with lack of extra incentives - time, money, lower class sizes
- Skill gaps; unaligned initiatives and infrastructure: There is a lack of aligned structures in a learner-centered system; lack of aligned professional learning based on student data and teacher needs; lack of alignment between initiatives

There are several other potential causes to a lack of teacher diversity in Southern Nevada. Teachers of color are disproportionately assigned to schools in urban areas with challenges, including under-resourced schools, violence, and crime, among other issues (Ingersoll & May, 2011). Nevada has recently evaluated its education funding plan per the state constitution. In a local news article, district stakeholders highlight recruitment challenges caused by uncertainty in the Clark County School District’s budget (Takahashi, 2012). Both per-pupil expenditures and teacher salaries in Clark County are below the national averages: Education Week’s Research Quality Counts report (2016) cites Nevada as 46th out of 51 states in school finance, last place for student chance of success, and 38th for K12 achievement, making it “difficult to shake the negative perceptions of Las Vegas’ education system” (CCSD Equity and Diversity Director Greta Peay, quoted in Takahashi, 2012). More than 30 states offer incentives to recruit teachers of color, yet Nevada only offers incentives in hiring hard-to-fill positions such as teachers for English language learners, math, science and special education (Bachler, S., Hill, T. L, & Allen, M., 2003). CCSD’s Human Resources Director, Staci Vesneske, suggests that Nevada’s Alternative Routes to Licensure program “is too complicated and has too many requirements,” which may also deter students of color (Takahashi, 2012).

To summarize, the causes of the diversity gap and its persistence in Nevada within the context of a nationwide issue, we can organize the problems into two broad areas: 1) problems in the pipeline supplying novice teachers of color to schools and districts; and 2) problems retaining teachers of color once they are in the classroom.

**Pipeline Issues**

The first pipeline issue to consider is the diversity gap itself—the features of the gap that tend to reinforce its existence and hinder efforts to shrink it. One such feature is the lack of role models in the teacher workforce for students of color, which limits the candidates available for recruitment at the middle and high school levels. That is to say, the very paucity of teachers of color limits the ability of students of color to envision careers in education, and develop the aspiration and resolve necessary to successfully navigate higher education. Second, endemic institution-
al bias in favor of white students and teachers—whether intentional or not—continues to be a serious problem, short-circuiting the career paths of teacher candidates of color at multiple points, from recruitment through preparation to licensure, assignment, and retention (Ahmad & Boser, 2014; Tyler, Whiting, Ferguson, & Eubanks 2011). Finally, several researchers have found that teacher education programs have been largely ineffective in preparing white teachers to teach students of color. In spite of required coursework and professional development training on multicultural education, differentiated instruction, and teaching for social justice, field studies indicate that white preservice and in-service teachers have not internalized these approaches or the philosophy underlying them. Rather, they are able to perform a shallow form of these approaches when given incentive and the opportunity to construct a carefully bounded example—but otherwise operate comfortably within the unconsidered privilege structure of the majority (Liu, 2013; Thomas & Liu, 2012).

Beyond the diversity gap itself—indeed, beyond teaching and teacher education as a whole—are a set of social problems that pose additional barriers to the induction of a greater number of teacher candidates of color. For example, the pipeline to college for students of color as a whole is leaky, at best, with students of color dropping their higher education plans (or never having the opportunity to develop such plans) at every stage from middle school to graduation from college (Ahmad & Boser, 2014, p.8). Thus, within the overall context of the leaky college pipeline for students of color as a whole, teacher education is not unique. Second, educational funding inequities at all levels disproportionately affect students of color, including teacher education students, exposing them to substandard educational experiences at every point in their K-16 schooling. This, in turn, makes success more difficult and attrition more likely (Ahmad & Boser, 2014, p. 7). Finally, it is worth pointing out that teacher candidates and teachers of color face continued discrimination, including de facto segregation enforced through illegal covenants and redlining, personal and institutional bias in admission and hiring, and a base of colleagues unlikely to have shared such experiences (Espino, 2008, p. 29).

Retention Issues

Once teacher candidates of color have made it through licensure, difficulty shrinking the diversity gap is no longer a pipeline issue but a retention one. We must discover how to ensure that a significant percentage of teachers of color early in their careers survive past the three- and five-year attrition points, and thrive in their chosen profession. Here researchers have identified several issues leading to relatively high attrition rates and proportionately low retention rates (Ingersoll & May, 2011; 2016). First, novice teachers of color are disproportionately assigned to teach in high-needs and “hard to staff” urban schools with a high percentage of students of color (Achinstein, Ogawa, Sexton, & Freitas, 2010; Ahmad & Boser, 2014). Such schools have high burnout and turnover rates for teachers in general, due to factors such as poor physical plant, insufficient funding, a largely disadvantaged and transient student population drawn from seriously stressed communities (Ingersoll & May, 2011), an emphasis on assessment-driven, scripted teaching (Ingersoll & Connor, 2009), and a lack of teacher autonomy and administrative support (Farinde, Allen, & Lewis, 2016). It is no surprise, then, that novice teachers of color in such schools also experience high attrition rates.

Second, regardless of the school in which they find themselves teaching, novice teachers of color pay an “invisible tax” (King, 2016) that leads to burnout. The invisible tax comes in the form of extra responsibilities and extra stress as the novice teachers of color find themselves acting as a bridge between students of color and white teachers and administrators. Novice teachers of color add student counseling and advocacy to their normal teaching duties, and may also be relied upon by administrators for much of the official communication between the school and students of color and their parents, be that translating during parent-teacher conferences, “explaining” student attitudes and behavior to other teachers and administrators, or delivering disciplinary letters to students of color and their parents (Machado, 2013). Moreover, as King notes, only 2 percent of the nation’s teachers are African-American, yet they are expected to serve as disciplinarians for the entire African-American student body. The strain this role places on teachers of color—King’s “invisible tax on teachers of color” (2016)—can be considerable and, on top of
the normal stresses faced by novice teachers, leads quickly to burnout.

Finally, compounding the two situations described above is a chronic problem in mentoring novice teachers of color. In the case of high-needs schools, systemic underfunding combined with high turnover make adequate mentoring difficult to accomplish. Yet it has been known since the 1980s that mentoring early-career teachers not only improved teacher retention but student achievement as well (Ingersoll & Strong, 2011). In the case of low-needs schools, the fact that few teachers of color have the seniority necessary to make them qualified as mentors means that novice teachers of color are likely to have a mentor who neither shares nor understands their background, not to mention that of the students of color (Johnson, 2007; Moule & Higgins, 2007). This makes misunderstanding and conflict much more likely which, in turn, may encourage the novice teacher of color to quit rather than persevere in a profession that doesn’t appear to want their participation as either student or teacher.

What Has Been Done to Shrink the Gap?

To date, multiple approaches have been taken in Nevada to address the diversity gap, either directly or indirectly, to improve recruitment and retention at both school district and statewide levels. Most prominently, as a federally designated Minority Serving Institution (MSI) and Hispanic Serving Institution (HIS), the University of Nevada, Las Vegas has taken a leadership role in the state by implementing alternative licensure programs, which enroll a larger percentage of teacher candidates of color than traditional programs or Teach For America programs. UNLV has also partnered with several community programs and has even started its own initiative to recruit students of color into the teaching field. One example, the TEACH Program, “helps juniors and seniors at Clark High School consider teaching as a profession by offering college-level education courses, mentoring and campus visits to UNLV” (Takahashi, 2012). Most recently, a UNLV grow your own initiative called the Abriendo Caminos/Openning Pathways program seeks to recruit more students of color in Clark County to consider teaching as an educational plan in high school. “The program is funded by a $335,000 grant from the Nevada Department of Education’s Great Teaching and Leading Fund through August 2017” (Bruzda, 2016).

At the local level, the Clark County School District, in an attempt to retain teachers of color, began to offer professional development opportunities to increase the cultural competence of all teachers working with students of color (Takahashi, 2012). Moreover, in spite of a tremendous budget deficit, in 2011 the Clark County School Board “approved $74,000 for multicultural training for about 350 teachers last school year, including 18 days of professional development and materials, as well as a $313-an-hour consultant to deliver the training” (Takahashi, 2012). In 2012, the Clark County School District implemented six initiatives to address the teacher shortage including: 1) A marketing campaign with fast-track-certification options; 2) Four positions for teaching recruiters; 3) A $5,000 hiring incentive for teachers who commit to working in low-wage earning and low-performing schools; 4) Scholarships and funding for teacher preparation and Alternate Route to Licensure (ARL) programs; 5) Support for the enrollment of long-term substitute teachers in ARL programs; 6) An increase in teacher salaries; and 7) Incentives for “teachers who take positions in hard-to-staff schools” (Rebora, 2016). Continued funding for such initiatives remains a concern for the District, however.

In spite of the large diversity gap, as late as 2003, Nevada was one of 21 states that did not offer specific incentives for recruiting teachers of color (Education Commission of the States, 2003), nor for supporting particular student populations such as English language learners (ELLs). More recently, Nevada was named as the only one of the five states with the largest diversity gap (the others being Arizona, California, New Mexico, and Texas) without a comprehensive plan to address the gap (Ahmad & Boser, 2014). Nevertheless, in recent years Nevada has seen legislation to address the teacher shortage challenge while working to increase diversity in the teacher corps. Senate Bill (SB) 511 offered incentives to newly hired teachers during the 2015-2016 and 2016-2017 school years, especially teachers of color, developing a Teach Nevada Scholarship program to provide $3,000 per semester for students in teacher education programs, with three-fourths of the funding coming during their studies, and the balance awarded after five years of teaching in the state (Rindels, 2015). SB 511 also proposed $5,000 incentives
to hire 2,000 new teachers over a two-year period (Rindels, 2015). During the implementation, in 2015-2016, $7.1M was expended to hire 1,579 new teachers. Novice teachers are required to complete a total of 60 hours of professional development as a condition of their employment and to receive their incentive.

The Nevada Department of Education has also developed a plan to enable students of color, from low income families, ELLs, and with special needs to have equitable access to quality teachers and school leaders using a three-tiered approach: enhancing teacher recruitment and teacher retention, to improve student learning outcomes.

Figure 6. Educator Equity Theory of Change (Nevada Department of Education, 2015, p.21)

Provide financial incentives to improve the pipeline and increase the supply of teachers by attracting them to fill teaching positions at high-need schools, and use a comprehensive talent management system to include using a Turnaround Strategy at underperforming schools; and

Ensure district support and sufficient school fiscal resources for having an aligned learner-centered infrastructure that drives educator effectiveness behaviors to facilitate and monitor students in mastering curricular learning targets; and

So students have equitable access to effective educators in order to have equitable opportunity to master academic standards and remain on track to graduate from high school college- and/or career-ready.

Nationwide, efforts to shrink the diversity gap have focused on one or more of the following approaches: 1) Better preparing white preservice and in-service teachers to work with students of color through training in multicultural education, culturally responsive pedagogies, and teaching for social justice, with the goal of increasing the overall pool of qualified undergraduates who might be interested in teaching students of color (Ladson-Billings, 1999; Nieto, 2000; Sleeter, 2008; Zeichner, Payne, & Brayko, 2015); 2) Increase the number of preservice teachers of color entering the K-12 education pipeline with a combination of recruitment, financial support, and mentorship. It is rare for pipeline approaches to continue past the licensure point of a teacher’s career.

Pipeline Approaches

Pipeline approaches taken nationwide to date, defined here as efforts to increase the number of teacher candidates of color, generally emphasize one or more of the following strategies: recruitment, financial support, and mentorship. It is rare for pipeline approaches to continue past the licensure point of a teacher’s career.

Recruitment

Recruitment approaches attempt to increase the number of teachers of color by increasing the number of teacher candidates of color. Literature on nationwide teacher recruitment efforts highlight unique programs in various states and efforts to recruit teachers of color, while documenting states with no history of specific recruitment policies, including Nevada (Bachler, Hill, & Allen, 2003; Simon, Moore Johnson, & Reinhorn, 2015; Villegas, Strom, & Lucas, 2012). For example, in 2012, Villegas, Strom, and Lucas found that 31 of the 50 states had implemented some kind of minority teacher recruitment policy, while only 19
Recruit, Prepare and Retain Teachers of Color

Recruit, Prepare and Retain Teachers of Color (including Nevada) had none (p. 290). Some of these programs, such as the Illinois Grow Your Own (GYO) and Enhancing Minority College and Career Preparation (EMCCaP) programs, begin recruitment efforts in high school or earlier; others, such as the Connecticut Summer Institute for Future Teachers and the Georgia Pathways programs, focus on higher education students already in associate’s or bachelor’s programs other than education. Grow Your Own Teachers Initiatives and other similar programs are designed to “recruit, support, and prepare educators to return to teach in the communities from which they spring,” (Toshalis, 2013). Ultimately, teacher candidates are encouraged to pursue education as a career and to return to their home neighborhoods as a way to give back to their community and to assist in meeting the needs for diverse educators. Here we survey two programs from Illinois and California.

The Grow Your Own Teachers (GYO) Illinois is committed to recruiting individuals to pursue education, and upon receiving their degree to teach in the communities in which they grew up. (Madda & Schultz, 2009). The goal is to equip Illinois schools with teachers who have an understanding of the student population they teach, as well as adequate knowledge about the communities in which they teach. Students pursuing education degrees are able to apply for and receive scholarships if they choose to teach in high need communities in Illinois. In addition, students who participate in the GYO initiative are eligible for a TEACH grant as long as they fulfill a teaching commitment in an Illinois school of need upon graduating (Grow Your Own Teachers website). According to Kretchmar and Zeichner (2016), the GYO Illinois program has the features of transformative teacher education program that values community expertise, emphasizes place-based learning, and prepares community teachers who are knowledgeable of the communities in which they teach (p. 428). As listed on their website, the GYO program has proven to be effective in equipping schools with diverse educators and increasing teacher retention (Grow Your Own Teachers website).

