Spring 2019

STEM Ready: Inspiring and Preparing Undergraduate Students for Successful Volunteerism in After-School STEM Programming with Marginalized Youth

Bailey N. Wagner
Merrimack College, wagnerb@merrimack.edu

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2019

MERRIMACK COLLEGE

CAPSTONE PAPER SIGNATURE PAGE

CAPSTONE SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE

MASTER OF EDUCATION

IN

COMMUNITY ENGAGEMENT

CAPSTONE TITLE: STEM Ready: Inspiring and Preparing Undergraduate Students for Successful Volunteerism in After-School STEM Programming with Marginalized Youth

AUTHOR: Bailey N. Wagner

THE CAPSTONE PAPER HAS BEEN ACCEPTED BY THE COMMUNITY ENGAGEMENT PROGRAM IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION IN COMMUNITY ENGAGEMENT.

Audrey Falk, Ed.D. DIRECTOR, COMMUNITY ENGAGEMENT	Audrey Falk SIGNATURE	5/10/19 DATE
Melissa Nemon, Ph.D. INSTRUCTOR, CAPSTONE COURSE	Melissa Nemon SIGNATURE	5/10/19 DATE

Acknowledgements

Completing a master's degree in a year is no small task, nor done alone and to this I say thank you – to the many educators throughout the years that showed me that education should not be contained to a box and inspired my love of teaching informally. To Dr. Melissa Nemon for guiding me through this whirlwind of a year, your passion and drive for education and our success only fueled the fire in us. To the whole Hands to Help crew; Alisha, Rosana, and Gina who provided an amazing work environment, thank you for letting me be a part of it, and for showing up every day with encouragement and support for me and my work. To Katie of the Steven's Service Learning Center, and all participants of this project thank you for opening your door and your mind and embracing every aspect of this project wholeheartedly. To Brooke and Erika for truly taking the out of towner under your friendship and constantly putting a smile on my face. Through the laughs and the tears, we made it girls!

None of this would have been possible without my family and friends at home, and their constant support of my dreams, even in long distance you all have stood by me during every struggle and all my successes this past year. To my mom Carol: for always being the person I could turn to, she sustained me in ways that I never knew that I needed. To my dad, Cory, brother, Adam, and sister, Mallory: thank you for always being a phone call away when I needed a laugh the most, your support and sarcasm will always be needed.

Lastly, thank you to the other members of the Community Engagement Cohort. Your continued support and constant drive for knowledge pushed me to think outside of the box. Here's to changing the world one step at a time!

Abstract

The activities in which children and youth engage while outside of school hours are critical to their development, highlighting the need for quality afterschool programs that engage students – regardless of gender, race/ethnicity, socioeconomic status, or minority classification. *STEM Ready* set out to study the effectiveness of an experiential education pedagogy approach in the design of a professional workshop for undergraduate volunteers who work directly with these marginalized populations in afterschool programs. This project hosted a training that gave the opportunity for afterschool volunteers to come together to be trained on STEM curriculum that has been developed in collaboration with practitioners and educators. The goal of this training was for participants to become more aware of how STEM is practical and meaningful and how to convey this to children in meaningful and fun ways. The project connected larger schemas and concepts to everyday life and local items to promote innovation, learning, and creativity in a hands-on space. The goal was to bring all portions of STEM together in a dynamic and exploratory relationship. The training provided students the chance to advance their understanding of their own power and privilege and learn techniques to effectively engage K-12 learners in STEM education.

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STEM Ready: Inspiring and Preparing Undergraduate Students for Successful Volunteerism in After-School STEM Programming with Marginalized Youth

In the 21st century, scientific and technological innovations have become increasingly important as we face the benefits and challenges of both globalization and a knowledge-based economy. Science, technology, engineering and mathematics are cultural achievements that reflect people's humanity, power the economy, and constitute fundamental aspects of our lives as citizens, workers, consumers and parents. As a previous National Research Council committee found (2011) the primary driver of the future economy and concomitant creation of jobs will be innovation, largely derived from advance in science and engineering.

STEM is a curriculum based on the idea of educating students in four specific disciplines — science, technology, engineering and mathematics — through an interdisciplinary and applied approach. Rather than teach the four disciplines as separate and discrete subjects, STEM integrates them into a cohesive learning paradigm based on real-world applications (Hom,2014). Though the United States has historically been a leader in these fields, fewer students have been focusing on these topics recently. According to the U.S. Department of Education, only 16 percent of high school students are interested in a STEM career and have proven a proficiency in mathematics. Currently, nearly 28 percent of high school freshmen declare an interest in a STEM-related field, the U.S. Department of Education (year) says, yet 57 percent of these students will lose interest by the time they graduate from high school. Much of the new STEM curriculum is a result of the Obama administration *Educate to Innovate* campaign to motivate and inspire students to excel in STEM subjects, is aimed toward attracting underrepresented populations. Female students, for example, are significantly less likely to pursue a college major or career. STEM education helps to bridge the ethnic and gender gaps sometimes found in math and science fields. Initiatives have been established to increase the roles of women and minorities in STEM-related fields. In order to compete in a global economy, STEM education and careers must be a national priority. Every decision made uses an aspect of STEM to understand the implications.

Effective instruction capitalizes on students' early interest and experiences, identifies and builds on what they know, and provides them with experiences to engage them in the practices of science and sustain their interest. The decrease in time for science education is a concern because some research suggests that interest in science careers may develop in elementary school years. Programs outside of school can help children to see that STEM is more than a class to finish. Having activities that show real-life implications of STEM can pull together the ideas presented in school and help to show how they benefit our society and even our world. Children can see that what they are learning now is pertinent to their future and the future of the whole world, creating an interest often lacking when learning new concepts that do not seem to carry real-world application.

This project proposes to host a professional workshop that will bring together after-school volunteers so that they can be trained on fun and interactive STEM curriculum that has been developed in collaboration with practitioners and educators. The goal of this training is for participants to become more aware of how STEM is practical and meaningful, how to convey this to children in meaningful and fun ways, and how to apply STEM in their interactions.

It will be an overall guide and resource manual framed through a hands-on approach to education. This project will transform a typical after school program beyond the traditional approach into an innovative learning experience for youth participants. The goal is bringing all portions of STEM together in a dynamic and exploratory relationship. The project will connect larger schemes and concepts to everyday life and local items to promote innovation, learning, and creativity in a hands-on space. It will also create a guide and resource model that can be reproduced by other institutions across the state and country.

Literature Review

"Science is more than a school subject, or the periodic table, or the properties of waves. It is an approach to the world, a critical way to understand and explore and engage with the world, and then have the capacity to change that world" — President Barack Obama, March 23, 2015

The United States has developed as a global leader, in large part, through the genius and hard work of its scientists, engineers, and innovators. In a world that's becoming increasingly complex, where success is driven not only by *what* you know, but by what you *can do* with what you know, it's more important than ever for our youth to be equipped with the knowledge and skills to solve tough problems, gather and evaluate evidence, and make sense of information. These are the types of skills that students learn by studying science, technology, engineering, and math—subjects collectively known as STEM.

