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STEM Education in Rural Schools: Implications of Untapped Potential

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Abstract
A large number of students in American public schools attend rural schools. In this paper, the authors explore rural science, technology, engineering, and math (STEM) education and the issues associated with STEM education for students, teachers, and parents in rural communities. Characteristics of rural STEM education are examined to highlight unique considerations for this context. The authors conclude with the recommendation that more research is needed that specifically addresses rural STEM education.

Keywords
rural education, STEM education, rural STEM education, STEM funding, education funding

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Due to the current, competitive status of the global market and changing trends in economic need, there is an increased demand for qualified individuals in science, technology, engineering, and mathematics (STEM) related fields. Figure 1 shows the projected need in some specific STEM areas.

In order to prepare the next generation of Americans to compete for these careers, their education must instill both interest and proficiency in STEM at a young age. STEM course work already has been integrated into many school curricula throughout the United States; however, there is a severe gap in access to these educational benefits for students that reside in rural areas. The implications of not affording equal STEM education opportunities to all students is reckless for a society that hopes to expand and regain its economic and intellectual foothold among other developed countries. The main barriers identified through examining current research on STEM education and rural schooling were access to necessary resources, incongruent values between local culture and

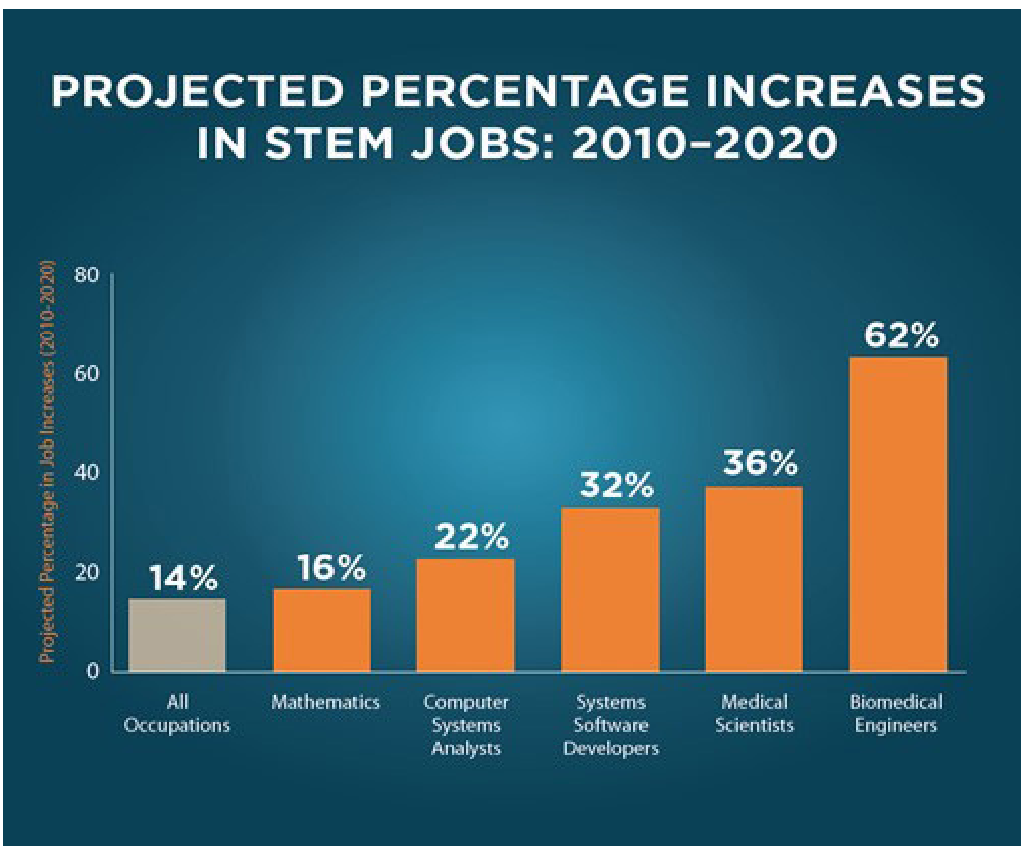

Figure 1. STEM job projections. Retrieved from https://www.ed.gov/stem

economic demand, and outreach disparities that lead to rural schools being devalued or ignored as potential aid recipients or research foci.