The Multilingual/Multicultural (M/M) Teacher Preparation Center at Sacramento State University is a center that works to recruit and prepare students from diverse backgrounds, typically students of color, to work as highly effective educators for social justice (Wong et al., 2007). The M/M center was established in 1974, and has grown since then to involve students in multicultural teacher preparation education while providing students with the support they need to receive teacher licensure. The M/M Center has been successful as supported by survey data, which explains “that the majority of M/M Center graduates leave the program with a strong desire to work in low-income and culturally and linguistically diverse communities,” (Wong et al., 2007, p. 21). Ultimately, the Multilingual/Multicultural Teacher Preparation Center was designed to encourage students of color to not only become teachers, but to also be effective as activists and role models in the field of education. The M/M center has been successful in its efforts; 80 percent of the cohort students who were contacted were “teaching in low-income and culturally and linguistically diverse settings,” and because a large number of the M/M Center graduates who are teaching “focus their work on activism within their classrooms and with/in behalf of their students.” (Wong, et al., 2007, p.22). Many of the graduates of the program have taken on roles that extend far beyond their teaching role as a way to advocate and lead their students to success.

Financial Support

Financial support approaches across the United States tend to make use of grants and loan forgiveness, typically with the stipulation of service for a certain number of years in a high-needs school within the state. More sophisticated approaches add an element of mentoring or networking into at least the early years as an in-service teacher. Here we survey programs in Illinois and Kentucky.

Golden Apple Scholars of Illinois. Similar to the Grow Your Own Initiative described above, the Golden Apple Scholars Foundation works to recruit, prepare, and retain diverse educators to serve in Illinois schools of need. The Golden Apple Scholars Foundation provides selected students with scholarships for college, provides them with varying degrees and opportunities for support both before beginning and during their undergraduate education careers, and assists them
in finding a teaching job post-graduation (Golden Apple Foundation website). The Golden Apple Scholars organization has proven to be successful in developing a diverse pool of highly qualified educators. For example, 57 percent of Golden Apple Scholars are the first in their families to attend college, 38 percent come from low socioeconomic backgrounds, and 50 percent are considered minorities, which proves the program is diverse in their recruitment efforts (Golden Apple Foundation). Not only does the program encourage diversity among participants, the program has proven to be effective in retaining teachers as well. Specifically, “82 percent of Golden Apple scholars teach five plus years in schools of need,” as opposed to “44 percent of teachers who leave their initial school within two years” (Golden Apple Foundation).

The Minority Teacher Recruitment Project (MTRP) with University of Louisville, Kentucky began in 1985 as a way to address the community’s shortage of minority teachers. The MTRP partners with school districts and the University of Louisville’s College of Education and Human Development as a way to fulfill the ongoing need of diverse educators to serve in various diverse school districts and communities surrounding the Louisville community (Minority Teacher Recruitment Project website). Through this project, the university provides financial support, such as a $5,000 yearly scholarship, professional development, and a range of academic support to meet the needs of the project participants (Minority Teacher Recruitment Project website).

Mentorship
Blankenship et al. (1992), in Embracing Cultural Diversity in Colleges of Education: Minority Recruitment and Retention Project (created for the reformist Far West Holmes Group), argue for a complete strategy from recruitment through training to mentorship of in-service teachers of color to support diversification of the administrative population as well as the teacher corps. One way in which this need for thorough, ongoing mentorship has been implemented is through Urban Teacher Residencies (UTR), teacher training programs designed to equip teachers with necessary skills and experiences to be an effective teacher in urban schools (Berry et al., 2008). During a UTR, teacher candidates, also referred to as residents, will spend one year teaching alongside a mentor teacher while fulfilling the requirements for a master’s degree. Once the residents have completed the first year, they will become full time teachers with their own classrooms but are given extensive mentorship and support during their first full time teaching year (Berry et al., 2008). This particular teacher training approach has shown some success in recruiting and retaining effective educators for high need districts; Berry et al. (2008) discuss how “school administrators rate UTR graduates’ skills and competencies highly,” and explain that “90 to 95 percent of graduates are still teaching after three years” (p. 5). Here we discuss the Boston Teacher Residency (BTR) program, which has been indicated as a model for other programs—with the caveat, however, that it does not specifically target teacher candidates of color.

The Boston Teacher Residency (BRT) Program began in 2004 and is aimed at recruiting individuals who hold bachelor’s degrees and are passionate about working and making a positive difference of the lives of Boston Public School students (BTR, 2016). In their efforts to recruit, the BTR program works to identify and train hard-working, passionate, and committed educators of varying backgrounds as a way to enhance the teacher quality pool of Boston Public Schools. Educators who are accepted into the BTR program are provided with health benefits, a living stipend, and end the program with a master’s degree and teacher licensure in both the content they are teaching and in special education (BTR, 2016). As indicated by their website (2016), “87 percent of BTR program graduates are still teaching, 90 percent are still in the field of education, and 80 percent of those hired by the Boston Public Schools have remained in the district,” which identifies the effectiveness of the year-long teacher residency program (BTR, 2016). Additionally, Boston Public Schools have expressed extreme satisfaction with BTR program graduates in their school district, and the program continues to receive positive praise. Specifically, 97 percent of administrators working with graduates from the Boston Teacher Residency program would recommend that other administrators hire graduates from the BTR program as well (BTR, 2016).
Retention Approaches

It has been established for some time that a strong contributing factor to the diversity gap is the relatively high attrition rate of early-career teachers of color (Ingersoll & May, 2011). Nevertheless, discussion of retention approaches is very simple because, across the United States and within Nevada, few special efforts have been made to retain teachers of color. At the same time, efforts to assist retention of teachers in schools with high percentages of ELL students, or located in high-poverty areas, can boost retention of teachers of color by virtue of the fact that so many teachers of color teach in such schools.

For example, in 2015 the Nevada State Legislature passed two bills, SB 405, “Zoom Schools Act,” and SB 432, “Victory Schools Act.” Both acts provide (among other support) financial incentives for recruitment and retention of teachers in low-performing schools in Clark and Washoe counties, provided they also fit other specific criteria, such as having large populations of ELLs in the student body (Zoom Schools) or being located in one of the 20 poorest zip codes in the state (Victory Schools). There are strict limits in the legislation capping the combined total of the funding for a Zoom or Victory school that can be used for professional development, recruitment and retention pay, and family engagement to 2 percent of that school’s budget. Nevertheless, because the biennial budget for each act is $25 million, the estimated total for recruitment and retention incentives is more than $1 million per year.

Why Has Success Been Limited?

As the problems described in the previous section have been identified, programs have been developed to address them—yet, today, the diversity gap remains almost unchanged. In a statistical sense, this is not because the number of teachers of color has failed to grow, but that it has not grown as rapidly as the number of students of color. In other words, although both statistics are increasing, that for students of color is increasing more rapidly than that for teachers of color (Villegas, Strom, & Lucas, 2012, p. 296). Observing this fact simply underscores the urgency of the need to improve the recruitment and retention of teachers of color.

Scholars have identified various factors limiting the success of the efforts to shrink the diversity gap, some of which are grounded in larger educational inequities. For example, the leaky pipeline for the production of teachers of color is part of the leaky pipeline for all students of color, which is, in turn, grounded in large social issues of school funding inequities, community segregation, salary stagnation at the lower end of the economy, and institutional racism (Ahmad & Bose, 2014). As far as teacher preparation programs go, it appears that the efforts to recruit and train teachers of color have not been a complete failure—there has been improvement in the numbers, after all. Rather, research on the leaky pipeline indicates the problem lies in the support and training for prospective teachers of color, the kinds of assignments teachers of color receive in the first few years of their careers, and the general lack of support they obtain over their careers. For example, teachers of color tend to be over-represented in high-needs schools, which not only leads to higher attrition rates but may also discourage recruitment in the first place (Villegas, Strom, & Lucas, 2012, p. 296). On the other hand, programs emphasizing continuing mentorship and support through the early years of teachers’ careers, such as the Urban Teacher Residencies described above have shown significantly greater retention three years into a teaching career than the national average, even though teachers of color have been placed in high-needs schools (Berry, et al., 2008). In short, it is possible that the problems at the beginning of the pipeline could be adequately addressed with existing programs, given appropriate funding and staffing, but more attention needs to be paid to supporting and retaining teachers of color once they have graduated from college and entered the workforce if the recruitment programs are to reach their full potential.

Implications for Policy

The presence and persistence of the diversity gap, and the benefits of having a more diverse teacher corps not just for students of color but for all students, clearly lead to the conclusion that more needs to be done to shrink the gap. Moreover, the rapidity with which the student population is continuing to diversify—particularly in Clark and Washoe counties—lends an extra level of urgency that has not, to date, been visible in Nevada. There are many students, families, and communities that are not well served by ignoring the diversity gap, and it is unconscionable to let their needs go unmet while attempting to craft the perfect solution. At
the same time, educators, communities, and policymakers especially, need to consider the deep structural foundations that have led to the diversity gap, and recognize that fundamental change cannot happen overnight. To a certain extent this awareness is already present: As part of the presentation to the Legislature, Durish, Dietrich, and Sposito (2016) proposed to shrink the equity gap by focusing on improving fiscal resources to match K-12 demographic shifts, and work on attracting, preparing, developing, supporting, and retaining effective site-based administrators and teachers. Strictly speaking, however, these are goals, not strategies, and have no clear timeline or set of priorities, much less concrete steps to take. For these reasons, the authors suggest considering the implications of current research on the diversity gap for policy over the short, medium, and long term, and begin by identifying appropriate priorities for recruitment, preparation, and retention over each term. This will allow relatively speedy easing of acute problems while moving forward on more substantial change to patch the chronically leaky pipeline: Improving recruitment, training, mentorship, and retention of teachers of color in the Nevada schools.

**Short Term**

Over the short term, it is important to identify and address as quickly as possible the most pressing problems among the neediest communities. To summarize:

- Zoom and Victory schools promoted by SB 405 and SB 432 are excellent first steps, identifying high-needs schools with large populations of ELLs (Zoom Schools) or high concentrations of poverty (Victory Schools), then directing extra funding toward them.
- Increasing funding for recruitment, professional development, and retention will start to patch the leaky pipeline that endangers the careers of teachers of color.
- Improving working conditions by increasing funding for other activities that form the bulk of the Zoom and Victory school budgets; working conditions are strongly correlated with attrition versus retention, particularly among teachers of color.
- In short, as successes are seen in the Zoom and Victory schools, they can be used as model programs for other schools that might not see such high levels of need, but which do need significant improvement.

**Medium Term**

Over the medium term, it is vital to begin repairing the pipeline from high school through teacher preparation and into successful teaching careers. This requires:

- Improving the recruitment, support, training, and mentoring of teachers of color through programs such as Urban Teacher Residencies and homegrown programs recruiting teacher candidates from the areas where they will teach, career mentoring programs, and efforts to increase the number of administrators of color with expertise in these areas.
- Improving the interaction of white teachers and administrators with students and teachers of color by integrating diversity issues throughout the teacher education and school leadership curricula as well as ongoing school and district professional development programs.
- Increasing state-level funding to support programs such as the UNLV grow your own programs and the *Abriendo Caminos/Openning Pathways* initiative to recruit and prepare community-based teachers.

It is true that one benefit to having teachers of color, particularly at the middle and high school levels, is to serve as aspirational role models, encouraging students of color to consider a career in teaching. However, it is also true that positive experiences with teachers and teaching in middle and high school years in itself encourages students to consider a career in teaching, whether the inspirational teacher is the same race as the student or not. Therefore, better training for white preservice and in-service teachers in multicultural teaching, culturally responsive pedagogy, and deep community engagement is vital to help shrink the diversity gap. The authors consider this a medium-term implication because the evidence clearly indicates that one-shot “diversity training,” whether in the form of a special class for preservice teachers or a professional development session for in-service teachers—by far the majority approach among teacher education programs in the U.S.—see Zeichner (1992) and Ladson-Billings (1999)—has failed to affect change in white teachers’ attitudes and behaviors (Montecinos, 2004).
Long Term

Over the long term, the persistence of the diversity gap suggests a need for an epistemological shift throughout the entire educational system toward an inclusive and democratic approach in which there is “respect for and interaction among practitioner, academic, and community-based knowledge” (Zeichner, Payne, Brayko, 2015). There are several approaches to developing this kind of epistemology in an educational system, but they all come down to eliminating the walls between K-12 schooling, the communities surrounding the schools, and college- or university-based teacher education programs. Approaches to accomplish this include:

• Implementing “Teacher Preparation 3.0” (Kretchmar and Zeichner 2016) grounded in school and community expertise, emphasizing learning from the community, preparing community teachers who are knowledgeable about the communities in which they teach.

• Enhancing partnerships among universities, K-12 schools, and local communities in the recruitment, preparation, and retention of teachers of color.

• Recruiting preservice teachers of color from the pool of unlicensed staff already working in the K-12 schools. This group that includes paraprofessionals such as teacher assistants already inclined to teach and familiar with both the schools and the routines of teaching. This approach was pioneered in North Carolina (Irvine & Fenwick, 2011, p. 17); studying their experience could be instructive.

• Continue improving the interaction of white teachers and administrators with students and teachers of color, their families, and their communities.

Sleeter (2008) called for teacher education that can be powerful enough to counter at least three forms of ongoing socialization that white teachers experience. Since most teacher education programs recruit and prepare white teachers and teachers of color together, this framework applies well to “Teacher Preparation 3.0.” First, the ongoing lived experiences of white people usually take place in relatively homogeneous neighborhoods, in which white individuals associate mainly with other white people, experiencing the everyday privileges that accrue to being white without being aware of this (Sleeter, 1992). Second, the ongoing experience of school and classroom life, first as a K-12 student, then as a university student, and subsequently as a new teacher, solidifies taken-for-granted conceptions of how schooling should go and what teaching should look like, making it difficult to envision alternatives in the classroom (Lortie, 1975). Third, the everyday conditions of teacher work generally structure teaching as transmission of prescribed content to crowds of students following a “banking” model of teaching and learning. When teaching is experienced this way and supported by testing, teachers learn to see differences among students primarily as differences in ability to learn what is prescribed (Prawat, 1992), rather than seeing difference as a source of knowledge and strength.