"Science, technology, engineering, and mathematics, are cultural achievements that reflect people's humanity, power the economy, and constitute fundamental aspects of our lives as citizens, workers, consumers, and parents," (National Research Council, 2011). All young people should be prepared to think deeply and to think well so that they have the chance to become the innovators, educators, researchers, and leaders who can solve the most pressing challenges facing our nation and our world, both today and tomorrow. "STEM could mean an integrated curricular approach to studying grand challenges of our era…challenges such as: energy efficiency, resource use, environmental quality, and hazard mitigation" (Bybee, 2010). Currently not enough of our youth have access to quality STEM learning opportunities and too few students see these disciplines as springboards for their careers.

The Gap in STEM Education

While concern about the state of American science has several origins, a primary cause of the doubt is the widely held perception that STEM education in the U.S. is woefully inadequate, in both quantity and quality, and unequally available across social groups. Moreover, there are significant gaps in achievement between student population groups: the black/white, Hispanic/white, and high-poverty/low-poverty gaps. A gap of this size means the average student in the underserved groups of black, Hispanic, or low-income students performs roughly at the 20^{th} percentile rather than the 50^{th} percentile, (National Research Council, 2011).

Institutional Factors

Schools differ widely in resources for STEM education, such as teacher quality and science labs, primarily reflecting cross-school inequalities in families of students. Studies of the elementary and secondary schools suggest that funding and resource availability shapes the extent to which students engage in and excel at STEM education (Wang, 2013). The current research largely focuses on the structural effect of resources: well-resourced schools offer relatively wide arrays of math and sciences courses, and greater access to resources such as textbooks and scientific lab equipment (Oakes & Saunders, 2004), but their effect on learning cultures or promotion of STEM education has receive much less attention (Wang, 2013). School resources are also positively associated with staffing of high-quality teachers (NCES, 2013). Numerous studies show that access to knowledgeable and experienced math and science teachers positively impacts both student learning (Sadler, 2013) and student interest in and passion for science. Although the studies often suffer from potential confounders (e.g., selection), together they provide compelling evidence that school context predicts achievement in STEM education.

Race and Ethnicity Factors

Despite significant gains in the participation of underrepresented minorities; African American, Hispanic, and Native Americans — in STEM education, they continue to be underrepresented in the STEM pipeline and to lag behind Whites and Asians in STEM and general achievement. In general, there are two broad explanations for the racial disparities in STEM education. The first attributes the gaps to underrepresented minorities students' lower levels of interest in and enjoyment of science. As we have already demonstrated, however, we find little evidence to support this hypothesis. Instead, mounting evidence suggests that social psychological factors may limit the extent to which underrepresented minorities students' students are able to convert their interests into meaningful STEM engagement. For example, studies show that while adolescent underrepresented minorities express a level of interest in science that resembles that of their White peers. Underrepresented minorities youth lack opportunities and family resources to develop a deep connection with science (Archer, 2012).

The second explanation attributes these racial gaps to underrepresented minorities students' lower levels of academic preparation at the K-12 level, which limits their attainment of both general and STEM education at the college and advanced levels. The structural causes of racial inequalities in access to the resources and opportunities that are more directly linked to STEM educational outcomes. Most often these explanations focus on two forms of structural inequality: social class differences that are closely correlated with race/ethnicity and school quality differences that are closely related to both race/ethnicity and social class (Hernandez,

2012) Underrepresented minorities students are significantly overrepresented among relatively poor, less educated, underemployed families and those headed by single parents than are whites and Asians. Black, Hispanic, and Native-American youth are therefore less likely to be supported by financial and parental resources.

Studies reveal that underrepresented students in STEM majors at the post-secondary level often struggle with feelings of isolation and have difficulty adapting to the white, middle-class culture of science, that lead to have negative effects on their academic confidence, engagement, and likelihood of persisting in STEM (Archer, 2012).

Gender Factors

Despite robust progress toward equity, gender disparities continue to be a defining characteristic of STEM education. Achievement is commonly measured with standardized test scores and course grades in math and science. Studies have long shown that female students' math and science grades are equal to or better than those of their male classmates throughout elementary and secondary school. Participation in STEM education is conventionally measured in terms of high school math and science course completion and postsecondary choice of major and degree field, and the size of the gender gap varies across these measures. Gender gaps in high school math participation have disappeared, as female students are now more likely than their male peers to complete precalculus and algebra II and are equally likely to complete calculus (NSB, 2014). In high school science, girls continue to be overrepresented in advanced biology and underrepresented in physics, but these completion disparities have declined significantly. Despite growing equality in high school coursework, however, wide gaps in STEM participation remain in tertiary education. Thus far, growth in women's participation in STEM majors has been driven mainly by the general increasing enrollment of women (Mann & DiPrete,

2013) and declining gender gaps in persistence in the "science pipeline" during college and into post-baccalaureate education. Consequently, while the number of women earning undergraduate and graduate degrees in STEM fields has steadily increased, the proportionate representation of women in many STEM fields has not increased since the 1980s (Mann & DiPrete, 2013) and may be declining in some engineering fields (Mann & DiPrete, 2013) Women in the U.S. and other industrialized countries have earned the majority of biological and social science degrees since the 1980s, but they remain significantly underrepresented among degree recipients in engineering, the physical sciences, math, and computer science (Mann & DiPrete, 2013).

Improving science, technology, engineering, and mathematics (STEM) education, especially for traditionally disadvantaged groups, is widely recognized as pivotal to the U.S.'s long-term economic growth and security. Children's race, zip code, or socioeconomic status should never determine their STEM fluency. We must give all children the opportunity to be college-ready and to thrive in a modern STEM economy.

STEM and Economic Impact to US

The principle that educational achievement is the primary door to economic success in life is at the foundation of our public education system. However, an alarming achievement gap exists between children growing up in poverty and their higher income peers, effectively barring low-income children from an adulthood that includes economic mobility and financial security. Moreover, even after decades of effort to reinvent the public education system, this gap still exists and continues growing; a comparison of test scores among low-income and higher-income children over the last 50 years reveals that the disparity between these two groups has grown by 40 percent, (Reardon, 2013) leaving the poorest members of our society trapped. The impact of this and other similarly sobering statistics is profound and lifelong. As these children grow up, the achievement gap turns into an opportunity gap, creating a starkly stratified society. With postsecondary education becoming more important than ever to securing employment in the 21st century, the clear majority of today's low-income children will become tomorrow's low-income adults, perpetuating our country's seemingly unbreakable cycle of poverty. Calls for school reform to address this achievement gap abound from almost every sector of society, each armed with its own solution to the education problem: better funding, more accountability for teachers, or a longer school day. Decades of vigorous efforts on these fronts have not yet succeeded in opening the floodgates for low-income youth to succeed in education.

For America, improving achievement in science, technology, engineering, and math will go a long way to ensuring that our country can compete globally, create jobs, and achieve the levels of economic growth that will buttress Americans' standard of living and social safety net. High-quality STEM education represents an opportunity that students, workers, educators, and business must seize if we are to keep the country strong.

STEM education, however, is embedded in the general education system and its dynamics. A vast literature in economics treats education as a form of human capital that yields substantial economic returns, which have increased significantly in recent decades, especially for the highly educated. STEM education carries a premium in the overall labor market (Rothwell, 2013), although the earnings of basic scientists have stagnated in recent decades. Yet a vast literature in sociology on education stratification affirms that educational attainment is highly dependent on social characteristics, including but not limited to family socioeconomic background, race and ethnicity, family structure, sibship size, schools, and neighborhood. The economic imperative for STEM education is one of many different justifications for the teaching of science, but it is one of the most influential. Advanced economies need to innovate, the argument goes, to grow their gross domestic product, GDP, and therefore, need a continuous supply of scientists and engineers to drive innovation. STEM education is the pipeline that provides these future scientists. Without this steady flow of scientists, policy makers and academics have argued US economic competitiveness will decline.