There are approximately 6.5 million students in American rural schools, which is more than the combined population of 20 of the country's largest urban school districts (Hill, 2014). An area is classified as urban when there are 50,000 or more residents, and an area is classified as being part of a cluster or sprawl anywhere the population ranges between 2,500 and 50,000 people (U.S. Census Bureau, n.d.). According to the most recent definition provided by both the U.S. Census Bureau (n.d.) and the National Center for Education Statistics (U.S. Department of Education, 2012), a school would be considered rural if it is outside of both an urban area and the surrounding urban clusters or suburban sprawl. These 6.5 million rural students are a wealth of relatively untapped potential for STEM degrees and careers. The United States as a whole is lagging behind other developed countries in the global market through evaluation of standardized international testing (e.g., Programme for International Student Assessment [PISA]). As of 2012, the mean PISA math score for the United States placed us in the "below average" category when compared with other nations, as we ranked 27th out of the 34 countries involved in this testing (Organization for Economic Co-Operation and Development, 2012). In science, the United States ranked 20th in the PISA testing, and, while this rank places the U.S. near the "average," it is on the lower end of the average range which is 14th–20th (Organization for Economic Co-Operation and Development, 2012).

The United States has enacted several policies and laws with the intent of improving education; the Rural Education Achievement Program (REAP) came out of the Elementary and Secondary Education Act. REAP was created to assist rural schools with the unique administrative challenges these school systems face (Yettick, Baker, Wickersham, & Hupfeld, 2014). A survey was conducted to evaluate opinions of educators in Colorado on their opinion of resulting issues of the No Child Left Behind Act, and the results highlighted a few distinct differences between the perceptions of rural and non-rural educators (Yettick et al., 2014). While the two groups did have a few commonalities, like challenges with reporting and filing for these benefits, differences in responses yielded a significant difference in multiple areas. Funding was a major point of disagreement between rural and non-rural educators who participated in this survey, and rural school officials nearly unanimously agreed that funding was inadequate while non-rural participants did not think that funding was an issue (Yettick et al., 2014). The issue of funding rural education through these governmental programs has not been alleviated due to stipulations that are not conducive to rural needs. For instance, Yettick et al. (2014) highlighted that some school officials even forgo the option of applying for REAP and similar benefits due to restrictions placed on any awarded funding. One of these restrictions is based on the issue that regardless of how large or small the award and what the locally relevant costs may be, all awards are mandated to set aside at least 15% of the award for supplemental educational services (Yettick et al., 2014). The remoteness of these rural schools is a major factor in the cost of these supplemental educational services and it is so extreme that one interviewee in the study remarked that it would have been more cost effective for the district to buy the educational services program as opposed to paying a nearby supplemental educational agency to work with their rural community once (Yettick et al., 2014). A similar issue exists with professional development opportunities in rural areas. It is too expensive, in comparison to the amount of money allotted, for most rural educators to spend the time and money required to travel to wherever the nearest conference may be and pay for lodging, food, and conference fees or registration (Yettick et al., 2014).

Finally, a key component of the Yettick et al. (2014) study was the way in which funds were calculated and distributed. Due to the larger issue of rural poverty, rural schools seem to slip through the cracks in many ways, even with help from REAP. Funding is calculated based on many factors, but two main components are population and community poverty; this is a large problem in many communities, but especially in rural ones (Yettick et al., 2014). Rural schools are some of the smallest schools and districts out of all classifications, and, due to these small numbers, the funds they are allotted are limited when compared with larger urban or suburban schools (Yettick et al., 2014). Community poverty also factors into this issue, because a community must have at least 10% of the population living at or below the poverty line to qualify for special exemptions and bonuses (Yettick et al., 2014). This uniquely affects rural education because although living in a community that does not seem to be in poverty may seem appealing, that is not the true story in the schools (Yettick et al., 2014). The child poverty level in rural areas can sometimes be double that of the community poverty level, but that is not always accounted for because poverty, as it relates to this funding, is based on whether or not 10% or more of the households in the community are at or below the poverty line and have children who qualify for reduced-price or free lunch programs (Yettick et al., 2014). These statistics are often not reliable measures of families involved in the rural school system due to many unique attributes of these communities.