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College Pipeline Issues for Students of Color in Southern Nevada

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Although the Nevada System of Higher Education (NSHE) student enrollment rates are increasing annually, the number and percentage of racial and ethnic minority students who graduate from high school and pursue postsecondary education continues to trail behind national student completion rates. Despite large numbers of racially and ethnically diverse students in Nevada’s primary and secondary schools, our state’s college-going population does not reflect this level of diversity, an issue characterized by educators as a “leaky pipeline” from high school to college.

**Nevada Facts & Statistics**
- Hispanics/Latinos account for 41.1 percent of student primary/secondary school enrollment and are the largest racial/ethnic group in the state, followed by Whites at 35.07 percent.
- African Americans/Blacks represent 10.16 percent of Nevada’s enrollment, followed by Asians at 5.51 percent and American Indian/Alaska Native at 1.1 percent.
- Of Nevada’s ~21,000 high school graduates in the 2011-12 academic year, less than half enrolled in a state public institution of higher education within 16 months of graduation.
- Students of color are significantly more likely to be placed in at least one remedial math or English course compared with White and Asian students.
- Graduation rates for English language learners (ELLs) were significantly lower than for students enrolled in English mainstream courses; fewer than one-third of ELL students graduate from high school.
- 23 percent of Nevada families earn less than $30,000 annually, and would need to commit 65 percent of that income to attend a public four-year institution.

**U.S. Facts & Statistics**
- The national Adjusted Cohort Graduate Rate for public high school students for 2013-14 school year are as follows: Asian American, 93 percent; White, 85 percent; Hispanic, 76 percent; Black, 68 percent; American Indian/Alaska Native, 68 percent.
- Nationally, the percentage of enrollment in degree-granting postsecondary institutions increased between 2008 and 2013; Nevada is one of only seven states that saw a decline during that period.
- Nevada is significantly below the national average in terms of college enrollment rates, with higher discrepancies among Black, Hispanic/Latino and Asian subpopulations.

**Recent Actions in Nevada**
- The Upward Bound program, which has more than doubled postsecondary enrollment where implemented, has been adopted by the University of Nevada, Reno; University of Nevada, Las Vegas; and Nevada State College.

**Considerations for Future Actions**
Nevada, which has a percentage of students of color far greater than the national average, may consider the following mitigation measures to address the “leaky pipeline” between high school and college:
- Assess initiatives from other states, such as California, New York and Illinois, that have demonstrated progress in terms of graduation rates and college enrollment among students of color.
- Institute a position to manage and coordinate
college readiness work across sectors at the state, agency and campus-level.

- Evaluate external funding opportunities (foundation grants, federal grants and cross-state initiatives) to augment existing state resources.
- Consider how tuition and financial aid policies either hinder or help students of color, as well as the economically disadvantaged, access higher education.

**Statewide Benefits of Future Action**

- Given the low graduation rate among ELLs and the correlation between income and education, it is in Nevada’s economic interest to improve graduation rates among this group.
- Nevada’s demographic shift indicates greater numbers of students of color, whose graduation rates currently lag behind both the overall national average and their White counterparts in Nevada; addressing this issue will draw the state closer to national graduation and postsecondary enrollment averages.
- Both dependence upon government assistance programs and crime rates are inversely correlated with educational attainment; increasing graduation rates would provide both societal and economic benefits.

**Implications of Maintaining Status Quo**

- Nevada currently lags behind the national average in virtually every educational category, and has a percentage of student of color and ELLs far higher than the national average.
- The rate of postsecondary enrollment may continue to decrease, bucking a national trend.
- Failure to intervene in a meaningful manner will exacerbate the societal and economic issues associated with below-average educational achievement among Nevada’s students.

**Introduction**

Undergraduate full-time enrollment increased in fall 2015 at almost every major public higher education institution in Nevada (Nevada System of Higher Education [NSHE], 2016a). Although the Nevada System of Higher Education student enrollment rates are increasing annually, the number and percentage of racial and ethnic minority students who graduate from high school and pursue postsecondary education continues to trail behind national student completion rates (Governing Data, 2013). The high school graduation and baccalaureate attainment rates among different racial and ethnic groups reflect substantial economic and social educational disparities. This paper focuses on the racial and ethnic composition of Nevada public schools and the disparities in high school graduation rates among different student populations. This topic is paramount to study in Nevada because more than 64 percent of the K-12 student composition self-identifies as non-White. According to Nevada Department of Education 2015 data, Hispanics/Latinos account for 41.1 percent of student enrollment and are the largest racial and ethnic group in the state, followed by Whites comprising 35.07 percent, African Americans/Blacks at 10.16 percent, Asians at 5.51 percent, and American Indian/Alaska Native with 1.1 percent enrollment (NDE, 2015). Despite these large numbers of racially and ethnically diverse students in primary and secondary schools, Nevada’s college-going population does not reflect this level of diversity. This issue is frequently referred to as the “leaky pipeline” from high school to college.

Herein are included recommendations, best practices, and empirically-driven research that focus on improving the educational pipeline from high school to college, specifically for students of color. This paper primarily concentrates on Nevada public students who identify as American Indian/Native Alaskan, Black/African American, and Hispanic/Latino. In some cases, comparisons are used to illustrate disparities in the level of educational attainment among different student groups. Additionally, this report uses the terms “students of color” and “ethnic minority students” interchangeably to address the racially and ethnically diverse student populations collectively of the state and nation. These expressions are consistent with educational attainment research studies in K-12 and higher education settings, as well as federal agencies’ usage of the terms (Ryan & Bauman, 2006; U.S. DOE, 2016).

In 2016, the state’s high school graduation rate increased to 70.77 percent (NDE, 2016a). Although the state’s graduation rates are increasing annually, they remain significantly lower than the U.S. national average of 82 percent (National Center for Education Statistics [NCES], 2016). Fur-
Furthermore, the Nevada graduation rates vary considerably by race and ethnicity. Asian and White students are more likely to graduate from a Nevada high school than their African-American/Black, Hispanic/Latino, and American Indian/Alaska Native counterparts (NDE, 2016b; NSHE, 2014). This trend is consistent for all counties in Nevada, and nationwide, where the high school graduation and college enrollment rates are lower for students of color than their White and Asian peers (NCES, 2016; NDE, 2016a).

The graphic below (Fig. 1), created by UCLA’s Chicano Studies Research Center in 2015, shows the progression of 100 American students that start elementary school and their likelihood of completing high school and persisting to college and graduate degrees. For example, of 100 Latinos who start school, only 60 will earn their high school diploma, 11 will earn a bachelor’s degree, three will earn a graduate degree, and fewer than one will earn a doctorate. The numbers are similar for African Americans and Native Americans.

**Figure 1. The U.S. Education Pipeline by Race/Ethnicity and Gender**

![Diagram showing the education pipeline by race/ethnicity and gender](image.png)

*Note: The first number in each column represents females; the second number, males.*

*Source: UCLA CSRC, drawn from American Community Survey Data, compiled by the U.S. Census Bureau*
Data in Nevada and Nationwide

For the 2011-2012 academic year, Nevada reported a total of 20,884 high school graduates (NDE, 2012). Of this number, only 49.3 percent enrolled in a state public institution of higher education within 16 months after high school graduation. This statistic suggests that fewer than half of the state’s high school diploma graduates are enrolling in Nevada public colleges and universities, and the larger percentage of high school graduates are choosing not to matriculate into any of the NSHE institutions.

The rate of initial in-state college enrollment is also much lower for students of color when the data are disaggregated by different racial and ethnic categories. For example, only 41.9 percent of American Indian/Alaska Native high school graduates enrolled in any of the NSHE institutions. This rate suggests that for every 10 high school graduates who self-identify as American Indian/Alaska Native, only four students will enroll in any public in-state postsecondary institution (NDE, 2012).

Even when racial and ethnic students do enroll in Nevada public colleges and universities, data show that the majority of them have inadequate K-12 preparation to enter and succeed in college. Statewide educational pipeline issues portray an alarming picture of Nevada high school graduates. According to the 2014 Remedial Placement and Enrollment Report by NSHE, students of color are significantly more likely to be placed in at least one remedial math or English course than Asian and White students: The remedial course enrollment rates for students of color in this cohort exceed 50 percent. In some cases, more than 60 percent of African-American and Hispanic high school graduates will likely be enrolled in one or more remedial college course (NSHE, 2014). These figures indicate that even among the relatively low numbers of students of color who are graduating from high school, many are not academically prepared to handle the rigors of the learning environment associated with an undergraduate education at a college or university.

Also notable is the educational disparity in Nevada between those who are primarily native English speakers and those students who are learning and acquiring English as a second language. The Nevada Department of Education (2016b) reported that the state’s graduation rates are significantly lower for special student populations, such as English language learners (ELL) and foreign-born students. Students who are learning and acquiring English as a second language face different types of challenges and barriers in the Nevada public educational systems (National Council of Teachers of English [NCTE], 2008; Ruiz Soto, Hooker, & Batalova, 2015). In 2015, the Nevada high school graduation rates for ELLs were significantly lower than for students who were enrolled in English mainstream courses. In fact, students classified as ELLs are half as likely to graduate from high school in comparison to the state aggregate composite: 32.05 percent ELLs versus 70.77 percent state average. In other words, fewer than one-third of ELL students in Nevada graduate from high school. Foreign-born students are also significantly less likely to finish high school than U.S. native-born students. U.S. native-born students are three times more likely to graduate from high school than foreign-born students (Ryan & Bauman, 2016). Even though ELL students’ backgrounds are heterogeneous and complex, data indicate that the majority of ELL and foreign students in Nevada and the United States self-identified as Hispanics and speak Spanish (Ruiz Soto et al., 2015).

Current National Statistics for Students of Color

As previously stated, the pipeline metaphor is ubiquitous in educational research. Used to illustrate movement through K-12 and postsecondary levels of education, the educational pipeline represents the ideal path for students through the United States educational system, depicting them flowing smoothly through the various level of education and resulting in a representative number of high school and postsecondary graduates (Perez-Huber et al., 2006). Yet, the pipeline does not function smoothly for all populations. Closer examination of student of color populations depicts educational inequities and disparate college enrollment rates and degree attainment rates. This is important as the National Center for Educational Statistics, Institute of Educational Sciences, and U.S. Census Bureau have all noted that the United States is growing into a “minority-majority” nation, predicting a population transition in 2050. However, in the state of Nevada, this “minority-majority” is already a reality in our school systems. Currently,
students of color already outnumber White students in the Nevada public school system. Therefore, it is essential to examine the current state of the educational pipeline for students of color.

Secondary Education in Nevada

Recently, the U.S. Department of Education has used adjusted cohort graduation rate (ACGR), which utilizes detailed student-level data to determine the percentage of students who graduate within four years of beginning 9th grade for the first time (National Center for Educational Statistics, 2016a). The ACGR can help determine if students of color are “trickling” out of the educational pipeline in Nevada and where those leaks are located. During the 2013-2014 school year, the United States rose to an all-time high with an 82 percent ACGR (National Center for Educational Statistics, 2016a). Similarly, Nevada has seen an upward trend ACGR, increasing from 62 percent in the 2010-2011 school year to 71 percent in 2012-2013 (US Census Bureau, 2015). However, certain populations trail behind in ACGR percentages: Asian/Pacific Islander students had the highest ACGR at 89 percent, followed by White students at 87 percent, Hispanic students at 76 percent, Black students at 73 percent, and American Indian/Alaska Native students at 70 percent. However, even with the recent increase in ACGR, Nevada is one of only six states to report an ACGR under 75 percent (National Center for Educational Statistics, 2016a). More specifically, Nevada lags behind the national average in all student of color ACGR categories. (See Figure 2):

Figure 2. Adjusted Cohort Graduation Rate for public high school students by race/ethnicity (2013-14)

It is important to call attention to a majority of these Nevada ACGR statistics. First, Hispanic students represent the largest overall student population in Nevada; therefore, the lower ACGR represents a significantly larger number of students not attaining high school diplomas. Second, while the ACGR of Black students is significantly lower than the national average, a more alarming fact is that Nevada also has the lowest ACGR of Black students in the nation (National Center for Educational Statistics, 2016a). Lastly, the ACGR gap of American Indian/Alaska Native students represent one of the largest disparities compared to the national average of any population (National Center for Educational Statistics, 2016a). These ACGR rates of Nevada’s student of color populations show a need to better understand the educational experiences of these students as they represent ever-growing and important populations.
Postsecondary Education in Nevada

One key section of the educational pipeline is postsecondary education. With President Obama’s recent 2020 goals encouraging more college graduates, it is becoming more critical to ensure that the educational pipeline functions smoothly for students of color at Nevada institutions of higher education. Nationally, degree attainment has increased overall for all races/ethnicities; however, similar to secondary education, Nevada lags behind in degree attainment statistics. In fact, Nevada has seen a gradual decline in the percentage of the state’s working-age population (25-64) with a quality postsecondary credential (i.e. professional certificate, associate’s degree, and bachelor’s degree or higher), dropping from 30.1 percent in 2008 to 29.5 in 2010 (Lumina Foundation, 2016). While this decline does not tell the whole story, further analysis of enrollment rates and degree attainment rates illustrates further “leaks” in the educational pipeline for students of color in Nevada.

Nevada is one of only seven states to see a decline in the percentage of total enrollment in degree-granting postsecondary institutions from fall 2008 to fall 2013 (National Center for Educational Statistics, 2016a). At public and private, two-year and four-year postsecondary institutions, Nevada trails behind the national average within all student of color population categories in enrollment rates in 2014 (see Figure 3):

Figure 3. Comparison of College Enrollment Rates (Ages 18-54) in 2014

![Figure 3](image)

Note: These percentages reflect the enrollment of non-degree-holding students, ages 18-54, at public and private, two-year and four-year postsecondary institutions.

Source: Lumina Foundation (2016); U.S. Census Bureau, 2014 American Community Survey One-Year Public Use Microdata Sample.

This figure indicates that the Native American population had the lowest enrollment rate at 7.3 percent (2 percentage points below the national average), the Hispanic population was slightly higher at 8.3 (3 percentage points below the national average), and the Black population was at 9.1 percent (5.5 percentage points below the national average), and the Asian American/Pacific Islander population had the highest college enrollment rate at 17.9 percent (7.3 percentage points below the national average) (Lumina Foundation, 2016). However, low enrollment rates of students of color are not the only problems Nevada faces in the postsecondary pipeline.