The crucial role of science in a modern society is commonly acknowledged. Its central role in promoting technological innovation and sustained economic growth is not contested. Conversely, scientific progress depends on the strong financial and non-financial support of society. Social studies of science research devoted to elucidating the interplay between science and societal conditions point out that it is no accident that the United States has led the world both economically and in science, as America's economic strength has been closely linked to its advances in science and technology. Given this relationship, concern has recently resurfaced that the U.S. may be losing its lead in science, and therefore its economic competitive edge in an ever more globalized world (NAS, 2007).

Teaching STEM in Meaningful Ways

Many observers look to the nation's teaching force as a source of national shortcomings in student math and science achievement. Despite the ever-growing emphasis on STEM education, science and math teachers have long been in short supply because it's hard for public schools, many of which are drastically underfunded, to compete with private-sector salaries in their recruitment of young adults with those skills. Public schools in 48 states and the District of Columbia report teacher shortages in math and 43 states in science for the 2017-18 school year, according to the US Department of Education. "The first challenge involves actively including technology and engineering in school programs", (Bybee, 2010). But tapping into what makes students want to learn will help advance the STEM education. Research shows that what motivates students to learn is the joy of exploration—a hidden force that drives learning, critical thinking, and research. Intellectual curiosity has just as big of an effect on performance as hard work, people who are curious about a topic retain what they learn for longer periods of time. “The greatest advantage of curiosity lies in its power to motivate learning in areas of life and work that are meaningful to the leaner” (Price-Mitchell, 2015). An approach that begins with a challenge or problem that engages students by introducing STEM-related issues related to their everyday life and developing the competencies to address the issues students will confront as citizens. Fostering student’s curiosity in a fashion that intrigues them and draws them into the problem for piquing curiosity so that students engage in using critical thinking skills to solve problems. Learning through reflection and doing is compelling. When your students have their imagination piqued, give them opportunities to investigate multiple possible solutions to a problem, through providing hands-on and experiential learning.

The idea of hands-on science is associated with cognitive theory information processing model of the mind which includes a long-term memory and stores information for a long period of time (Gage & Berliner, 1984). The short-term memory holds information on the conscious level and can be worked with. The ability to retrieve relevant knowledge from the short-term memory for use is strengthened by the long-term memory. The reason being that the longer information stays in the short-memory, the stronger the association in the long term-memory. Hands-on activities create further associations by providing an extension between both memories so that information can be referenced both by abstract meaning and by a physical illustration. In this way, information retrieval is improved (Gage & Berliner, 1984). The activities within a STEM education curriculum should scaffold from confirmatory, structured, guided, and to open an inquiry to explore the real world (Harland, 2011). STEM well promoted to higher learning has the potential to impact and transform lives. In addition, hands-on learning uses kinesthetic learning, and this is a key learning technique that works for youth. Bronfenbrenner (1978) describes such a perspective as the ecology of human development: the mutual accommodation between an active, growing human being and the immediate setting the developing person lives. The youth development field has incorporated this perspective and has sought to understand and describe adolescent development in the context of the critical social systems in which youth grow and learn (Cahill et al., 2002).

We must improve how STEM subjects are taught in the classroom. We need to help teachers improve their approach and hone the techniques that motivate students and help them learn. We also need to produce more highly qualified STEM teachers armed with the degrees and knowledge that can bring STEM subjects to life and motivate our students. We need to create systemic changes with the influence from the youth of which we are teaching that makes a difference in their own lives, both now and the future.

After-School Programs

“After-School” is the general term used to describe an array of safe, structured programs that provide children and youth ages kindergarten through high school with a range of supervised activities intentionally designed to encourage learning and development outside the typical school day. (Little, Wimer, & Weiss, 2008). The activities in which children and youth engage while outside of school hours are critical to their development, highlighting the need for quality afterschool programs in all communities. “The demand for afterschool programs is strong; current estimates suggest that nearly 10 million children and youth participate in afterschool programs annually” (Yohalem, Pittman, & Edwards, 2010).

Before and after-school tutoring programs have been identified as having the potential to turn academic failure into academic success. It is important to note that a common thread among top leading schools and programs is not just that the programs intentionally tried to improve academic performance and therefore offered academic support, but that they combine it with other enrichment activities to achieve positive academic outcomes. "Well-implemented programs can have a positive impact on a range of academic, social, prevention, and other outcomes, particularly for disadvantaged children and youth" (Durlak & Weissberg, 2007). A good afterschool program can turn the aimless hours after school into productive learning time, that's a big benefit for kids with learning and attention issues. Some after school programs are demonstrating that they can have a huge impact on academic performance in several ways, including moving the needle on academic achievement test scores. "Balancing academic support with a variety of engaging, fun, and structured extra-curricular activities that promote youth development in a variety of real-world contexts appears to support and improve academic performance" (Little, Wimer, & Weiss, 2008). Participation in high quality out-of-school-time activities constitutes a significant portion of the time that many youths spend away from their families or school settings, and current theory and research suggests that activity participation can be an influential contextual asset for promoting adaptive outcomes for youth.

Bronfenbrenner's conception of human development suggests that development is generally promoted by engagement in activities that are regular and enduring and that are challenging in the sense of increasing in complexity as people gain competence (Hamilton, 2004). Schools should create classroom environments and programs that continuously give students opportunities for engagement and autonomy; there needs to be reciprocal processes. "Human beings develop through active engagement with their environment; by making choices and shaping that environment, they also direct their own development. They are more than passive recipients of external influences" (Hamilton, 2004). Formal, as well as informal, learning opportunities must be designed with a focus to create access as well as build confidence in all students to pursue their interests.

As schools struggle to meet federal achievement standards, after-school programs are increasingly viewed as a potential source of academic support for youth at risk of school failure. The hope among youth advocates and policymakers is that after-school programs can partially compensate for the inequities that plague our nation's schools and play a role in efforts to narrow gaps in achievement between more and less advantaged students. (Little, Wimer, & Weiss, 2008).

American school-aged youth (grades K-12) spend a larger percentage of their weekly waking hours in discretionary activities than in school (Hofferth &Sandberg, 2001). The hours between 3 p.m. and 6 p.m. — when students are out of class, but most parents are still working — are critically important to a child's well-being. But despite national efforts to improve access to after-school programs, many children, particularly in poor neighborhoods, still don't have seats. Children living in poverty face numerous obstacles when it comes to educational success, and the resulting achievement gap between low-income youth and their higher-income peers is well-documented. Moreover, even after decades of efforts to reinvent the public education system, this gap not only still exists but is growing: a comparison of test scores among low-income and higher-income children over the last 50 years reveals that the disparity between these two groups has grown by 40 percent, leaving the poorest members of our society trapped. (Reardon, 2013). Modest gaps between children from low- income and higher-income families are present even when these children first enter school, and the gap widens as the children grow.