According to a recent report from the ACT (2013), only 30% of 12th-grade students in the U.S. are sufficiently prepared to pursue a college-level science education. This prompts questions of why some students in America are more prepared than others and how can this disparity be minimized. Through review of applicable literature, it is evident that numerous state and federal initiatives have been implemented to address these issues and increase student attainment; however, the focus of these initiatives is most often on urban school reform. Urban schools have received the bulk of financial supplements from both private and governmental agencies, local support, and government incentives to draw in new or more qualified teachers, whereas rural schools have been marginalized or ignored in these respects. Large urban schools and rural schools produce extremely similar students educationally, whereas small urban areas and schools in the suburbs seem to have substantially better resources and, therefore, improved educational outcomes for their students (Miller & Votruba-Drzal, 2012). There are more similarities between student achievement in large urban cities and rural schools than there are differences; however, there is an outpouring of aid to educational programs in urban schools but minimal assistance available for rural school systems or rural educational research (Miller & Votruba-Drzal, 2012). According to a recent publication from the Rural School and Community Trust, the area in direst need of reformation in rural school systems is the southeastern region of the United States (Johnson, Showalter, Klein, & Lester, 2014). The southeastern states ranked in the highest need categories in all of the evaluations conducted in association with the 2013–2014 issue of *Why Rural Matters*. The evaluations included, but were not limited to, educational outcomes, student and family diversity, educational policy, and socioeconomic challenges (Johnson et al., 2014).

ACCESS TO RESOURCES

Funding

Although large urban schools are similar in a number of ways to rural schools, from socioeconomic status to testing achievement, there is one area in which the two groups are very different—the amount of funding they receive. Rural schools produce national test results that are not statistically different from the test results in large urban schools; however, the urban schools receive more funding than rural schools. Additionally, small urban and suburban schools receive more funding than both large urban and rural areas (Miller & Votruba-Drzal, 2012). This complex issue is mainly based on three factors: rural school districts produce low to average test scores, typically have the lowest amount of children that attend those schools, and the generally low populations yield a substantially smaller tax base for the district (Miller & Votruba-Drzal, 2012; Provasnik et al., 2007). To exacerbate the fact that rural schools receive less governmental funding, they also receive less financial support from the local community often due to a minimal local economy and lack of access to the local or private funding sources because rural schools lack much of the visibility that private funders seek to gain from donating to high-population urban areas (Provasnik et al., 2007).

Urban counterparts also are given priority for many other opportunities, such as grant funding and research, to improve their current conditions. Many philanthropic institutions very specifically identify the areas in which they will fund educational research and, when there is a locale restriction placed on these types of funding, one of two issues is apparent. It is either solely applicable to a metro-area and, therefore, would be inapplicable to rural STEM education, or it is to fund development in only a very specific town or county, which would severely limit the ability to reliably replicate the findings and resolutions this type of research could provide to other rural school districts.

In connection with this lack of accessible funding for research, the current body of scientific knowledge is disjointed. Many current studies focus on STEM education, or rural education, but not both. The specific context and approaches that would need to be applied to successfully teach STEM courses in rural areas are minimally explored, and further inquiry into this is necessary to develop comprehensive and competitive STEM education for rural K–12 students so they have the opportunity to contribute to the changing international economy.

Teachers

The lack of financial support available to rural school districts has major implications on the lack of access rural schools have to well-qualified teachers. This is due to the issue that new or more qualified teachers may be unaware of opportunities to work in rural areas. In addition to the lack of visibility that rural schools face due to their geographic position, there are also institutionalized barriers to recruiting teachers to rural schools. Just a few of these barriers are lack of financial incentive, human capital flight, remoteness (Boynton & Hossain, 2010; Harmon & Smith, 2012; Kelly, 2016; Stelmach, 2011), and inadequate facilities (Kelly, 2016).