While the current postsecondary pipeline seems to work for certain student populations, Nevada degree attainment data reveals achievement gaps in specific student of color populations. This is important as Nevada is seeing an increase in “post-traditional” learners such as Black, Hispanic, and Native American/Native Alaskan students. Degree attainment rates in Nevada (see Figure 4) demonstrate that a majority of student of color populations fall behind the national average and
their White peers (37.38). Hispanic students had the lowest degree attainment rate at 13.77 percent (7.09 percentage points behind the national average), Native American/Alaska Natives had a 21.24 percent degree attainment rate (2.5 percentage points behind the national average), Black students had a 24 percent degree attainment rate (4.88 percentage points behind the national average), and while at 44.89 percent Asian American/Pacific Islander students had a higher degree attainment rate than White students, who were 15.7 percentage points behind the national average.

**Figure 4. Comparison of College Enrollment Rates (Ages 18-54) in 2014**

![Figure 4](image)


This section of our policy paper will explore measures for supporting students of color in the pipeline to college. Many of the measures included within this paper have exhibited some form of success when implemented throughout the United States. Nevadans should consider investing in the educational pipeline for students of color as one of their greatest opportunities and greatest privileges. Programs like the ones identified in this section can help to ensure greater educational equality for students of color.

**Education Achievement Gap Programs**

**GEAR UP.** The Gaining Early Awareness and Readiness Undergraduate Program (GEAR UP) is a federally funded comprehensive intervention program created in 1999 to improve predictors of academic success and college readiness among 7th through 12th grade students as measured by PSAT and SAT scores, as well as GPA (Glennie, Dalton & Knapp, 2015; Sianjina & Phillips, 2014). The GEAR UP program operates by developing partnerships with colleges and universities, businesses, and local governments to benefit low-income students of every race and ethnicity (Sianjina & Phillips, 2014). The United States Department of Education (DOE) Office of Civil Rights, defined GEAR UP as an alternative pre-college education program that provides disadvantaged socio-economic and low-performing students with equal opportunity initiatives to prepare for college entrance. GEAR UP goals include: providing different grade levels of students with tutoring; mentoring; information on college preparation and financial aid; core academic preparation; and college scholarships (Sianjina & Phillips, 2014). Unlike other educational programs, all students within a grade are eligible for GEAR UP school services (Glennie et al., 2015). African-American students’ program participation in the components of GEAR UP has been considered important to raising academic performance predictors of college readiness (Phillips,
2007), and Sianjina & Phillips (2014) found African-American GEAR UP participants had significantly higher grade point averages than non-participants.

**Upward Bound.** Established through the Economic Opportunity Act 1964, Upward Bound serves high school students from low-income families and from families in which neither parent holds a bachelor’s degree (i.e., first-generation students). According to the Upward Bound website, “The goal of Upward Bound is to increase the rate at which participants complete secondary education and enroll in and graduate from institutions of postsecondary education.” Stipulations for participation require students to have completed the 8th grade, be between the ages of 13 and 19, and have a need for academic support in order to pursue a program of postsecondary education. All students must also be either from low-income families or be potential first-generation college students. Upward Bound has been found to more than double, from 18 to 38 percent, the likelihood that students will enroll in a four-year college, and the program improves students’ early college persistence as measured by total credits earned (Myers, Olsen, Seftor, Young, & Tuttle, 2004). Currently, University of Nevada, Reno, University of Nevada, Las Vegas, and Nevada State College all have Upward Bound programs and are looking to expand their offerings.

The Talent Search program identifies and assists individuals from disadvantaged backgrounds who have the potential to succeed in higher education. The program provides academic, career, and financial counseling to its participants and encourages them to graduate from high school and continue on to and complete their postsecondary education. Talent Search also encourages persons who have not completed education programs at the secondary or postsecondary level to enter or reenter and complete postsecondary education. The goal of Talent Search is to increase the number of youth from disadvantaged backgrounds who complete high school and enroll in and complete their postsecondary education (TRIO Program, 2008). Students must also be between the ages of 11 and 27 and have completed the fifth grade. Glennie et al. (2015) found Talent Search participants were more likely to both apply for financial aid and enroll in four-year colleges, than their non-participant peers. Unlike Upward Bound, Talent Search works with students who have left secondary or postsecondary institutions, as well as current students (Glennie et al., 2015).

**The Puente Project** is a program specifically designed to increase the number of educationally underserved students who enroll in four-year colleges and universities, earn degrees, and return to the community as leaders and mentors for future generations (Saenz & Ponjuan, 2009). According to its website, the Puente Project is a national award-winning program that, for more than 30 years, has improved the college-going rate of tens of thousands of California’s educationally underserved students. The program is interdisciplinary in approach, with writing, counseling and mentoring components. The Puente Project provides a strong programmatic model that has been empirically proven to help facilitate the college pathways for underrepresented students in California (Saenz & Ponjuan, 2009).

**High School Reform Model.** Early College High Schools (ECHS) are small schools, most often located on college campuses, designed to blur the distinction between high school and college. Serving students in Grades 9 to 12, the ECHS model is targeted at students who are underrepresented in college, including students who are low-income, the first in their family to go to college, or members of underrepresented ethnic and racial groups (Arshavsky, Edmunds, Miller, & Corritore, 2014). While taking classes toward their high school diploma, early college high school students are also earning up to two years’ worth of credits toward a bachelor’s degree—tuition-free (DiMaria, 2013). Since 2002, more than 270 early college schools in 28 states and the District of Columbia have launched or been redesigned. Nodine (2011) found that, nationally, about 70 percent of early college students are students of color. Sixty-one percent of ECHS students qualify for free or reduced lunch, and roughly half are the first in their family to attend college, while 43 percent are Hispanic (DiMaria, 2013). In states such as Texas, an estimated 66 percent of early college students are Hispanic, compared to a statewide average of 49 percent (Nodine, 2011).

ECHS are typically small programs, but they improve high school graduation rates and better prepare English language learners and students of color for high-skill careers (DiMaria, 2013). In the 2010-11 school year, ECHS nationwide had a median four-year graduation rate of 93 percent,
compared with 76 percent for their other respective school districts (DiMaria, 2013). In 2009, the American Institutes for Research and SRI International found that early college students nationally outperform students in their districts on exams and, nationally, 86 percent of ECHS students enroll in college directly after high school, significantly greater than the 66 percent for public schools nationwide (Nodine 2009; Nodine, 2011). Additionally, ECHS students use their learned experiences to bypass remedial classes and go straight to advanced courses in college. The DOE has recognized successful ECHS designs as potential strategies to graduate more college career-ready students (Hoffman & Vargas, 2010). In addition to their educational benefits, educational savings from ECHS for some states could also make the schools attractive. Texas produced an estimated savings of $6,800 per student completing an associate’s degree, and $10,500 of educational savings for students completing a bachelor’s degree (Nodine, 2011). With many states reducing funding for higher education, ECHS provide a winning financial scenario for both the state and their respective students.

**Denver High School: Creating and Sustaining a College-Going Culture.** To make their students more aware of, prepared for, and willing to pursue postsecondary education, Denver High School (DHS) in New York City utilizes smaller learning communities or “houses” to serve its student population of 9th to 12th graders. At the time of a four-year study by Knight-Diop (2000–2004), 30 percent of the 4,000 students at DHS were Black and 60 percent Hispanic. The school’s leadership created six college or career-themed houses and four general learning houses, with each one representing grades 9 through 12. Each house included three staff members: a guidance counselor for academic and personal student development; a house coordinator to aid the guidance counselor with scheduling; and a family assistant for community outreach. As an institutional and interpersonal structure of care, the house structure was created to allow movement and support students’ college-bound academic identities, while challenging notions of being permanently relegated to unequal educational opportunities (Knight-Diop, 2010).

The development of a learning center where students could receive tutoring from peers or teachers, use computers, and work on SAT test prep was very important. The two primary structures that supported the center’s success were the distribution of college advisement among staff and the embedded support of peers. In particular, both “close and distant peers can positively influence students’ participation, engagement, achievement, and access to college resources within schools... The learning center has powerfully tapped into the power of peers as a resource in the ... process” (p. 166). Essentially, the peer support and encouragement allowed the students to engage in meaningful relationships while relieving some of the burden on the counselors. Overall, the combination of peer support and effective leadership by administrators, teachers, and counselors within a college-going school culture created institutional and interpersonal structures of care in an urban school setting (Knight-Diop, 2010).

**The Career and College Readiness (CCR) Act in Illinois** seeks to aid student transition from secondary to postsecondary education by reducing the need for remedial coursework (Baber, 2014). The CCR Act supports intervention strategies at seven community colleges in the state of Illinois, targeting high school juniors and seniors with strong postsecondary aspirations but low standardized test scores in math and/or English. Students of color tend to rely on older siblings, relatives, and peers rather than guidance counselors and admissions officers as they develop plans for postsecondary attendance (Baber, 2014). Some of the males resisted seeking assistance academically due to an unwillingness to express vulnerability. However, African-American male students reshaped their perceptions of the educational environment when faculty or administrators created a safe space to reveal their struggles and anxiety at CCR. Although this emotional investment in African-American male students may seem simple, it is not always utilized throughout schools. Baber (2014) suggests three main areas of support made the difference: encouraging postsecondary aspirations; navigating multiple pathways to access; and persisting through stereotypes and perceived barriers. The study also found a valuable source of aspirations consistently discussed among African-American male students was peer support, specifically older male peer support. This reflects
a constant theme among males of color about the value of receiving “insider” advice from older peers, particularly African-American males who have experienced the postsecondary education process (Baber, 2014). Beyond peer support, Baber (2014) found it critical for students to be provided both the knowledge of their current skill set and an opportunity to talk with administrators/instructors about how to move beyond developmental courses. The CCR intervention also promoted postsecondary access by providing students with an opportunity to feel comfortable on a college campus. Many students experienced negative comments in academic settings from others who promoted negative stereotypes, even if they were succeeding academically (Baber, 2014).

**Children’s Aid Community Schools.**

Part of the strategy for success and closing the achievement gap involves reducing health care disparities. Studies show that healthy students who are not hungry or sick are better learners and that underserved communities can benefit from a system that brings health care to students where they are—in school. Research suggests that Children’s Aid Community Schools produce better student and teacher attendance, less grade retention, better test scores, and better parent involvement than similar schools (Gilroy, 2011). The Obama administration has cited Children’s Aid Society and community schools as an evidence-based reform strategy and is considering including it in the reauthorization of the Elementary and Secondary Education Act (Gilroy, 2011). Since 1992, Children’s Aid has partnered with the New York City Department of Education to ensure quality education in high-risk schools. According to the website, these schools offer a comprehensive, integrated approach to education that extends the hours, services and partnerships of traditional public schools. Most Children’s Aid Society schools are open all day and well into the evening, six days per week, year-round. Results of this 25-year “experiment” found that Children’s Aid Community Schools produce better student and teacher attendance, increased grade retention, more appropriate referrals to special education services, improved test scores and higher parental involvement than similar schools.

**Conclusion and Recommendations**

This paper has provided data on the demographics of students within each school district in Nevada, and the percentages of students of color that attend colleges in Nevada. Comparisons were also drawn between state and national trends. A review of research on successful measures for supporting students of color in the pipeline to college was also presented. After summarizing each of these sections, recommendations will be provided on how to approach the pipeline issue in Nevada.

In summary, the majority of districts in the state of Nevada have 50 percent or more White students, with the exceptions of Clark County and Washoe County, which have 26 percent and 45 percent respectively. When aggregating by race and ethnicity, Clark and Washoe school districts have a minority-majority with Hispanic students accounting for 45 percent of Clark County, and nearly 40 percent of Washoe County. The shift in the state’s demographics is expected to continue. Nevada is projected to see increases of Hispanic graduates by 2 percent, Black graduates by 4 percent, and Asian graduates by 4 percent, while the number of White graduates is expected to decrease by 2 percent between 2020 and 2028 (Institute for Research on Higher Education, 2016).

In comparison to the state’s demographics, NSHE’s (2013) Diversity Report indicates that the public higher education institutes in the south enrolled minority students at a higher rate than they are represented in the region. This same report reveals that minority enrollments at public higher education institutions in the north approximated the population distributions, but UNR fell short of matching the statewide population distributions. As the gap between White and minority students narrows in the state of Nevada, there is potential for growth in minority enrollment at all public higher education institutions in the state. However, Nevada Department of Education data from the 2015-2016 school year indicate that graduation rates for American Indians/Alaskan Natives, Blacks, Hispanics, Pacific Islanders, and those reporting two or more races fall behind those of their White and Asian peers. While national data (e.g., Snyder, de Brey, & Dillow, 2016) indicate higher rates of high school completion or beyond for Whites than any other race/ethnicity, each minority group reported 81 percent or higher with a high school degree or more with the exception of Hispanic individu-
als. However, in the state of Nevada, high school graduate rates ranged from a low of 55 percent for Black students to a high of about 85 percent for Asian students. Nevada has room to improve for all students.

Earlier in this paper, successful measures for supporting students of color in the pipeline to college were presented. The following highlights the key findings discussed at length in the aforementioned section: The literature supports moving away from a deficit perspective and shifting to a more supportive institutional culture (Rodríguez & Oseguera, 2015; Tsoi-A-Fatt Bryant, 2015). In particular, school systems should examine the opportunities provided to students of color to develop college readiness (Tsoi-A-Fatt Bryant, 2015). Strayhorn (2011) found that even with a simple summer bridge program intervention, the high school GPA of low-income students of color predicted success in the first term of college. In addition to preparing students of color to be ready for college, once enrolled, institutions can provide support to facilitate success. Institutions should provide a welcoming, positive environment for all students and evaluate whether their social justice and diversity initiatives advance the campus climate (Hernandez & Lopez, 2004). The interactions between faculty and students are important to creating a caring environment. Academic success has been linked with mentoring and quality relationships with faculty and staff (Hernandez & Lopez, 2004; Rodríguez & Oseguera, 2015). By initiating and maintaining positive relationships with students of color, institutions can reshape their institutional culture.