This inequity in academic achievement can be traced all the way to high school graduation where students in families whose incomes are in the lowest quintile of income distribution nationwide are six times more likely to drop out of high school than students from the top quintile. A 2012 study summarizes this dismal reality in stark terms: “Overall, children who spend a year or more in poverty account for 38 percent of all children, but they account for seven-tenths (70 percent) of all children who do not graduate from high school. Poverty matters” (Hernandez, 2012).

An examination of just three key out-of-school factors that impact student success—early childhood preparation, physical health, and after-school/summer programs—reveal the alarming impact that a life spent in poverty has on success in education. For example, children’s early exposure to foundational academic skills is critically important to their future ability to thrive in school. Children living in poverty often miss out on that early preparation, putting them at a disadvantage from the first day of school. (Reed, 2005). Enrichment in the hours after school and during the summer is also vitally important to academic success. After-school programs have been shown to improve students’ grades, test scores, engagement in learning, social and emotional development, and much more. Furthermore, low-income youth lack access to the summer experiences that their higher-income peers regularly enjoy. This single factor has been shown to contribute to as much as two-thirds of the achievement gap by the 9th grade. (Alexander, Entwisle, & Olson, 2007). While for many activities like tutoring, music lessons, and team sports are just a part of daily life, children living in poverty lack the financial resources to access these educational opportunities.

Leaders in science education improvement efforts recognize that afterschool programs can play an important role in STEM learning— especially when it involves real science and engineering practices. These practices, such as running science experiments, analyzing data and developing explanations, or designing engineering solutions, have been found to be the best way to learn science and engineering. As afterschool programs have expanded their offerings, many providers and funders have seen STEM as a natural fit for the setting. The strong focus on youth development allows for youth- driven exploration that can provide students with opportunities to immerse themselves in STEM learning, which complements the school day with a different approach to teaching and learning. There is room for experimentation and failure, and time for children to develop strong relationships with mentors and peers—all while gaining knowledge and skills. These are all vital for future access and participation in STEM fields and careers. Supporting quality STEM education for all children and youth is vital to our country's prosperity, and policymakers are paying attention to the afterschool space—President Obama's Council of Advisors on Science and Technology released a much-cited report that included a recommendation to "create opportunities for inspiration through individual and group experiences outside the classroom" the Department of Education has placed a priority on STEM in its 21st Century Community Learning Centers grants for afterschool and is forging new interagency collaborations that are aimed at making connections across various federal agencies to advance STEM in afterschool.

As schools struggle to meet federal achievement standards, after-school programs are also increasingly viewed as a potential source of academic support for youth at risk of school failure – a group that includes disproportionately large numbers of economically disadvantaged and ethnic minority youth. The hope among youth advocates and policymakers is that after-school programs can partially compensate for the inequities that plague our nation's schools and play a role in efforts to narrow gaps in achievement between more and less advantaged students. This hope is bolstered both by a wealth of decades-old research that suggests that more "time on task" (i.e., time spent engaged in academic activities) is associated with positive academic outcomes, as well as by promising findings from recent evaluations of several after-school programs. Children who live in low-income neighborhoods are 28 percent more likely than average to participate in after-school programs — but demand far exceeds supply, according to the Afterschool Alliance, a national advocacy group. The group looked at communities of concentrated poverty, where at least 30 percent of families are low-income. Increasingly, however, policymakers are recognizing the potential for after-school programs to play a broader role in promoting healthy growth and development for all youth, and for economically disadvantaged youth (Pittman, Irby, & Ferber, 2000). Kids spend only about 20 percent of their time in school. We need to think about the 80 percent they're not in school.

Volunteerism and After School Programs

Community involvement in after-school time programs is associated with many positive outcomes and with higher-quality programming overall. Research has shown that community involvement can improve program recruitment and attendance; help programs with mentoring and staffing; and enhance physical and financial resources, broaden participants' experiences, and teach social responsibility.

Many after-school programs turn to volunteers because they face financial limitations that make it hard for them to offer competitive wages. Programs can improve their participant-to-staff ratio and provide mentors for more young people without significantly increasing costs by reaching out to college students, retirees, parents, employees of local businesses, and other community members. After-school time programs that partner with their communities may be able to access rent-free facilities, such as classrooms, gyms, and computer labs, as well as attract additional funding. These partnerships may also enable programs to develop interesting field trips, career-related experiences, and service-learning opportunities. Many after-school programs are underutilized, especially by the high-risk, older youth most in need of them. Providing youth with opportunities to participate in their community is a powerful engagement strategy that can also teach social responsibility.

It is important to educate all volunteers and community members about the role of STEM knowledge and skills to prepare children for the future. Afterschool program providers should highlight that hands-on, inquiry-driven afterschool STEM programs can make afterschool enjoyable for children and should offer learning that looks and feels different from the school day. Teachers' special experience in the hands-on instruction in promoting STEM education helps the students who are prepared to face the demand of the new world (Cohan & Honigsfeld, 2011). If students are directed by quality teachers and volunteers to be thinking while performing, they could effectively learn new information. The process of involving quality teachers and volunteers in the teaching of math and science will help to stimulate and sustain the interest of students to decide to major in STEM disciplines (Khatri & Hughes, 2012).

In order to facilitate growth, we must increase the number of those pursuing careers in STEM and encourage the underrepresented to chase the same dreams. We can all agree on the serious ramifications that may result from the nation's lack of achievement in STEM education, but what can we do about it? Real education is not confined to the classroom… while we should support our teachers, schools and students, we can do this by both investing in and holding school accountable but also in providing supplemental programming that engage students – regardless of gender, race/ethnicity, socioeconomic status, or minority classification – to love learning, enjoy STEM, and foster their natural curiosity for the world.

Project Plan

With the mission to ensure that youth receive the hands-on, imaginative experiences they need to open their minds to new skills and bright futures, this project focuses on the working closely with the undergraduate volunteers in the Math and Science program located at Merrimack College to conduct training in the realms of teaching pedology, having proper dissipation towards service, and the cultural competency in working with the Lawrence, MA. youth.

Situational Statement

It is vital that those of us in higher education recognize the importance of addressing STEM fields in PK–12 education and affirm the essential role of using experiential education pedagogy in a hands-on environment as the center of any STEM education program. In addition to integrative experiences connecting the disciplines of STEM, allow students to form a strong foundation that will allow them to succeed in STEM fields and to make sense of STEM-related topics in their daily lives. Because of the prevalence of STEM in our daily lives, any STEM education program (including out-of-school activities) should support and enhance a student's learning no matter the socio-economic status.

Defined Goals

Within this vision is a strong commitment to teach mathematics and science in ways that emphasize the relevance of the disciplines and engage students in developing thinking, reasoning, and problem-solving skills. Research shows that there are benefits of activities that connect two or more of the four STEM fields in meaningful ways. The goal of this project is to use the platform of after-school programing and take a hands-on approach with volunteers that includes pedological training and proper disposition towards service fragments as well as cultural competence training is to achieve an infusion of cultural competence values into daily practices. This project will require trainees to dispense stereotypes and negative connotations regarding different ethnic groups, and instead replace them with relevant, culturally based understanding and knowledge to build up the under reached youth in the Lawrence, MA area.

Our plan is to prepare non-formal educators, professionals as well as volunteers, to work in educational programs in communities outside the school system and will leave with an understanding of the importance of teaching STEM in meaningful ways.

Ultimate Goal – Bring Merrimack College to the forefront for after school-programing in STEM related activities that works with "at-risk" youth of Lawrence, MA.