Similar to the issues discussed earlier in this paper, urban schools also receive more funding to incentivize new, more qualified teachers to work for them (Harmon & Smith, 2012). In urban impoverished districts, there are federal incentives for teachers to work with these schools, such as monetary bonuses or student loan repayment, if a teacher agrees to work with the school for a particular period of time. Rural schools are rarely afforded all of these same recruitment tools from the government, even if they are at a similar poverty level to that of the urban districts receiving aid (Harmon & Smith, 2012). In addition to a lack of access to other financial bonuses, rural teachers are typically paid a lower salary than teachers in other districts. To exacerbate an already difficult issue, a culture also has developed within rural education that conveys the idea that students must move away if they wish to have a successful career (Boynton & Hossain, 2010). Due to this concept, the individuals that are most likely to be interested in teaching in rural schools are discouraged from doing so at a young age.

Remoteness is a strong deterrent for individuals that are not from these areas. Remoteness can deter potential teachers not only on the basis of distance from resources more common in the suburbs or cities, but there also is a subconscious concept of remoteness that shapes the perception of a rural community both internally and externally (Stelmach, 2011). Externally, incoming teachers or applicants may feel distant from the rural culture and communities that they are considering joining because they are unfamiliar with them; additionally, the parents or students may view this teacher in a different light because they may assume the teacher will not understand or respect the unique culture of their rural community (Stelmach, 2011). Due to the inability to hire or recruit new teachers, the teachers that are available to these rural schools often teach as many subjects as possible and, therefore, are not fully competent in all of the topics (Moskal & Skokan, 2011). These complications often result in a staff of teachers that is spread too thinly throughout the school and may be unaware of newer, more applicable methods and educational topics, particularly in science and math (Moskal & Skokan, 2011). These problems are not just observed in the United States, as similar issues have been identified in other countries (e.g., Australia as seen in Kline, White, & Lock, 2013).

LOCAL IMPLICATIONS

Parental Values

Pursuing STEM careers usually means leaving rural communities, at least for higher education opportunities, and leaving is a difficult proposition for many parents in rural areas (Peterson, Bornemann, Lydon, & West, 2015). This issue may be especially prominent in the southeastern region of the United States. According to a recent publication of *Why Rural Matters*, an 11-state area that spans from Virginia to Arkansas, excluding Florida, has the lowest percentage of adults that have attained at least a high school diploma or equivalent (Johnson et al., 2014). The rural parents' educational experiences have undoubtedly shaped their opinions of what is important for their children to learn in school. If steps are not taken to illustrate how STEM education is applicable to rural life, the schools will lack parental support; this causes problems in both a teacher's ability to educate students effectively and the curriculum decisions of administration. When polled, lack of parental support was rated as a serious to moderate issue for the majority of math and science teachers working in American elementary and secondary schools, 65% and 57% respectively (U.S. Department of Education, 2012).

Many articles suggest that parental opinions of STEM education in rural areas are incongruent with the realistic need for students to learn the principles and skills of the field to be able to compete in the current economy. This issue needs to be addressed because not only will parental attitude sway student interest and attainment in STEM, but, in rural areas, parents often play a major role in school boards and the development of school curriculum (Williams & Nierengarten, 2011). In rural schools, a difficult divide is created when parental attitudes and opinions about the value of education are very different than the opinions of the teachers and administrators (Stelmach, 2011). The reason this is an issue is because these perceptions are passed on to the students and that outlook shapes their educational performance and goals. Data suggest that all students, rural or not, possess an equal mean aptitude to study and succeed in engineering fields; however, rural students are drastically unrepresented in the population of undergraduate engineering majors in Tennessee (Boynton & Hossain, 2010). A recent article by Byker (2014) suggested that one way to approach the social factors involved with STEM education and technological integration is to use a theory referred to as the Social Construction of Technology. The basis of this theory is that the perceptions of technology are formed socially and that meaning is determined for a given situation by the important social groups (Byker, 2014). In regard to the present issue of rural STEM education, the important social groups would be the students, teachers, parents, and school administrators. This theory is very representative of the ways rural education is shaped; therefore, to successfully implement a STEM curriculum, you would need to convince each of these social groups of the reasons why STEM education is important. Furthermore, it is best to use the groups' unique perspectives when addressing why STEM education should be important to them and the education in their community.