While the previous section summarized some of the literature on successful measures for supporting students of color in the pipeline to college, this section draws from a recent report of the collaborative efforts of postsecondary and K-12 leaders in 10 states to increase college readiness (SHEEO & NASH, 2016). Interviews with leaders in both state agencies and system offices gleaned the following recommendations for states seeking to improve college readiness:

- Engage representatives from constituencies across the pipeline together in a shared dialogue.
- Institute a position to manage college readiness work across sectors at the state, agency and campus-level.
- State leaders should directly engage campus leaders and faculty, particularly those at community colleges.
- An integrative approach across sectors should be used to effectively communicate elements of college readiness.
- States may need to look to external funding (e.g. foundation grants, federal grants, and cross-state initiatives) to augment their resources.

In addition to considering these recommendations for improving college readiness, state leaders may also examine policies that impact the pipeline into college. In particular, policies around funding of higher education could be evaluated to assess the impact on students’ access to an affordable education. In Nevada, 23 percent of families earn $30,000 or less per year, and would need to commit nearly 40 percent of their income to attend one of the public two-year institutions, 65 percent to attend a public four-year institution, and 62 percent to attend a public research institution (Institute for Research on Higher Education, 2016). State leaders and system and institution leaders may consider examining how tuition and financial aid policies either hinder or help students of color as well as the economically disadvantaged to access higher education.

In conclusion, to address leaks in the pipeline of students of color into higher education in Nevada, the state should consider an integrated approach. Efforts to improve college readiness will depend on buy-in across sectors. Successful measures to support students of color should be considered for integration into K-12 through post-secondary institutions. Finally, the societal and economic benefits associated with college affordability and accessibility for students at all income levels warrants a thorough analysis.
Additional Charts/Tables

Figure 4. Nevada Student Population Count by Race/Ethnicity 2015-16

Source: Nevada Department of Education

Figure 4. Levels of Education for Nevada Residents (Ages 25-64) in 2014

Source: Lumina Foundation (2016); U.S. Census Bureau, 2014 American Community Survey
References


The English Language Acquisition and Development (ELAD) Endorsement: An Opportunity for Preparing a Resilient Pre-service Teacher Workforce in the State of Nevada

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English learners (ELs) refers to students who speak a native language other than English in the home, and for whom speaking, reading and writing in English is a targeted educational outcome. In mid-2016, the Nevada State Board of Education voted in favor of mandating that future pre-service teacher graduates of the Nevada System of Higher Education (NSHE) be required to complete an English Language Acquisition and Development (ELAD) endorsement to better prepare new teachers to respond to the multi-dimensional needs of PK-12 ELs. This mandate is being phased in through 2022, providing a window during which incoming pre-service teachers can be prepared for both ELAD-related coursework and the real-world application thereof. Opportunities include exposing pre-service teachers to high quality endorsement-related coursework (e.g. curriculum development, assessment, practicum, etc.), which can be co-developed via collaborative networking among NSHE institutions, school districts and instructional leaders.

Nevada Facts & Statistics

• In 2010-11, Nevada was identified among the states with the fastest EL demographic growth.
• Nevada is considered a “new growth state,” with an immigrant population that doubled between 2000 and 2006.
• The number of EL students in Nevada’s schools increased 208 percent between 1994 and 2005.

U.S. Facts & Statistics

• With approximately 4.7 million ELs in U.S. public schools, this constituency represents the fastest-growing group in the primary and secondary public education system.
• By 2040, it is projected that ELs will comprise 40 percent of the U.S. school population, with Spanish-speakers constituting the fastest-growing subgroup.
• Nationally, more than 25 percent of ELs speak a language that is not Spanish-dominant.
• The majority of general education teachers from urban (67 percent), rural (82 percent) and centrally located (58 percent) cities report that they have never participated in professional development experiences related to EL learning.
• Many teachers admit that their knowledge related to ELs is underdeveloped and is acquired via on-the-job experiences.

Recent Actions in Nevada

• A full ELAD endorsement for Early Childhood Education (birth to grade 2) and elementary (K-8) teacher preparation programs is required by 2020.
• Secondary teacher preparation programs must include ELAD-endorsements by 2022.
• The Nevada State Board of Education’s decision was based upon input from the English Mastery Council, the Commission on Professional Standards in Education, and the Teaching English as a Second Language subcommittee.

Considerations for Future Actions

During the implementation period for the ELAD endorsement, the state has an opportunity to prepare future NSHE preservice teachers by:

• Developing teacher residency programs in which expert teachers work in the university teacher education programs, participating in interactive activities to develop their leadership competencies while supervising and organizing the preservice teacher practicum experience.
• Integrating modes of best practices into university coursework.
• Teaching university courses entirely or partially in school settings, affording preservice teachers the opportunity to observe teaching in a field environment and utilizing debriefing sessions to bridge knowledge and practice gaps between university coursework and the “real world.”

Statewide Benefits of Future Action
The ELAD endorsement will increase the state’s capacity to provide preservice teachers with strategies to improve the quality of instruction and supports for EL students. Implementation of those strategies will promote quality instruction that fosters the development of academic content and language for all Nevada students. This additional support promotes teacher resiliency and tolerance for instructional challenges, potentially mitigating educator turnover in the state. Bolstering this aspect of preservice teacher education produces an opportunity to evaluate student learning and causes for low achievement among ELs.

Implications of Maintaining Status Quo

- The percentage of ELs in Nevada’s public school system is large and projected to grow during the coming decades; failure to adopt proactive measures designed to improve academic performance among this group of students will exacerbate existing challenges.
- Addressing learning challenges faced by ELs and other student populations in a classroom setting contributes to Nevada’s high teacher turnover rate. Absent mitigation, this problem will persist, creating ongoing issues for both schools and the communities they serve.

Introduction

In the summer of 2016, the Nevada State Board of Education voted in favor of mandating that future graduates of the Nevada System of Higher Education (NSHE) institutions’ preservice teacher education programs be required to complete an English Language Acquisition and Development (ELAD) endorsement to better prepare new teachers to respond to the multi-dimensional needs of PK – 12 English learners (ELs). Specifically, ELs are students who speak a native language other than English in the home and for whom speaking, reading, and writing in English is a targeted instructional outcome. In U.S. classrooms, these students are acquiring academic knowledge in a second language while still developing their native oral language abilities in the home or at school (Garcia, Kleifgen, & Falchi, 2008; Goldenberg, Hicks, & Lit, 2013).

Although being able to speak two languages is an asset with far-reaching benefits (e.g., cross-cultural sensitivity, executive functioning, analytical thinking) (Bialystok & Craik, 2010; Bialystok & Hakuta, 1994; Rodriguez, Carrasquillo, & Lee, 2014), the persistent underachievement of ELs in the nation (e.g., National Assessment of Educational Progress [NAEP] 4th and 8th grade U.S. History, Science, and literacy) (NAEP, 2011; 2012) and state (e.g., 90 percent of Nevada’s ELs in grade 4 scored below reading proficiency in 2011) (Mokhtar, 2012) is a dismal reminder that school systems have failed to ensure that ELs have equal access to a quality education as specified by federal law (e.g., explicit English language development instruction and quality general academic knowledge) (Zacharian, 2012).

The mandated ELAD endorsement, therefore, provides an historic juncture or opportunity to bridge research with practice to build a future PK-12 teacher workforce that is better equipped with the professional knowledge, skills, and dispositions that support interacting with a “new mainstream” of learners (Enright, 2011; pg. 111). These culturally and linguistically diverse learners are not characterized by traditional European, middle-class, English-speaking experiences (Lee & Luykx, 2007) and require explicit guidance from teachers in how to navigate the discontinuity between home culture and U.S. academic environments. Because ELs are not a homogeneous group, they arrive to school with varied educational backgrounds, exposure to English, and second language proficiency (Gutierrez, Zepeda, & Castro, 2010). One goal of the ELAD endorsement, therefore, is to address the professional learning needs of general education practitioners in rural and urban settings who often do not speak the native tongue of the students they teach, and who may feel overwhelmed because they are unequipped to attend to the wide range of language demands that impact their daily instructional planning (Fillmore & Snow, 2000; Goldenberg, 2008).

In short, the ELAD endorsement was proposed by the English Mastery Council, an intellectual think-tank across the state composed of NSHE faculty, policy makers, school district administrators, parents, teachers, and other community stakeholders who were charged in 2013 with the responsibilities outlined in Nevada Senate Bill 504 (Sec. 1.4):
“Make recommendations to the Superintendent of Public Instruction, the Commission on Professional Standards in Education and the State Board for:

a. The adoption of regulations pursuant to NRS 391.019 concerning the requirements for an endorsement to teach English as a second language, including, without limitation, the teachers who should be required to obtain the endorsement; and

b. After the adoption of the regulations pursuant to paragraph (a), any revisions to those regulations as deemed necessary by the Council.” (Nevada Department of Education, 2014).

The 3.1 ELAD endorsement represents a culmination of recommendations and dialogues across NSHE institutions with feedback and guidance from the Commission on Professional Standards in Education (COPS), some members on the Nevada State Board, and the English Mastery Council (EMC) TESL (Teaching English as a Second Language) Subcommittee. The 3.1 ELAD endorsement is summarized below:

In an effort to improve the quality of instruction for all English language learners in PK-12, all Nevada teacher preservice preparation programs and Alternate Route Licensure (ARL) programs will include the ELAD endorsement. We propose that:

• The first stage requires that Early Childhood Education (ECE) (birth to grade 2) and elementary (K-8) teacher preparation programs include an ELAD endorsement in the state of Nevada by 2020.

• The second stage would include an ELAD endorsement for secondary teacher preparation programs in the state of Nevada by 2022.

The culmination of this effort is full ELAD endorsement for all preservice and Alternate Route Licensure (ARL) teachers by 2022 or no later than six years after adoption of the regulation by the regulatory board. (EMC, 2016).

The Potential Impact of the ELAD Endorsement

The English Master Council (EMC) emphasized the following four points regarding the potential impact of the mandated ELAD endorsement on teacher and student outcomes:

• The EMC recommendation would build capacity in the state by providing Nevada’s System of Higher Education four to six years to ensure that future Nevada-prepared educators receive an ELAD endorsement upon graduation. This can be accomplished via continued university collaborations, dialogues, and sharing of resources.

• The ELAD endorsement will build the state’s capacity to provide teachers with strategies to improve the quality of instruction and supports for EL students in Nevada.

• The strategies implemented by future ELAD-endorsed teachers will promote quality instruction that fosters the development of academic content and language for all Nevada students.

• The Endorsement will provide extra supports to teachers in meeting the needs of their students and, thereby, promote teacher resiliency and tolerance for instructional challenges—dispositions that may be essential to decreasing the educator turnover rate in the state. (English Mastery Council, 2016)

The potential long-term benefit for EL students in the state of Nevada is improvement in educational achievement that supports future career options. The potential long-term benefits for preservice teachers include the development of skill competency, professional knowledge, and a “higher tolerance for ambiguity” (Attencio, 2012; pgs. 45-46) and change—a personality variable that influences the formation of teacher identity. Although tolerance may be a malleable personality trait that benefits all teachers, cultivating greater tolerance may especially empower EL teachers of to put forth their very best instructional practices to address the complex instructional needs of an increasing population of diverse learners (Attencio, 2012).

The Increasing Population of EL Students

With approximately 4.7 million or more ELs in U.S. public schools (The Progress of Education Reform, 2013), ELs constitute the fastest growing group in the U.S. with the most rapid growth occurring in grades seven through 12 (e.g., middle and high school years) (Batalova & McHugh, 2010). From 1990 to 2000, the national EL population grew by 46 percent, superseding the national population growth (17 percent) in individuals from ages five to 17 (NCELA, 2002). Prag-
matically, the number of EL students educated in U. S. public schools doubled (e.g., from 2 million to nearly 5 million students) between 1990 and 2004 (NCELA, 2004).

By the 2030s, it is projected that ELs will comprise 40 percent of the U.S. school population (American Speech-Language-Hearing Association, 2015; Magruder, Hayslip, Espinosa, & Matera, 2013), with Spanish-speakers constituting the fastest growing group (National Center for Education Statistics, 2013; Passel, Cohn & Lopez, 2011). More than 25 percent of ELs, however, speak a language that is not Spanish dominant (Education Commission of the States, 2013).

In 2010-2011, the states that experienced the largest EL demographic growth were South Carolina, Kansas, Hawaii, and Nevada (ECS, 2013). Nevada, therefore, reflects national EL population growth trends (Mokhtar, 2012) and has earned the designation of a “new growth state” (Terrazas & Fix, 2008; pg. 1) with an immigrant population that doubled between 2000 and 2006. The term immigrant is used for individuals born without U.S. citizenship (Zong & Batalova, 2015). Immigrants who move to Nevada are attracted to the potential of obtaining economic advancement via low-skill, low-wage jobs (e.g., gaming, construction, hospitality, and repair) that do not require a high school diploma. Overall, this Nevada labor trend mirrors broader national labor market trends (e.g., employment in maintenance, construction, and service occupations) for adults who may be limited in their career advancement due to limited skills and English proficiency (Zong & Batalova, 2015).

Further, in 2006, immigrant workers without a high school diploma earned a median annual income in Nevada that was 28 percent higher than the earnings of their immigrant peers in other states (Terrazas & Fix, 2008). Because of the accessible economic prospects, immigrant families will continue to move to Nevada and play a critical role in the national and state labor market. Likewise, these growing numbers of immigrant families will continue to depend on public school systems to educate their EL children.

Due to this search for employment, the number of immigrant children in Nevada has increased dramatically since 1990 and includes both foreign born and second-generation EL children who were born in the U.S. with at least one parent who was born in a foreign location (Terrazas & Fix, 2008). The percentage of second-generation children, however, has experienced the most growth in Nevada increasing from 11.7 to 30.5 percent of Nevada’s total population of children.

Overall, the number of EL students in Nevada schools increased 208 percent from 1994 to 2005. Clark County School District (CCSD), the largest school district in Nevada and the fifth largest in the nation, opened approximately one new school monthly from 2004 to 2006 to accommodate the increasing number of students including both ELs and native English-speaking students (Terrazas & Fix, 2008).