Target Audience and Stakeholders

Due to the nature of this workshop, the ideal target audience would be the undergraduate volunteers that work with the Math and Science Program at Merrimack College in which offers after-school programs to youth in the local and surrounding communities. Youth in the Math and Science Program are also beneficiaries in results of this workshop as well as schools and parents.

Incentives for Engagement

Volunteers in the Merrimack College Science and Math program will gain knowledge and resources on how to engage youth in STEM activities more meaningfully. The incentive for this will be an improved volunteer experience, education experience, and professional development. There are no financial incentives for participating and the workshop will be highly encouraged for all volunteers.

Outreach Methods

We will reach out to the coordinator of the Math and Science Program at Merrimack College's Steven's Service Learning Center (SSLC) with the idea of the workshop and ask to use their platform for this workshop.

Once a date and time has been settled on, we will do outreach through the contact list from SSLC. This workshop will be mandatory for undergraduate volunteers who will be working with the Math and Science Program to attend as pre-service training.

Responsibility Chart

Name:	**Organization:**	**Responsibility:**	**Contact Info:**
Bailey Wagner	Merrimack College	Program Planner and Host	wagnerb@merrimack.edu
Katie Donell	Merrimack College	Coordinate volunteers that will be working with the Math and Science program and sites	donellk@merrimack.edu
Anne Gatling Cynthia Carlson	Merrimack College	Look over lesson plans that will be implemented in after-school program and ensure that they are and can be replicated easily	
Rosana Urbaez	Merrimack College/Hands to Help Site Supervisor	Assist in evaluations of Math and Science Program	urbaezr@merrimack.edu
Erika Proulx	Merrimack College	Assist with event coordination	proulxe@merrimack.edu

Tools and Measures to Assess Progress

To measure the impact of the workshop, I will begin the workshop with a discussion in order to compare what knowledge the participants had before they attend the workshop. During the workshop, we will breakout into groups and work through an activity and the groups will then report to the bigger group. The activity output will be captured for analysis as we will utilize the white boards in the room. At the end of the workshop, I will pass around a post-event evaluation which I will collect. Lastly, about a week after the workshop, when attendees have had time to digest the information received, I will send out another email survey with additional resources attached.

Implementation Timeline

Dates:	**Action:**
Oct 22 – Oct 26	• Reach out to SSLC
Oct 29 – Nov 2	• Meet with Katie Donnell
Dec 3 – Dec 7	• Select final lesson plan ideas for the program
Jan 7 – Jan 11	• Follow-up with Katie Donnell
Jan 14 – Jan 18	• Set up a meeting Katie Donnell
Jan 21 – Feb 8	• Settle on a date • Work on the curricula • Wait for undergraduate volunteer list to be finalized for semester
Feb 11 – Feb 15	• Send pre-survey to site supervisors
Feb 18 – March 1	• Host workshop
Feb 25 – March 4	• Math and Science Program begins at community partners
Apr 1 – Apr 12	• Midway check with site supervisors and volunteers • Send out post evaluation; ask if there is any clarification needed
Apr 1 – Apr 26	• Assess evaluation data

Logical Framework

I Will	Host a workshop to educate undergraduate volunteers on the importance of teaching STEM in meaningful ways and cultural competency around the "at-risk" youth population of Lawrence, MA
So That	They become better informed and find new ways to best work with the "at-risk" youth
So That	They push outside of their comfort zones to form bonds and relationships with the youth participants
So That	They can inspire and ignite young minds to think about STEM in different ways.
So That	The youth become more interested and intrigued with STEM education and career opportunities
So That	Youth get the spark they need to persist and continue / further their education in STEM
So That	The achievement gap gets smaller.

Methodology

Recognizing the need and opportunity for innovation and improvement to the Lawrence Math and Science after-school Program, this training workshop was designed for Merrimack College undergraduate volunteers working with STEM education and after-school programming. These workshops were designed using experiential education pedagogy to encourage a hands-on, interactive learning environment. The training workshops provided students the chance to advance their understanding of their own power and privilege that they hold and learn techniques to effectively engage K-12 learners in STEM education in the 21st century.

Participants

The workshop was conducted at Merrimack College. All participants were undergraduate students at Merrimack. According to college tuition compare, Merrimack College had 3,535 undergraduate students enrolled in the 2017-2018 school year. Approximately 51% are women, more over 75% of undergraduate students identify as white, while only 254 students enrolled at Merrimack identify as Hispanic. About 91.4% of the students enrolled at Merrimack are regular full-time students, regular being defined as non-transfer students. By age category, 32 students are younger than 18 and 7 students are older than 65. The school has 3,249 students aged under 25 and 351 students aged 25 and over.

The event was specifically marketed towards students who participate and volunteer with the Lawrence School District Math and Science Program. In partnerships with the Stevens Service Learning Center, the workshop was also advertised to other students who participate in youth-based service-learning through a varied amount of programs and classes that Merrimack offers their students. For those students who work with the Lawrence Math and Science Program, this workshop was mandatory for them to attend. All participants who were interested were able to take part in the workshop through the two different dates that were available. Students who attended the event had the opportunity to gain an hour and half worth of service to go towards any required service hours. All participant data was collected during the two workshops which were held on February 19, 2019 and February 21, 2019.

Materials

The study utilized two different materials for data collection including a landing spot for sticky notes and evaluation survey (see appendix A-C for all materials). The first material for data collection came from participant responses on a reflection wall. The white board on the side of the room served as a landing spot for sticky notes that reflected participants favorite lessons/activities they did when in elementary and middle school. This landing spot also served as space for participants to write down their favorite way to learn now. The posts acted as individual data sets that were later categorized by themes in effort to identify best practices when working with undergraduate student population.

The second data collection material was the evaluation survey that was handed out at the end of the workshop. The evaluation featured questions that measured the impact of hands on activities, educational components, and assessed the likelihood of using different approaches to engage youth in STEM activities.

Procedure

The trainings were held in a classroom in Crowe hall. Trainings began at 3:00 pm, where students were greeted to a classroom that was arranged into four pods, inclusive for group work and activities. As people arrived, they were encouraged to sit with friends and peers.

At 3:00 pm participants were greeted with the chance share their favorite academic activity they participated in as a kid, by writing it on a sticky note and posting it in the landing spot. This gave the opportunity for people to get up and move as well give the facilitator the opportunity the opportunity to ensure that each pod has an equal number of participants, and if needed to have people move without hassle. The sticky notes are an opportunity for facilitator to grasp an idea of learning styles that participants have.

The workshop started with facts of Lawrence, MA. the city in which participants of the workshop will be working. Followed by content of what after-school programming is, it's importunacy, and how it benefits marginalized youth. Specifically diving deep into academic enrichment programs and STEM.

At 3:20 pm the first activity was held (see Appendix B for lesson plan). In this activity participants worked in groups to protect their egg from 7ft drop. This activity had a classism lens to it, for each group was allotted a different amount of money that signify different socioeconomic levels. Each group was allotted a certain amount of money to spend at the "store" to buy materials that could help them protect their egg. Supplies included but not limited to bubble wrap, rubber bands, tape, tissue paper, notebook paper, stickers, etc. The activity allowed for each group to follow the engineering design process formula; identifying the issue, plan, create, test, communicate what went well and what they would have changed if they could. This activity was followed with reflection of what participants felt and thought as the activity was being conducted, these thoughts were taken in through notes taken by a volunteer.