Local culture is a very important factor in a rural community. One portion of rural culture that may result in deterring students from pursuing STEM careers is parental expectations. Many studies have found that parental expectations for educational attainment are lower in rural communities than anywhere else (Avery, 2013; Provasnik et al., 2007). A 2003 study confirmed this statistically where 42% of rural parents expect their children to obtain less than a bachelor's degree; this percentage can be compared to 25% of suburban parents and 30% of urban parents that had the same outlook on educational attainment (Provasnik et al., 2007). This parental influence could be a major reason that although rural students have higher high school graduation rates than their urban counterparts, urban students surpass rural populations in college enrollment rates (Avery, 2013). It is crucial to the STEM field that students not only have the necessary knowledge base to enroll in undergraduate science programs, but that they also have the desire to attend college. The effect of parental attitudes on student interest in STEM careers cannot be ignored as a deterrent factor. Careers in STEM related fields require higher education, and, without grooming an interest in both the specific topics of STEM and the pursuit of a higher education in general, rural students may not participate in these vital career fields regardless of whether they are introduced to these topics at a young age or not.

Local Relevancy

Making the education that students receive in school applicable to the local condition can improve not only educational attainment, but also interest in pursuing those fields as a career. Elam, Donham, and Soloman (2012) found that rural and urban students had no difference in their career goals except for areas that would be considered professional or technical careers, which would include the majority of STEM careers. When these findings were explored, Elam et al. found that nearly all students that chose to pursue higher education were going into programs for careers that they had seen or experienced within their local context. Zimmerman and Weible (2017) reinforced this notion when they observed positive results of using place-based education for rural STEM education in the Appalachian areas of the United States. Also, it has been found that exposure to engineering coursework early in students' education increases the likelihood that they will pursue a STEM career in the future (Selingo, 2007).

Place-based education addresses many issues of the implementation of STEM education in rural schools. Student interest and attainment would improve in STEM courses by using this model because it has been shown that students learn and retain more information when they perceive that what they are learning is applicable to them personally (Avery, 2013). The likelihood of parental acceptance of a STEM curriculum in rural schools would increase if educators were able to illustrate how it pertains to the local context. As previously mentioned, parental support of curricula is crucial to a successful

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program and, in a rural context, locality and community are very important values (Stelmach, 2011). If these values were applied to STEM education by the use of a place-based model, parental support would improve greatly; this would also have a positive effect on student perception. Logistically, the application of a place-based approach to STEM education would minimize imposition on administrators as well. In addition to the fact that students are more likely to pursue careers that they see in their community, administrators can utilize these local examples to minimize the cost of field trips or educational speakers while still providing a valuable educational experience to students. A study conducted by Boynton and Hossain (2010) utilized an engineering risk analysis of a local dam to both illustrate the local applications of engineering in their community and offer personal motivation for in-class problem solving that could hypothetically benefit the local community. Another study by Avery (2013) took students on a field trip to a local fishery to learn about the parallels between what students see as a simple fishery and the engineering that was used to operate this staple of their local economy. In addition to improving support and learning in rural STEM education, place-based education can also combat many issues of rurality in general by negating the idea that students need to leave these communities to be successful in STEM fields. This will help improve rural economies, minimize the loss of human capital, and, over time, improve educational access for future generations.

OUTREACH DISPARITIES

Lack of Research

There is a detrimental lack of research that combines both rural education and STEM curricula. There is an abundance of evaluations and reports of research on STEM programs or general evaluations of rural education, but not those that cover both rural education and STEM. When this issue has been addressed in the few studies available, they are typically short-term or small-scale research studies focused mainly on how to teach rural students STEM courses, and they typically only address one or two barriers involved in the lack of STEM education in rural schools. For example, one study examined the effect of a mobile laboratory that is shared between multiple schools, but is only available for those few schools and for short periods of time (Franzblau, Romney, Faux, & DeRosa, 2011). A few other studies examined the before and after perceptions of STEM coursework after university students went into the local schools and facilitated a STEM project (Boynton & Hossain, 2010; Matson, DeLoach, & Pauly, 2004; Moskal & Skokan, 2011). While these are helpful to the body of research, the small number of studies that can be found in this area results in a relatively minimal impact on rural students or curriculum and education policy.