The Reality of EL Teacher Preparation

The unprecedented growth of EL students in public schools is accompanied by a growing national concern that general education teachers are not equipped with the competencies and professional knowledge base that could support improved EL learning. Many teachers admit that their knowledge related to ELs is acquired via on-the-job experiences (Goldenberg, 2008; Téllez & Waxman, 2004). This current concern, however, is rooted in a history of neglect in which the preparation of EL teachers was ignored in the professional development field until the 1980s (Téllez & Waxman, 2004). Even during the early movement in the 1960s towards bilingual education, teacher preparation programs did not emphasize specific language strategies, scaffolds, or pedagogical approaches to facilitate EL school learning. In contrast, bilingual teachers were advised to speak Spanish while English language development teachers were told to speak English (Téllez & Waxman, 2004).

Further, current evidence suggests that most general education teachers from urban (67 percent), rural (82 percent), and centrally located (58 percent) cities report that they have never participated in professional development (PD) experiences related to EL learning (Flynn & Hill, 2005; Lewis, Parsad, Carey, Bartfai, Smerdon, & Green, 1999). Overall, teachers in densely populated urban areas with higher percentages of EL students (e.g. 63 percent) plausibly receive greater PD experiences around teaching EL students than their peers in schools with fewer numbers of ELs (e.g., 25 percent) (Cosentino de Cohen, Deterding, & Clewell, 2005).

The sheer growth of EL students national-
ly and locally, however, warrants that the issue of EL teacher preparation can no longer be ignored. The implication for NSHE preservice teacher preparation programs is that higher education institutions must take the lead in providing more comprehensive preparation for novice teachers prior to entering the field where PD experiences related to EL instruction may be limited. The mandated ELAD endorsement coursework provides an opportunity for such preservice professional support. Without these targeted pedagogical experiences, new teachers may follow the path of previous generations of EL teachers who:

“…grope for quick-fix strategies, often becoming stressed at their lack of success. Such teachers can “burn out” quickly, leaving the profession or remaining in teaching but without the motivation to provide a quality education or obtain the requisite skills.” (Téllez & Waxman, 2005; pg. 2).

The Next Six Years in Nevada

Passing the mandated ELAD endorsement in the state of Nevada does not mean that our educational mission is complete. In the next six years, NSHE institutions must ensure that preservice teachers will have access to high quality endorsement related coursework (e.g., curriculum development, assessment, methods, etc.) with in-depth learning experiences across urban and rural Nevada—these are professional learning experiences that could be co-constructed via collaborative networking (e.g., NSHE institutions, school districts, instructional leaders) and critical resource sharing.

The next six years, therefore, serve as a critical window through which we can better understand typical PK—12 EL instructional practices in Nevada (e.g., research-driven field-based observations, disaggregation of global teacher practice trends as measured by the Nevada Educator Performance Framework) to leverage field-based knowledge to increase the relevancy of preservice ELAD related coursework and learning experiences. Likewise, teacher preparation faculty can design meaningful learning experiences around ELAD coursework discussions to dispel common myths, identify teachers’ beliefs about ELs, and to strengthen connections between university preservice courses and inquiry-based field experiences in schools.

Opportunities to dispel myths

Three common myths that pose obstacles to improved EL academic achievement are presented below:

Myth #1: Previous generations of immigrants in the U.S. learned English without special accommodations or instructional practices.

Historically, individuals who were not English proficient have always struggled in the U.S. to learn English for school or employment purposes and benefited from explicit second language support (Gil & Bardack, 2010). Further, the U.S. Immigration Service documented in 1911 the high percentages of immigrant EL children who were under achieving (e.g. behind one or more grade levels) in U.S. schools (e.g., 77 percent of Italian heritage, 60 percent of Russian heritage) in comparison to native English-speaking nonimmigrant children (Haynes, 2002). Preservice teachers in the state of Nevada must graduate with the understanding that EL children’s academic success is grounded on explicit instructional support during content instruction. A “sink or swim” (Gil & Bardack, 2010; pg.10) approach is ineffective.

Myth #2: By the time EL students reach middle or high school, they are English proficient.

A strong early oral language base is often missing in long-term ELs (LTEls) who have attended U.S. schools for six years or more and have not reached a threshold of adequate English proficiency. These students are at risk for underachievement because they struggle with the language that is required in academic discussions and comprehension tasks due to limited English syntax and content related vocabulary knowledge (Olsen, 2014).

Long-term ELs (LTELs) represent a growing percentage of ELs who will enter kindergarten and never attain English proficiency due to insurmountable language barriers—partially attributed to early instructional inconsistencies—and the false expectation that they will “just catch up” in becoming English proficient. There is an increasing number of LTELs in middle and high school settings.

Further, there is an increasing population of EL students who enter U.S. schools during the middle and high school years with gaps in their formal education background and English language
abilities (Hakuta, August, and O’Day, 2009). EL students with limited English abilities (51 percent) or who speak English with difficulty (51 percent) are therefore prone to drop out of school (NCES, 2004). Preservice middle and secondary teachers in the state of Nevada must graduate with the understanding that middle and high school enrollment is not a guarantee that ELs are English proficient; however, providing explicit English language development during middle and high school subject-area instruction is a good practice (Gil & Baradack, 2010).

**Myth #3: Dual language bilingual education approaches promote language delays and confusion for EL children who are acquiring English as a second language and native English speaking children who are still developing their English abilities while acquiring a second language.**

There are benefits for both EL and native English speaking students who participate in dual language bilingual program models. Specifically, Thomas and Collier (2002) noted in a longitudinal study that EL learners benefit from language interactions with their peers while monolingual English speakers maintain their English competencies while learning a second language. Additionally, EL students enrolled in bilingual education models have acquired English competencies at the same rate as ELs immersed in English-only programs (Thomas and Collier, 2002).

Overall, native oral language maintenance provides a strong foundation for second language literacy and academic achievement without promoting language confusion and/or delays (Goldenberg, 2013; Garcia, 2009; August & Shanahan, 2006). This instruction is premised on the theory that conceptual understandings acquired in one language transfer to other languages (Cummins, 1981; Ramirez, Yuen, Ramey, & Pasta, 1991; Yoshida, 2008). Preservice teachers in the state of Nevada must graduate with the understanding that native language instruction does not hinder English language acquisition and that native-English speakers benefit from dual language instruction.

**Opportunities to shed light on the influence of EL teacher beliefs**

Beyond the opportunity to dispel myths about second language learning, the ELAD endorsement courses can provide opportunities to ensure that preservice teachers are more aware of their beliefs about EL students and their families. There is evidence that teachers’ beliefs are translated into actions, which are related to children’s academic growth (August & Calderón, 2006; Greenfield, 2013). Positive perceptions of EL’s language competence and culture can influence teachers’ motivation to “engage” with students, resulting in higher or lower student engagement and academic success (Greenfield, 2013). In one study, when general education teachers viewed EL children’s emerging English language proficiency status as an obstacle, (Greenfield, 2013), these beliefs were translated into decisions and actions that led to unnecessary special education placements. Preservice teachers must understand the consequences of how their students may be different from themselves.

**Opportunities to strengthen university courses and inquiry-based field connections**

A culminating experience in the mandated ELAD coursework is a practicum experience which allows preservice teachers to implement and practice skills and strategies that they have been taught in a real school setting under the supervision of a mentor teacher. Zeichner (2010) suggests that practicum experiences are important; however, their impact on university-school transitions can be diluted when the following occurs:

a. Preservice teachers have limited exposure to the decision-making process of experienced teachers in the field (Hammerness, Darling-Hammond, & Bransford, 2005).

b. Preservice teachers participate in loosely constructed or sequenced field experiences that are the result of disconnected university coursework/school experiences (Zeichner, 1996).

In the next six years, NSHE institutions can investigate the feasibility of implementing practicum models that provide more relevant university/school connections for preservice teachers of EL students. Three possible options include teacher residency programs, the integration of models of best practices into university coursework, and teaching university courses (e.g., methods course) entirely or partially in a school setting. A summary of the three approaches follows:

1. **Teacher residency programs.** In teacher residency programs, expert teachers work in the uni-
versity teacher education programs (e.g., teaching of courses, recruitment of students, supporting preservice teacher graduates in the field, etc.), participate in seminars to develop their leadership competencies, and upon completion of their residency return to the field (e.g., University of Wisconsin-Milwaukee Teachers in Residence program).

2. Integrating models of best practices into university coursework. This is an alternative to teacher residency programs in which the goal is not to bring the expert teacher to the university program but to bring a “representation” (Zeichner, 2010; pg. 488) of the teacher or representation of expert teaching into university coursework. This can include incorporating teacher generated research, writing, or other forms of teacher-generated knowledge into coursework so that preservice teachers have models of teachers’ practices and decision-making processes which depict how teachers in the field learn from their own instructional decisions. In a national research initiative, the Carnegie Foundation collaborated with K-12 teachers to develop technology driven (e.g., web-based, multi-media supports) representations of their teaching practices. Teacher educators across the nation then incorporated these multi-media representations in courses for preservice teachers (e.g., integrating the website of an inner city high school English teacher’ classroom experiences in an English methods course at Stanford University). Teacher educators can also develop representations of best practices (e.g., videotaped instructional vignettes of specific strategies or best practices) to accomplish the same goal.

3. University courses taught in school settings. In this model, a university preservice course (e.g., a methods course) can be taught entirely or partially in a real school setting. Here preservice teachers have opportunities to observe teaching with debriefing sessions that serve as opportunities to bridge gaps of knowledge and practice between university coursework and the real world. This model includes opportunities for mentor teachers to assume a more active role in (a) assisting pre-interns to analyze field-based observations of specific instructional practices or (b) making explicit connections with the assistance of a teacher educator between specific course syllabus content and field-based applications and demonstrations (Zeichner, 2010).

Overall, these three approaches to preservice field placement experiences provide opportunities for future teachers of ELs to gain in-depth knowledge about the daily dynamics (e.g., on-the-feet thinking) of school teaching. This deep understanding is lost when intentional efforts are not made to connect university coursework with field applications to facilitate “school to work transitions” (Zeichner, 2010; pg. 491).

Conclusions and Implications
The major goal of the mandated ELAD endorsement is to improve PK-12 EL student achievement by taking intentional steps to provide a higher quality of instruction in urban and rural Nevada so that future EL public school graduates will have access to a higher quality of life. Preservice NSHE teachers, will play a major role in this process and will depend on NSHE institutions and scholars to use scientific approaches and tools to build and extend teacher knowledge and expertise. The ultimate goal is to bolster preservice teachers’ instructional decision-making abilities so that they are able to plan quality instruction, implement appropriate strategies, evaluate student learning and causes for low achievement, and think on their feet during complex scenarios that require both linguistic and academic scaffolding.

At the University of Nevada, Las Vegas, faculty in the English Language Learning Program are engaged in cutting edge research around professional development practices for teachers of ELs in urban and rural settings. In two National Professional Development grants funded by the Office of English Language Acquisition in the U.S. Department of Education, researchers will answer important questions related to:

a. Effective coaching models that can be utilized remotely (e.g., Apple devices) to provide feedback loops on EL teachers’ practices in early childhood settings;

b. The feasibility of eWorkshops to provide cost effective yet rigorous opportunities for professional knowledge building and online supported field-applications in 4th and 5th grade rural settings;

c. The potential use of tools that measure shifts in EL teachers’ beliefs and culturally responsive practices; and
d. A deeper and more nuanced understanding of EL teacher practices across the state.

Knowledge from these studies will be used to restructure ELAD related coursework and field experiences for preservice teachers who graduate from UNLV teacher education programs. Additionally study outcomes will be disseminated to NSHE institutions across the state via a permanent website that includes representations of EL teaching practices (e.g., videotaped instructional vignettes of best practices). Future research opportunities that aim to build the state’s capacity to support EL learning can only take place when NSHE institutions and stakeholders (e.g., the Nevada State Department of Education, school districts, etc.) are committed to working as a unified Nevada that supersedes rural, urban, north, and south boundaries.

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Nevada Facts & Statistics

• In 2014, Nevada was ranked lowest (51st) in the nation for “access to care” regarding mental health, moving from the 2011 ranking of 49th.
• Studies show 69 percent of adults 18+ having any mental illness did not receive any form of treatment at any point from 2009-2013 (SAMHSA, 2014).
• Nevada’s rates of mental illness are consistent with national averages, but substance abuse rates are higher in Nevada (12.6 percent) than comparable states (AZ: 11.6 percent; CO: 9.5 percent; and FL: 7.4 percent) (Denby, Owens, Kern, 2013).
• Children and adolescents’ mental health needs are even higher at 14 percent, but Nevada has considerably lower rates of access to services than for children in comparable states.
• There is a significant shortage of mental health care professionals in the state, with only 1.7 licensed counselors per every 100,000 people in the state (Brune & Carreón, 2014).

U.S. Facts, Statistics & Comparisons to Nevada

• The Center for Disease Control reports the prevalence of mental illness in approximately 25 percent of adults. Depression rates nationally are approximately 8 percent, with Nevada at 9 percent.
• In 2013, State Mental Health Agency (SMHA) expenditures per capita in the U.S. were approximately $120. Nevada’s average was nearly 26 percent lower at $89 (Kaiser Family Foundation, 2015).
• Reducing the student-to-counselor ratio parallels a 59 percent decrease in student discipline problems (Carrell & Carrell, 2016), contributing to fewer disciplinary incidents and higher graduation rates (Lapar, Gysbers, Bragg & Pierce, 2012). And elementary schools with model school counseling programs achieved higher proficiency scores in language arts and math (Wilkerson, Perruse & Hughes, 2013).
• Counseling is one of the fastest growing occupations in the US with a growth rate of 20 percent from 2014 to 2024. In Nevada, the demand and growth rate is at 17 percent. Substance abuse and behavioral disorders counselors have an even higher demand with anticipated growth of 22 percent in Nevada and the U.S. Demand for school counselors is even higher in Nevada, projected to grow 30 percent in the same time frame (compared to 8 percent nationally) (Bureau of Labor Statistics, 2017).
Recent Actions in Nevada
• Moving from 49th to 51st from 2011 to 2014, Mental Health America (MHA) indicates “a lack of movement at the bottom indicates continued neglect of the mental health needs of constituents” (Mental Health America, 2016, p. 15).