After reflection from the activity participants were asked to write on a sticky note what they believed their learning style is, this sticky note was also placed on the landing spot. This was then guided into an open discussion about what ways people learn. This conversation lead to more content on the learning cycle and learning styles.

Around 4:00 pm we put to test the participants ideas on what their learning style was, with an activity where participants worked in groups and competed against other groups to build the tallest and sturdiest noodle tower. Each was given the same amount of spaghetti noodles and marshmallows, there were now rules to what participants could or couldn't do other than that they were not allowed to moisten the marshmallows to make them sticky. Participants were granted 8 minutes to build and after the 8 minutes passed, we measured each tower. If the two tallest towers were the same height, they were then tested by setting 10 pieces of paper on top. After each tower was measured and/or tested the facilitator asked the group a series of questions: "Who has had a direct experience with building a noodle tower and took action in the planning (activist), Who was the one that took in all the rules and was reviewing everything that was presented to the group (reflector), Who was the one who was looking to see what other teams were doing and concluding from that (theorist), Who in the group was the one constantly trying to plan for the next step and trying to stay ahead of the crowd (pragmatist).” The questions were intended to help direct participants towards a common learning style that represented their actions in the activity. Students were labeled as Activists; get involved, open-minded, Reflectors; gather info, tend to be cautious and thoughtful, Theorist; systems people, tend to be logical and look for connections, or a Pragmatist; apply theories, tend to like to improve things.

This conversation was followed with content of best practices of using youth’s learning styles to engage them in activities and teaching STEM in meaningful way. The training wrapped up around 4:30 pm with tips for the road and evaluations of the workshop.

Findings

STEM Ready conducted a training workshop in efforts to better prepare undergraduate volunteers for their service-learning placements of working with marginalized youth. Quantitative and qualitative data was collected by means of evaluation surveys and reflection wall. All data was classified into two categories; demographic and survey statement responses. All responses were largely positive and supportive of the established project questions.

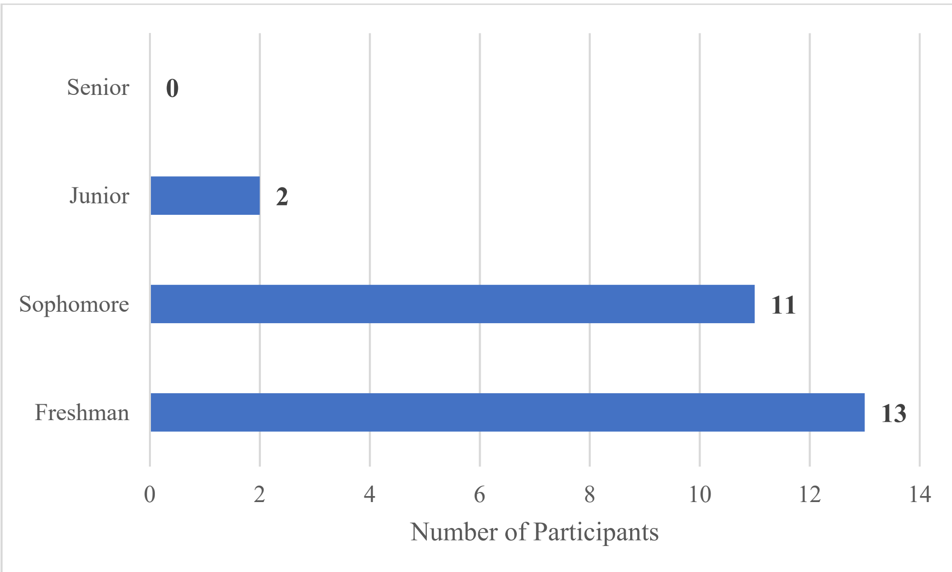
Demographics

On February 19, 2019 and February 21, 2019 there were a total of 32 attendees at the trainings. A total of twenty-nine participants completed the evaluation surveys resulting in a 90% response rate.

Participants were all under the age of 25 years old and represented Freshman, Sophomore, and Juniors in college. The largest group represented was “Freshman” which made up 50% of the respondents (n=13). Eleven participants identified themselves as “Sophomores”

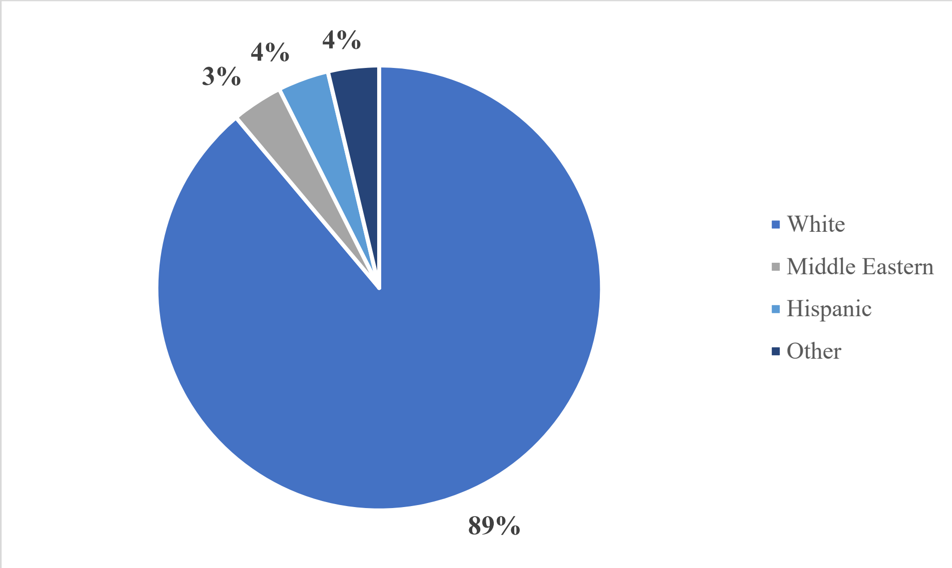
(42%). Only two participants identified themselves as "Juniors" making it the smallest age group represented (7.6%)

Figure 1: Participant Breakdown by Grade Level



Additionally, participants were asked to self-identify their race as one of the following options; Caucasian/White, Hispanic/Latino/Latina/Spanish Origin, Black/African American, Asian, American Indian/Alaskan Native, Middle Eastern/North African, Native Hawaiian/Pacific Islander, and/or other. Of the 29 participants who completed surveys, 26 responded to the race question resulting in an 89% response rate. Twenty-four participants identified as Caucasian/White representing 82% of those who completed surveys. One participant identified as White/Middle Eastern. Only one participant identified as Hispanic/Latino/Latina/Spanish Origin.