Lack of Programs

Finally, the programs that seem to be the most effective for provoking student interest are summer camps, internships, or distance learning opportunities, but these do not address the lack of STEM programs physically available to rural students. Placements in these programs are typically reserved for students that fall into one of two categories, "at risk" or "gifted" (Boynton & Hossain, 2010; Franzblau et al., 2011; Matson et al., 2004; Moskal & Skokan, 2011). While these programs often are meaningful opportunities for the students involved, they typically last for a very limited amount of time, which tends not to leave a lasting impression. This outreach disparity leaves the vast majority of rural students right where they began, without access to STEM education. While the purpose of this section is not to negate the value of providing these types of programs, there is one consistent, fatal flaw to these programs. That flaw is that if the barriers to rural education as a whole are not addressed, there will continue to be barriers to the majority of the students that deserve an education equal to their urban and suburban peers.

CONCLUSION

The United States as a whole is suffering from a lack of STEM programs available to K–12 students resulting in a lack of STEM professionals in younger generations and, thus, damaging our ability to compete with other developed countries on a global scale. Specifically, rural areas in the southeastern portion of the U.S. seem to be suffering the most from a lack of STEM professionals. In a paper by Wicklein (2006), it was revealed that the population of students pursuing an engineering degree throughout the U.S. had decreased by 50% in 2006. To make matters worse, the southeastern U.S. has taken the brunt of the impact of this professional loss. For example, in the same year, 2006, the southern U.S. state of Georgia sought 50% of its engineering labor force from sources outside of the state (Wicklein, 2006). This results in the benefits that are provided by these well-compensated professional jobs not going to the citizens of Georgia, and, therefore, not helping to improve the economy of the rural populations that make up 109 out of Georgia's 159 counties (Georgia Rural Health Association, 2014).

There are nearly 6.5 million students in remote and small rural school districts around the country, not accounting for the students in fringe and distant rural schools (Hill, 2014). These 6.5 million rural students outnumber the total population of the combined enrollment at 20 of the largest urban districts in the United States, yet they receive a small percentage of attention from reformers, researchers, and legislation (Harmon & Smith, 2012; Hill, 2014). Neglecting to provide satisfactory STEM education to rural populations does not only negatively impact the country's ability to compete in the global economy, but it unjustly neglects rural populations. In order to eradicate these problems, external sources of aid need to come together and address the lack of resources rural schools receive, how to approach STEM education in a locally relevant way, and how to equalize current outreach disparities.

The gap in the research literature associated with both rural education and STEM education, i.e., rural STEM education, needs to be addressed. Some researchers will have an interest in rural STEM education. However, to help close the gap, funding opportunities for this specific type of research are needed to attract and produce more research. New funding initiatives could be established, or currently available funding opportunities could acknowledge that rural schools represent mostly untapped potential, thus allowing them to be included in areas were broadening participation is desired.

REFERENCES

ACT. (2013). *What are the ACT college readiness benchmarks?* Retrieved from http://www.act.org/research/policymakers/pdf/benchmarks.pdf

Avery, L. M. (2013). Rural science education: Valuing local knowledge. *Theory Into Practice, 52*(1), 28–35. doi:10.1080/07351690.2013.743769

Boynton, M., & Hossain, F. (2010). Improving engineering education outreach in rural counties through engineering risk analysis. *Journal of Professional Issues in Engineering Education & Practice, 136*(4), 224–232. doi:10.1061/(ASCE)EI.1943-5541.0000026

Byker, E. J. (2014). Sociotechnical narratives in rural, high-poverty elementary schools: Comparative findings for east Texas and south India. *International Journal of Education and Development using Information and Communication Technology, 10*(2), 29–40.

Elam, M. E., Donham, B. L., & Soloman, S. R. (2012). An engineering summer program for underrepresented students from rural school districts. *Journal of STEM Education: Innovations and Research, 13*(2), 35–44.