Considerations for Future Actions
Nevada, which has rates of mental illness consistent with national averages, but far fewer counseling/mental health professionals, may consider the following mitigation measures to address the counselor shortage in the state:
• Support federal legislation that addresses the mental health needs of adults and youth in Nevada.
• Remove obstacles to licensure for clinical and mental health professionals coming from out-of-state.
• Revise state mandates to provide K-8 students and schools with school counselors as well as lowering the existing, overtaxed student-to-counselor ratios to meet national recommendations.
• Develop innovative state legislation that stimulates and supports additional students to pursue degrees in higher education in order to fill currently vacant counseling roles.

Statewide Benefits of Future Action
• Counseling as a profession contributes to the success of other professions. Such training not only addresses mental health treatment, but also increases the likelihood of wellness in preventive services.
• Evidence has shown that counseling is a proven a cost-effective intervention. Moreover, research indicates that counseling/therapy is related to a decrease in the need for physical medical/healthcare.
• School counseling seems likely to improve college access as well as the increased academic success of English language learners and students entering STEM careers, further boosting Nevada’s output of qualified workers to service a 21st century economy.

Implications of Maintaining Status Quo
• State and national employment trends place school counseling and clinical mental health counseling as fast-growing occupations, however demand is already exceeded the number of graduates from the only nationally accredited programs at NSHE intuitions.
• Continued low rankings will indicate that Nevada is not adequately addressing the mental health needs of its residents.

Introduction
What is ‘counseling’? As a word the definition could mean everything from a diplomat to summer supervisor of a cabin full of kids. Clinical mental health counseling and school counseling, however, are distinct professions that serve persons/students in ways unique from psychology, social work, marriage/family therapy, or other helping professions.

“Counseling is a professional relationship that empowers diverse individuals, families, and groups to accomplish mental health, wellness, education, and career goals” (American Counseling Association: ACA, 2017). Counselors work to help individuals and groups find solutions to problems, develop coping skills, improve relationships, and make life changes in order to develop optimal mental health. One of the unique features of the counseling profession is the emphasis on culturally competent practice and the ubiquitous ability of the profession to work effectively in a variety of settings. Clinical mental health counselors work in hospitals, inpatient/outpatient addiction centers, nursing homes, college counseling centers, on military bases, in career centers, and vocational rehabilitation, as examples of the wide range of settings served by counselors.

School counselors work in elementary, middle schools/junior highs, and high schools, helping students maximize their academic achievement and college/career readiness (ASCA, 2014a). The American School Counselor Association provides a definition of professional school counselors: “School counselors are certified/licensed educators with the minimum of a master’s degree in school counseling and are uniquely qualified to address the developmental needs of all students through a comprehensive school counseling program addressing the academic, career and personal/social development of all students” (2017, p. 2).

Mental Health America (MHA) ranks the 50 states and Washington D.C. on 15 measures that are indicators of prevalence and access to care. MHA compares 2011 to 2014 rankings as a mea-
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sure of the impact of local and state policies on mental health care. Nevada is ranked at 51st, the lowest out of all the states (2016). In the specific “access to care” category Nevada is also ranked last, having moved from 49th in 2011 down to 51st in 2014. MHA maintains that “…a lack of movement at the bottom indicates continued neglect of the mental health needs of constituents” (2016, p.15).

The Kaiser Family Foundation provides state data on mental health expenditures for the years 2008-2013. As illustrated in Figure/Table 1, Nevada’s expenditures per capita have been half of the national average for four of the six years in the timeframe.

Figure/Table 1. State Mental Health Agency (SMHA) Per Capita Mental Health Services Expenditures, Nevada vs. National Average

<table>
<thead>
<tr>
<th>Location</th>
<th>FY2008-SMHA Expenditures Per Capita</th>
<th>FY2009-SMHA Expenditures Per Capita</th>
<th>FY2010-SMHA Expenditures Per Capita</th>
<th>FY2011-SMHA Expenditures Per Capita</th>
<th>FY2012-SMHA Expenditures Per Capita</th>
<th>FY2013-SMHA Expenditures Per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>121.13</td>
<td>122.9</td>
<td>120.56</td>
<td>123.93</td>
<td>124.99</td>
<td>119.62</td>
</tr>
<tr>
<td>Nevada</td>
<td>81.38</td>
<td>64</td>
<td>68.32</td>
<td>64.73</td>
<td>59.41</td>
<td>89.41</td>
</tr>
</tbody>
</table>

Source: Kaiser Family Foundation, 2015

Access to school counselors for Nevada students does not look much better. National survey data show students desire greater access to school counselors and a lack of good counseling experience is related to delayed college and possibly college dropout (Johnson, Rochkind, Ott, & DuPont, 2010). Yet at 508 to one, the student to school counselor ration in Nevada is over twice what is recommended by the American School Counselor Association (ASCA, 2014b).

This paper discusses the high demand for clinical mental health counselors, and school counselors in the state of Nevada. While Nevada has rates of mental illnesses fairly consistent with the national averages, the average rate of substance abuse is higher in Nevada. The mental health needs of children/adolescents is even higher with an alarmingly smaller percentage of youth receiving treatment. Equally alarming is the decline in K-12 education rankings of the state of Nevada, placing it at the very bottom in comparison to all other states. With a student to school counselor ratio over twice the ratio recommended by the ASCA (2014b), Nevada contributes to the increasing deficit of school counselors in schools. Moreover, state and national employment trends place school counseling and clinical mental health counseling as some of the fastest growing occupations with demand already exceeding the number of graduates from the two largest universities in Nevada (and the only nationally accredited programs). This paper discusses the evidence pointing to the need for more counselors in the state of Nevada and makes policy recommendations for addressing this growing crisis.

Need for Counseling

The increased need for clinical mental health counselors and school counselors is predicated on the unmet mental health treatment needs of children and adults as well as the need for addressing personal/social obstacles to that impeded academic success in schools and workforce stability respectively. This section briefly discusses the
prevalence of mental health needs and the percentage of individuals not receiving treatment.

The national rates of mental health concerns such as depression and psychological stress have been rising, but the proportion of individuals receiving treatment (such as counseling) is still disproportionately small. According to the Substance Abuse and Mental Health Services Administration (SAMHSA, 2015) about 2.8 million adolescents (12 percent) had a major depressive episode in the last 12 months. This figure represents a 5.4 percent increase for females and a 1.3 percent increase for males over the previous four years. Equally concerning, 9.4 million adults reported having serious thoughts of suicide in the previous year. The Center for Disease Control reports prevalence of mental illness to be about 25 percent of adults (2011). Nationally depression rates appear to be around 8 percent with Nevada being slightly higher at 9 percent. Rates of individuals experiencing serious psychological stress within the last 30 days are 3.6 percent nationally (CDC, 2011) and 4 percent in Nevada (CDC, 2016).

Of the 23.5 million people needing treatment for substance abuse, only 11 percent received the needed treatment (NIDA, 2011). According to the National Survey on Drug Use and Health (NSDUH, 2014) conducted by SAMHSA, Nevada’s rates of substance abuse and addiction is also on parity with the national average. In Nevada, 21.56 percent of adults aged 18-25 years old report illicit drug use in the past month compared the national average of 21.44. Rates of drug/alcohol abuse in Nevada appear to be slightly higher that the national average.

Denby, Owens, and Kern (2014) made state comparisons regarding adult treatment for mental illness. For 2011, adults in Nevada had lower rates of diagnosable mental illness (11 percent) compared to Arizona (21.4 percent), Colorado (18.8 percent), and Florida (15.5 percent). But again, the disproportion of treatment was very high. SAMHSA (2014) indicates that in Nevada 69 percent of adults aged 18 or older having any mental illness did not receive any treatment at any point from 2009-2013. It is not surprising that the National Alliance of Mental Illness has given Nevada a ‘D’ grade in 2006 and 2009 (NAMI, 2009).

The lack of treatment for individuals struggling with mental health issues poses a concern for the workforce as well. Mental Disorders currently comprise 30 percent of Social Security Insurance Disability claims (Social Security Administration; SSA, 2016). Within this category, ‘mood disorders’ has the largest quantity of individuals applying for disability and the largest group of recipients with over 1.2 million Americans receiving benefits for ‘mood disorders’.

Lack of mental health services for individuals with drug/alcohol addiction also diminishes workforce strength and poses a drain on the economy in Nevada. Denby et al. (2014) report Nevada as having the highest rate of substance abuse disorder in comparison to similar states (12.6 percent as compared to 11.6, 9.5, and 7.4 percent in Arizona, Colorado, and Florida respectively) and the lowest proportion of individuals receiving services. Looking specifically at illicit drug use/dependence for example, SAMHSA (2014) illustrates that nearly 87 percent of individuals do not receive treatment in the previous year (data from 2005-2013). Overall the illicit drug use has been declining for students in grades 8, 10, and 12 (Johnston, O’Malley, Miech, Bachman, & Schulenberg, 2017). In contrast to this overall trend however, Hispanic students’ rates of illicit drug use have been the highest (compared to African-American and White/Non-Hispanic groups) for grades 8, 10, and 12 in 2013-2016.

Compared to adults, an even smaller proportion of adolescents receive adequate mental health services. Of the 2.8 million adolescents experiencing a major depressive episode, 58.8 percent did not receive any treatment (SAMHSA, 2015). Denby, Owens, & Kern (2013) compared the NSDUH data on Nevada to states with comparable metropolitan areas. Nevada youth have slightly higher rates of depression (14 percent) but considerably lower rates of access to mental health services. Only 29 percent of Nevada children received services in comparison to 41 percent in Florida, 46 percent in Colorado, and 54 percent in Arizona. The unmet mental health needs of children and adolescents pose a challenge to the academic success of students in Nevada’s K-12 system.

In a later section we discuss the empirical research supporting the argument that school counselors contribute to positive outcomes for students. The growing mental health problems of children/adolescents is one reason for increased need of school counselors. Another compelling rationale is
the research indicating that more school counselors equate to fewer student misbehavior in classrooms (Reback, 2010) and schools (Carrell & Carrell, 2006). Moreover, school counselor programs contribute to higher academic achievement (Lapan, Gysbers, & Petroski, 2001; Lapan, Gysbers, & Sun, 1997; Sink & Stroh, 2003) and greater annual yearly progress (AYP) of schools (Wilkerson, Perruse, & Hughes, 2013). School interventions that improve student academic success are especially important in Nevada, due to the current status of K-12 education in Nevada.

Nevada’s K-12 educational system continues to receive poor ratings. Education Week’s 2017 Quality Counts Report rates Nevada as dead last (51st) in the U.S., similar to previous years (Education Week, 2017). National Assessment of Educational Progress (NAEP, 2015) data indicate that 29 percent of Nevada’s 8th graders are below proficiency in reading. The state report card indicates that only 17.6 percent of 8th graders are proficient in math. Disaggregated data reveals that 40 percent and 39 percent of Nevada’s African-American and Hispanic students respectively are below proficiency in reading at 8th grade. In earlier grades this disparity is even greater with 58 percent of African-American Students and 49 percent of Hispanic students below reading proficiency in the 4th grade.

Nevada Counselor Shortage

While Nevada has rates of mental illnesses fairly consistent with the national averages, the average rate of substance abuse is higher in Nevada. The mental health needs of children and adolescents are even higher with an alarmingly smaller percentage of youth receiving treatment. Equally concerning is the decline in K-12 education ranking of Nevada, placing it at the very bottom in comparison to all other states. With a student to school counselor ratio over twice the ratio recommended by the ASCA (2014), Nevada contributes to the increasing deficit of school counselors in schools. Moreover, state and national employment trends place school counseling and clinical mental health counseling as some of the fastest growing occupations with demand already exceeding the number of graduates from the two largest universities in Nevada (and the only nationally accredited programs in the state). This paper discusses the evidence pointing to the need for more counselors in the state of Nevada and makes policy recommendations for addressing this growing crisis.

There is a significant shortage of mental health care professionals in the state of Nevada (Brune & Carreón, 2014). Specifically, there are only 1.7 licensed mental health counselors per every 100,000 people in the state of Nevada. The Guinn report on Nevada’s mental health workforce: Shortages and opportunities (Brune & Carreón, 2014) notes that 1.4 million people in the state of Nevada live in an area specifically designated as a mental health professional shortage area by the U.S. Department of Health and Human Services, Health Resources and Services Administration (2014). The shortage of mental health counselors further exacerbates the pervasive problem of accessing mental health services.

Similarly, Nevada is experiencing a shortage of school counselors. School counselors are on Nevada’s designated teacher shortage areas (Mahaffie, 2016) and have been identified as such for 11 of the past 13 years (Cross, 2016). With less than 1,000 school counselors serving nearly a half million students in the state of Nevada, clearly the lack of school counselors creates a diminished capacity to meet students’ needs in the areas of academic, career, and personal/social development.

Job Outlook: School Counseling & Clinical Mental Health Counseling

It is evident that there is tremendous need for clinical mental health counselors and school counselors in the state of Nevada, but are there jobs for the graduates of UNLV and Nevada-Reno? The bureau of labor statistics calculates projected job growth in vocations based on statistical data including the number of retirements in a field, employment trends, and other nationally and regionally available data. Categorized as a ‘bright outlook’ occupation, clinical mental health counseling is one of the fastest growing occupations in the U.S. with a growth rate of 20 percent from 2014 to 2024. In Nevada, the demand and growth rate is at 17 percent. Substance abuse and behavioral disorders counselors have an even higher demand with anticipated growth of 22 percent in Nevada and nationally. The demand for school counselors is even higher in Nevada as it is projected to grow 30 percent in the same time frame (compared to 8 percent nationally) (Bureau of Labor Statistics, 2017).

Research/Evidence of Counseling Effectiveness
A comprehensive overview of the research literature supporting the efficacy of clinical mental health counseling and school counseling is beyond the scope of this policy paper. A brief synopsis of some empirical evidence in support of these professions is warranted in order to justify an increased employment in these professions as a means to better serve Nevada’s adults and children. Due to the large body of research investigating the efficacy/effectiveness of counseling and related interventions, researchers are able to conduct meta-analyses on large groups of studies with different sample sizes. A meta-analyses is a means of reviewing a large body of research and providing a statistical evaluation of the strength of a particular intervention. Quintana and Minami (2006) add the following, “… meta-analyses involve the application of statistical procedures to literature reviews, replacing somewhat subjective decisions about research trends, such as magnitude and consistency of research trends, with statistically informed decisions (p. 840).”