Figure 2: Participant Breakdown by Race

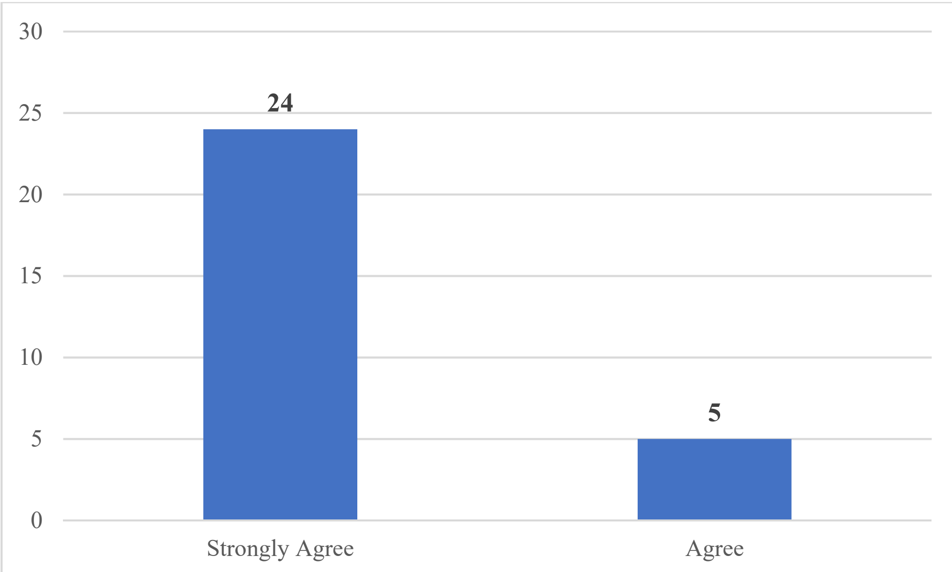


Survey Question Responses

Evaluation surveys asked participants to consider 12 statements measuring the appeal of experiential education, bringing STEM education to the table, and educational influence. Participants were asked to rate the intensity of agreement using the following scale: strongly agree, agree, disagree, strongly disagree. The responses of participants fell largely within the strongly agree or agree categories.

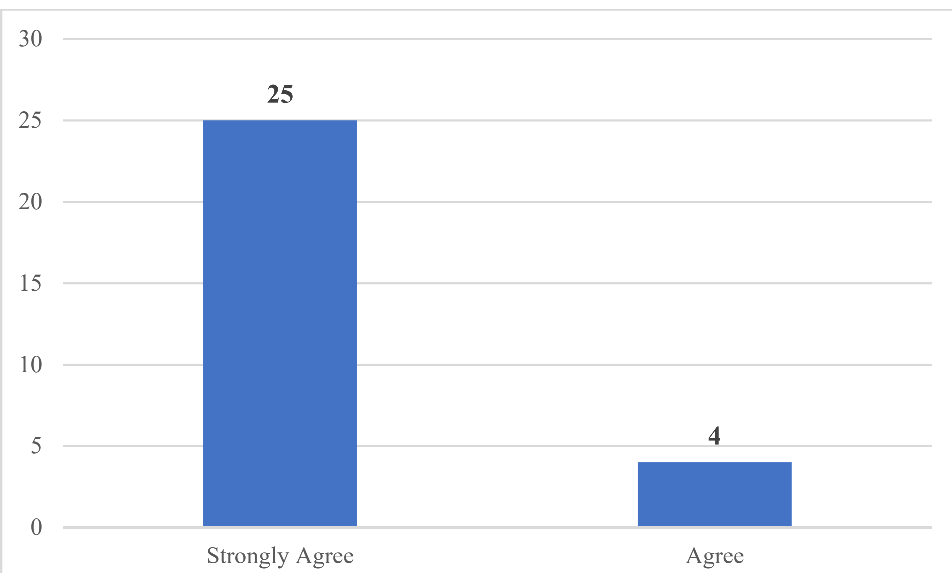
The second, third, sixth, eighth, ninth, and eleventh statements attempts to measure the allure of an experiential education training workshop and overall effectiveness of the workshop. The third statement reads, *"The content was relevant to me and my work"* twenty-nine people recorded responses to this statement. Twenty-four participants strongly agreed with that the workshop was relevant to their work, making up 83% of the responses. Five of the participants agreed with the statement, comprising 17% of responses.

Figure 3: "The content was relevant to me and my work"



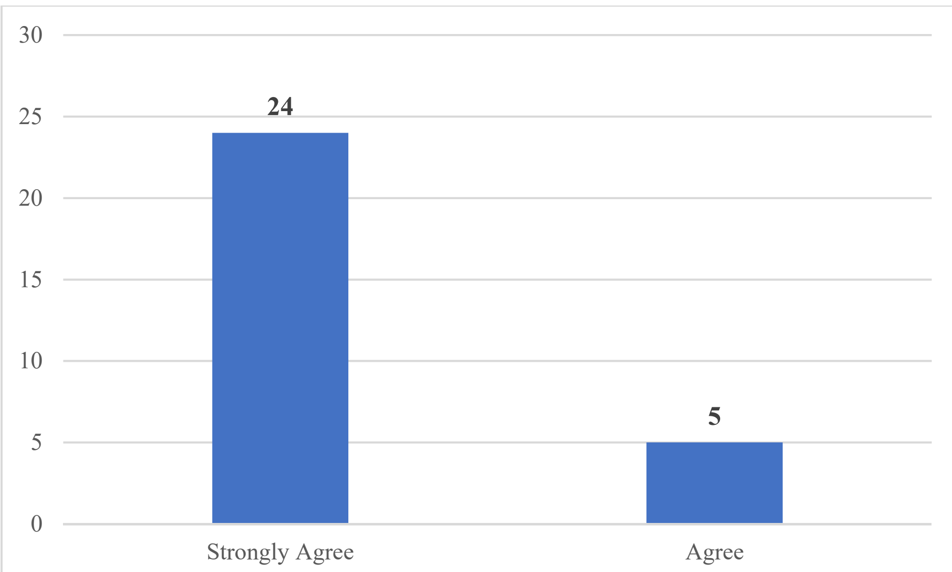
Very similar responses were recorded to the eighth evaluation statement which read, *"The activities made sense for the topic"* Twenty-five participants strongly agreed that they were inspired to find new ways, making up 86% of participants responses. Four participants agreed with the statement, comprising the remaining 14% of responses.

Figure 4: "The activities made sense for the topic"



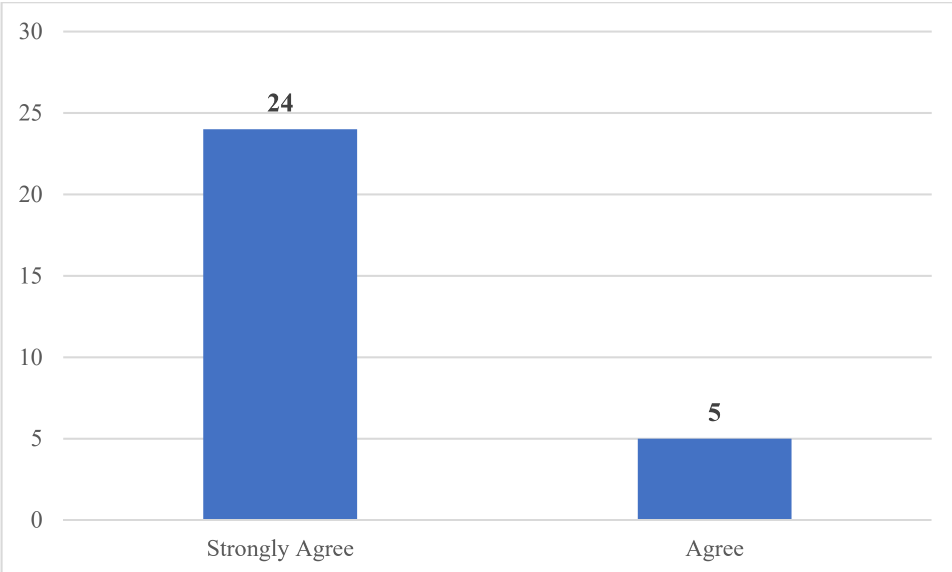
The fourth and fifth statements attempt to measure the use of bringing STEM to the table. Statement 5 reads *"The activities helped me better understand how youth engage in learning STEM?"* Of the total participants who completed evaluation surveys, twenty-four participants strongly agreed that the workshop successfully brought STEM into the discussion and activities; thus, 83% of the participants responded such. The other five participants agreed with the statement, comprising of the other 17%.