Franzblau, C., Romney, C. A., Faux, R., & DeRosa, D. (2011). Mobile laboratory programs as

DOI: 10.20429/nyarj.2018.030102

vehicles to promote STEM education in K–12 and beyond. *Proceedings of the Frontiers in Education Conference.* doi:10.1109/FIE.2011.6142774

Georgia Rural Health Association. (2014). *R.A.I.S.E. 2014 GRHA legislative agenda.* Retrieved from http://grhainfo.org/legislation.htm

Harmon, H. L., & Smith, K. C. (2012). *Legacy of the rural systemic initiatives: Innovation, leadership, teacher development, and lessons learned*. Retrieved from http://eric.ed.gov/?id=ED531890

Hill, P. T. (2014, February 4). Taking a closer look at rural schools. *Education Week, 33*(20), 25. Retrieved from http://www.edweek.org/ew/articles/2014/02/05/20hill.h33.html

Johnson, J., Showalter, D., Klein, R., & Lester, C. (2014). *Why rural matters 2013–14: The condition of rural education in the 50 states.* Retrieved from http://www.ruraledu.org/articles.php?id=3181

Kelly, K. L. (2016). Engaging rural Appalachian high school girls in college science laboratories to foster STEM-related career interest. *Journal of Microbiology and Biology Education, 17*(1), 77–80. doi:10.1128/jmbe.v17i1.996

Kline, J., White, S., & Lock, G. (2013). The rural practicum: Preparing a quality teacher workforce for rural and regional Australia. *Journal of Research in Rural Education, 28*(3), 1–13.

Matson, E., DeLoach, S., & Pauly, R. (2004). Building interest in math and science for rural and underserved elementary school children using robots. *Journal of STEM Education, 5*(3 & 4), 35–46.

Miller, P., & Votruba-Drzal, E. (2012). Early academic skills and childhood experiences across the urban-rural continuum. *Early Childhood Research Quarterly, 28*, 234–248.

Moskal, B., & Skokan, C. (2011). Supporting the K–12 classroom through university outreach. *Journal of Higher Education Outreach and Engagement, 15*(1), 53–75.

Organization for Economic Co-Operation and Development. (2012). *Results from PISA 2012* [Data file]. Retrieved from http://www.oecd.org/pisa/keyfindings/pisa-2012-results.htm

Peterson, B., Bornemann, G., Lydon, C., & West, K. (2015). Rural students in Washington state: STEM as a strategy for building rigor, postsecondary aspirations, and relevant career opportunities. *Peabody Journal of Education, 90*(2), 280–293. http://dx.doi.org/10.1080/0161956X.2015.1022397

Provasnik, S., KewalRamani, A., McLaughlin-Coleman, M. Gilbertson, L. Herring, W., & Xie, Q. (2007). *Status of education in rural America*. Retrieved from http://nces.ed.gov/pubs2007/2007040.pdf

Selingo, J. (2007, April). Powering up the pipeline: Schools hope their innovative K–12 programs will propel more students into college engineering courses—and careers. *PRISM Magazine, 16*(8). Retrieved from http://www.prism-magazine.org/apr07/feature_K-12.cfm

Stelmach, B. L. (2011). A synthesis of international rural education issues and responses. *Rural Educator*, *32*(2), 32–42.

U.S. Department of Education. (2006). *School locale definitions*. Retrieved from http://nces.ed.gov/surveys/ruraled/definitions.asp

U.S. Department of Education. (2012). *Schools and staffing survey*. Retrieved from http://nces.ed.gov/surveys/sass/question1112.asp

U.S. Census Bureau. (n.d.). *2010 census urban and rural classification and urban area criteria*. Retrieved from https://www.census.gov/geo/reference/ua/urban-rural-2010.html

Wicklein, R. C. (2006). Five good reasons for engineering design as the focus for technology education. *Technology Teacher, 65*(7), 25–29.

Williams, J. M., & Nierengarten, G. (2011). Recommendations from the North Star state: Rural administrators speak out. *Rural Educator, 33*(1), 15–24.

Yettick, H., Baker, R., Wickersham, M., & Hupfeld, K. (2014). Rural districts left behind? Rural districts and the challenges of administering the Elementary and Secondary Education Act. *Journal of Research in Rural Education, 29*(13). Retrieved from http://jrre.psu.edu/wp-content/uploads/2015/01/29-13.pdf

Zimmerman, H. T., & Weible, J. L. (2017). Learning in and about rural places: Connections and tensions between students' everyday experiences and environmental quality issues in their community. *Cultural Studies of Science Education*, *12*(1), 7–31. doi:10.1007/s11422-016-9757-1

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