There is (and has been for many years) a strong body of research that supports the effectiveness of counseling. Smith & Glass (1977) conducted a meta-analysis of 375 studies and determined that individuals receiving therapy were better off than 75 percent of individuals receiving no treatment. In their meta-analysis of 76 studies, Griner, & Smith, (2006) determined that culturally adapted mental health interventions are effective for a range of racial/ethnic groups.

The research evidence indicates that effectiveness increases with the quantity of counseling sessions (Lambert & Cattani-Thompson, 1996). Whiston, Sexton, and Lasoff, (1998) in their meta-analysis of 46 studies and 4,660 participants, (building earlier research by Oliver & Spokane, 1988) found evidence supporting the effectiveness of career counseling, especially individual career counseling via multiple sessions. It is important to note that of the many different theories/theoretical orientations in the counseling profession, there is evidence that they are equally effective (Wampold, Mondin, Moody, Stich, Benson, & Hyun-nie, 1997). The parity between counseling theories can be interpreted as indicative that the profession of counseling is effective as a discipline as opposed to a specific theoretical orientation.

Evidence suggests counseling is a cost effective intervention. As mentioned previously, nearly a third of Social Security Insurance Disability claims are for mental illness. It may not be surprising that there is evidence that counseling is associated with increased work productivity and the cost of treatment for depression (for example) is fully offset by savings from reduced sick days (Zhang, Rost, Fortney, & Smith, 1999). Moreover, research indicates that counseling/therapy is related to a decrease in the need for physical medical/healthcare (Buchanan, Gardenswartz, & Seligman, 1999; Rainer, 1996).

The evidence in support of counseling for adolescents/children is equally strong. In a meta-analysis of 21 clinical trials Erford, Bardhoshi, Ross, Gunther, & Duncan (2017) found counseling to be effective in treating conduct disorders in youth. This finding is especially significant given that in-service training on disruptive behavior disorder has been the greatest professional need in inner city schools and disruptive behavior was listed as the greatest mental health issue in schools by 50 percent of teachers (Walter, Gouze, & Lim, 2006).

Erford et. al (2011) conducted a meta-analysis of 42 published clinical trials from 1990-2008 counseling for youth with depression. The researchers found a moderate effect size for counseling as an intervention and interestingly, no significant difference between school based counseling interventions and clinic based results.

Similarly, Whiston and Quinby (2009) in a meta-analysis of 117 studies including 153 school counseling interventions, and 16,296 students found strong research support for group counseling in schools. Dimmitt & Holt (2011) note that these research are as strong as or stronger than empirical evidence for some medical treatments, “…school counseling interventions have a larger effect size than aspirin for preventing heart attacks” (p.1).

Research supports school counseling as a positive impact on school-wide academic outcomes as well. Bryan, Moore-Thomas, Day-Vines, and Holcomb-McCoy, (2011) found student-school counselor contact to be a positive predictor of college application and the number of school counselors in a school had a positive effect on students applying to two or more colleges. Similarly, Hurwitz & Howell (2014) conducted regression analyses that indicate an additional high school counselor corresponds to a 10 percent increase in four year college enrollment.
Wilkerson, Perruse, & Hughes (2013) examined four year longitudinal data and found that elementary schools with model school counseling programs achieved higher proficiency scores in language arts and math. Sink & Stroh (2003) found that the longer students stayed in schools with comprehensive school counseling programs, the more likely they were to have higher academic achievement test scores as compared to students in schools without such programs. These studies at the elementary school level are consistent with earlier studies that support academic achievement and other positive educational outcomes for students given comprehensive school counseling programs at the middle and high school levels (Lapan, Gysbers, & Petroski, 2001; Lapan, Gysbers, & Sun, 1997).

Perhaps most compelling is the body of research in support of lower student to school counselor ratios. Carrell & Carrell (2006) found that reducing the student to school counselor ratio to the ASCA recommendation corresponds to a 59 percent decrease in student discipline problems. Lowering the number of students per school counselor reduced the probability of a discipline problem occurring and the proportion of students involved in discipline incidents. These effects were greatest for minority students and students in poverty. Lapan, Gysbers, Bragg, and Pierce (2012) also found that lower student to school counselor ratios made the most substantial difference in high poverty schools, contributing to fewer disciplinary incidents and higher graduation rates. Carrell and Hoekstra (2014) determined that an additional school counselor reduces student misbehavior and increases academic achievement for boys. The substantial body of research in describing the effectiveness of school counseling poses the obvious question of why Nevada mandates school counseling in grades 9-12 and not K-8. And moreover, why Nevada maintains a student to school counselor ratio at twice what is recommended by ASCA.

Recommendations for Legislators
This section makes recommendations in four areas: (a) support for federal legislation that addresses the mental health needs of Nevadans, (b) removing impediments to licensure for clinical mental health counselors, (c) revising state mandates to better meet Nevada’s mental health needs and provide K-8 students/schools the benefits of school counseling programs, and (d) develop innovative state legislation that provides stimulus and support for increased training/education of clinical mental health counselors, school counselors, and human services professionals.

Support for Federal Legislation
There are an unusual quantity of proposed federal legislation developed in the last few years. Representative Murphy (PA) has proposed HR 2646, Helping Families in Mental Health Crisis Act of 2015. Senators Cassidy (LA) and Murphy (CT) prosed the Mental Health Reform Act of 2015 (S. 1945). Senator Murray (WA) and others have proposed The Mental Health Reform Act of 2016 (S. 2680). Mental Health America notes that this pending legislation

Some federal legislation focuses specifically on improving mental health services for youth. The Mental Health Awareness and Improvement Act of 2015 proposes the creation of a youth interagency resource center for research, training and technical assistance.

A major overview of the house and senate bills is beyond the purview of this policy paper. For further information, readers are referred to the American Psychiatric Association (APA) document that provides a comparative overview of HR 2646, S. 1945, and S. 2680.

The Affordable Care Act expanded mental health and substance abuse treatment coverage to 62 million Americans (Beronio, Po, Skopec, & Glied, 2013). This legislation and similar laws such as the Wellstone-Domenici Mental Health Parity and Addiction Equity Act (MHPAEA) of 2008 prevent insurance providers from having different copays for mental health treatment. Previously, some insurance providers would have a higher copay requirement for individuals/couples/families seeking mental health treatment (as an obvious means of preventing the use of insurance benefits for counseling/therapy or similar treatment). The repeal of the Affordable Care Act without protections for mental health treatment could result in a “mental health crisis” that overwhelms the overstretched public mental health care provider infrastructure and places incredible financial burden on counties and states (Chen, 2017). Clearly it is in the best interests of Nevada to advocate for and support federal legislation that helps provide mental health treatment.
**Removing Impediments to Licensure**

There are currently seven licensing boards for mental health professions in the state of Nevada, (Brune & Carreon, 2014) including the Board of Examiners for Marriage and Family Therapists and Clinical Professional Counselors that oversees licensure of clinical mental health counselors. The for licensed clinical mental health counselors is increasing at five times the demand for marriage and family therapists (Brune & Carreon, 2014; Griswold, Packham, Etchegoyhen, & Marchand, 2015) and moreover, there are nearly six times as many annual job openings for counselors in Nevada. Yet, the rate of licensure for clinical mental health counselors is far below that of marriage and family therapists.

In Nevada, the Legislative Committee on Health Care is proposing legislation to consolidate the 20 plus health care licensing boards, including the behavioral health licensing boards such as the Board of Examiners for Marriage and Family Therapists and Clinical Professional Counselors under the State Board of Health. One concern is if such an infrastructure could adequately monitor and maintain high standards in the mental health areas currently under seven different licensing boards (and another 13 health professions). A greater concern, given the tremendous deficit of certain mental health professionals, is if proportional representation (or if some professions are not represented at all) on the board would contribute to further inequities in licensed professionals. For example, there are currently 7.1 psychiatrists and 1.7 clinical mental health counselors per every 100,000 people in Nevada (Brune & Carreon, 2014). Licensed Clinical Social Workers and Marriage & Family Therapists are three times that ratio, at 21.7 and 24.3 respectively. So, given the disparity between certain mental health professions—proportionate representation on a licensing board or worse, a lack of representation—could perpetuate gatekeeping to protect professional ‘turf’ as opposed to ensuring high quality training and professional competency for respective professions.

The Guinn Center recommends making licensure in mental health professions easier for professionals coming from out of state. The counseling profession has a national accreditation group (CACREP: Council for the Accreditation of Counseling and Related Educational Programs) that monitors academic standards for counselor training as well as a national exam (NCMHCE: National Certified Mental Health Counseling Examination). With use of these organizations and the guidance of reciprocity agreements from states that have had counselor licensure much longer than Nevada, (Nevada and California were some of the last states to legislate licensed clinical mental health counselors) this suggestion shouldn’t be difficult for a licensing board to address.

**Revising State Mandates**

Currently in Nevada, school districts are required to have school counselors at grades 9-12 but not K-8. With increasing awareness of the significance of support for children earlier in their educational experience, legislation that expands the current mandate for school counselors to elementary schools and middle schools/junior high would increase preventative efforts against obstacles to educational success such as bullying/violence and substance abuse.

Unlike other states, Nevada currently has no legislation that mandates the student to school counselor ratio at either 9-12 or K-8. Passing legislation that set standards for maintaining a student to school counselor ratio that approximates the ratio recommended by the leading professional association would help guarantee that there is infrastructure to support comprehensive educational programming for students. Ideally, such legislation would include appropriated funding in support of such an initiative. However, many states enact mandates without specifically designating funding (ASCA, 2017). As with similar mandates for teacher class size, such a mandate serves to make sure public schools and charter schools are appropriating funds and conducting hiring in ways that are consistent with evidence based practice—such as the research on student school counselor ratios discussed earlier in this paper (Carrell & Carrell, 2006; Carrell, & Hoekstra, 2014).

**Nevada Legislation Providing Stimulus and Support**

The profession of school counseling was greatly expanded by the 1958 National Defense Education Act (NDEA). The legislation was in response to the launching of Sputnik and the fear that Americans were losing the ‘space race’ and needed to encourage more American youth to pursue careers in science and engineering. NDEA provid-
ed funding for training of school counselors often through summer institutes where teachers could go to get their graduate degrees in counseling. This legislation greatly increased the number of school counselors. From 1960 to 1970 the number of college students more than doubled from 3.6 million to 7.5 million U.S. students. As Nehls, Schneider, Espinoza-Parra, and Nourrie (2017) note in their policy brief that over 60 percent of jobs in the future will require college degrees and presently Nevada is below half the capacity to meet such demand (30 percent). So legislation that has the potential to double the number of Nevadans earning college degrees is important.

Nevada needs to build capacity to meet the mental health demands of youth and adults in Nevada, and to help address the obstacles impeding the academic success of Nevada’s K-12 students. Toward this goal, the state must develop innovative legislation that stimulates and supports an increase in the quantity of school counselors and clinical mental health counselors entering the Nevada workforce. Legislation such as the 1958 NDEA and federal loan forgiveness programs could provide examples for state legislators to develop similar legislation tailored to the specific needs of Nevada.

It may be that the best approach is to incorporate provisions in pending legislation to address the shortage of counselors in Nevada. One of the major drawbacks in the HR 2646 proposal is that it takes a narrow view of mental health care providers and prioritizes psychologists for leadership in government oversight as well as providing treatment. Excluding clinical mental health counselors may inhibit a more cost effective solution as training counselors is less expensive as is the cost of treatment provided by clinical mental health counselors.

National accreditation standards train counselors to consultation and systemic approaches to working in mental health care. Similarly, recent emphases in school counseling such as the Transforming School Counseling Initiative (TSCI) out of the Education Trust have emphasized the leadership role in designing and implementing school wide educational programming and collaborative team approaches in addressing school problems. The interdisciplinary nature of school counseling and clinical mental health counseling therefore, should lend the profession from inclusion in omnibus legislation or legislation addressing outcomes that could be supported by counseling.

Counseling as a profession contributes to the success of other professions. For example, counselors can provide mental health training for a variety of professions in the medical field. Such training addresses not only mental health treatment but also increases the likelihood of wellness and other health related behaviors (depression, substance use, HIV screenings, smoking cessation interventions, domestic/interpersonal violence intervention, and behavioral assessments) in preventative services as an element of patient care (ACA, 2017). Similarly, increasing school counseling seems likely to improve college access, the increased academic success of Nevada’s English language learners, and students entering STEM careers. NDEA and the related educational outcomes are in part testament to this plausibility. So including provisions for increased training of counselors in or legislation that addresses mental health in Nevada, and similarly including school counseling in Nevada education initiatives, is quite simply a smart thing to do.

**Summary**

This paper has discussed the substantial mental health and educational needs in Nevada. There is a strong body of research pointing to the effectiveness of clinical mental health counseling in treating, and school counseling in affecting positive academic outcomes for students and/or schools. Suggest these professions could make a much needed positive impact in Nevada. The shortage of clinical mental health counselors and school counselors in a state where demand for both is rising at a faster rate than the national average, however, creates a culminating crisis in the state. Therefore, this paper concludes with four recommendations: (1) increased support for federal legislation that addresses the mental health needs of Nevadans, (2) removing impediments to licensure for clinical mental health counselors, (3) revising state mandates to provide K-8 students/schools with school counselors, as well as lowering existing student to school counselor ratios and (4) developing innovative state legislation that provides stimulus and support for increasing the needed workforce.

It has been suggested that government might be judged by how it takes care of its most vulnerable members. The large student-to-school
counselor ratio (508 to 1), low proportion of clinical mental health counselors in Nevada (1.7 per 100,000 citizens), and being 51st in terms of education (Education Week, 2017) and mental health care (MHA, 2016) certainly do not bode well in this regard. However, out of such conundrum there is an opportunity for improvement. In the course of history, Nevada could come to be less known for the Comstock Lode but rather the investment in trained professionals it created as infrastructure for the care of its citizens.

References
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