Figure 5: "The activities helped better understand how youth engage in learning STEM?"



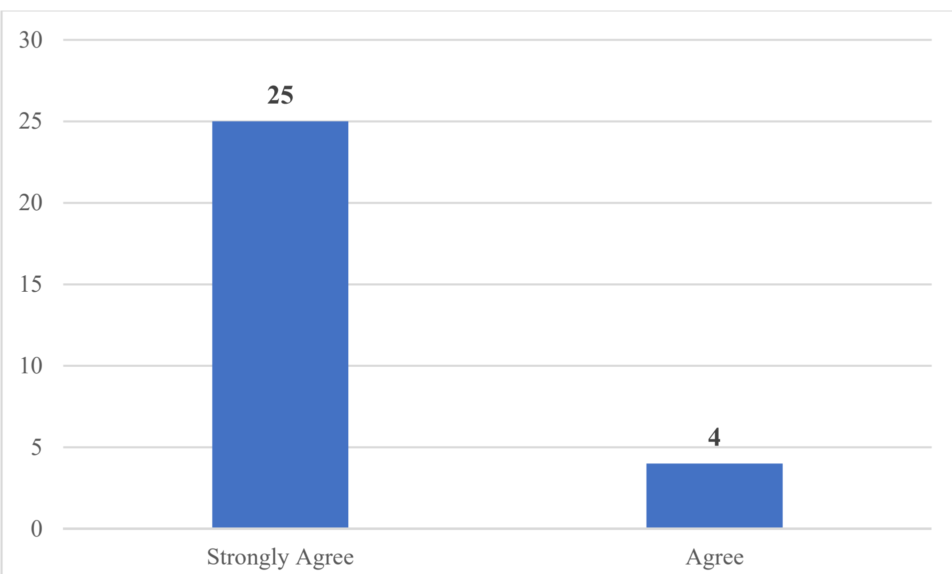
The seventh, tenth and twelve statements on the evaluation survey appraises the educational influence of the workshop. Every participant recorded responses to the three statements. The seventh statement read, *"As a result of this workshop, I now have a better understanding of how after school programs can be meaningful to youth?"* Twenty-four participants strongly agreed with the statement, making up 83% of those who completed responses. The remaining five participants agreed with the statement, thus comprising the other 17% of participant responses.

Figure 6: "As a result of this workshop, I now have a better understanding of how after school programs can be meaningful to youth?"



Comparable responses were recorded in the twelve statement, *"This workshop has inspired me to find new ways/activities to work with youth"* Twenty-five participants strongly agreed that they were inspired to find new ways, making up 86% of participants responses. Four participants agreed with the statement, comprising the remaining 14% of responses.

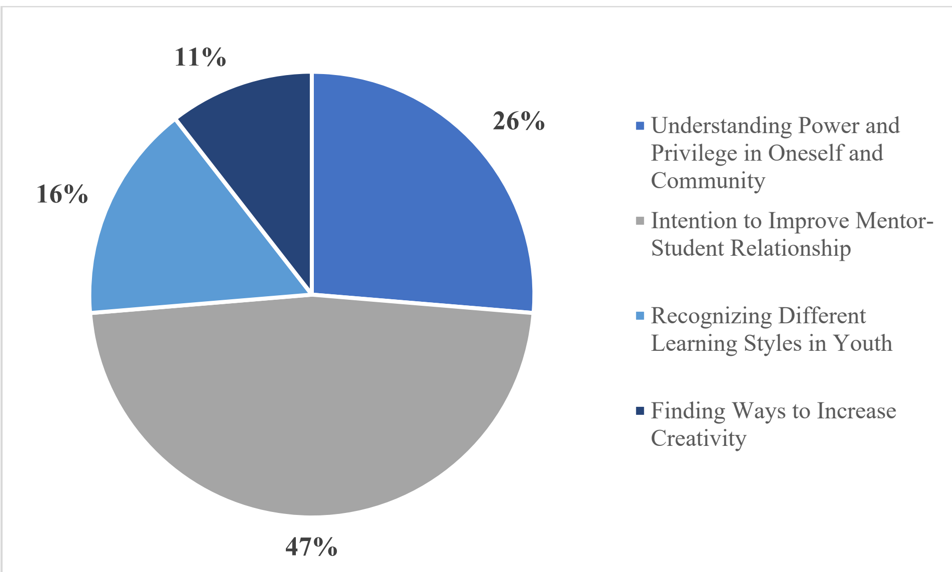
Figure 7: "This workshop has inspired me to find new ways/activities to work with youth"



Qualitative Responses

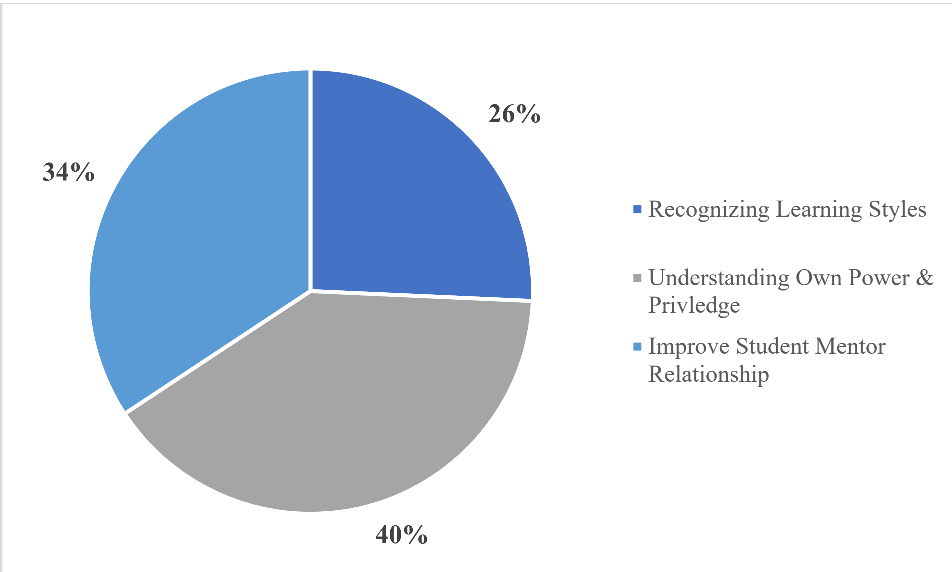
Participants were given the opportunity to share their responses to open-ended questions. All responses were mostly positive. Due to large collection of positive feedback, data was further sorted into three main categories for questions thirteen and fourteen on the evaluation, those categories being; understanding power and privilege in oneself and community, intention to improve mentor-student relationship, recognizing different learning styles in youth, and finding ways to increase creativity.

Figure 8: Participants Response Categories – Overall Themes



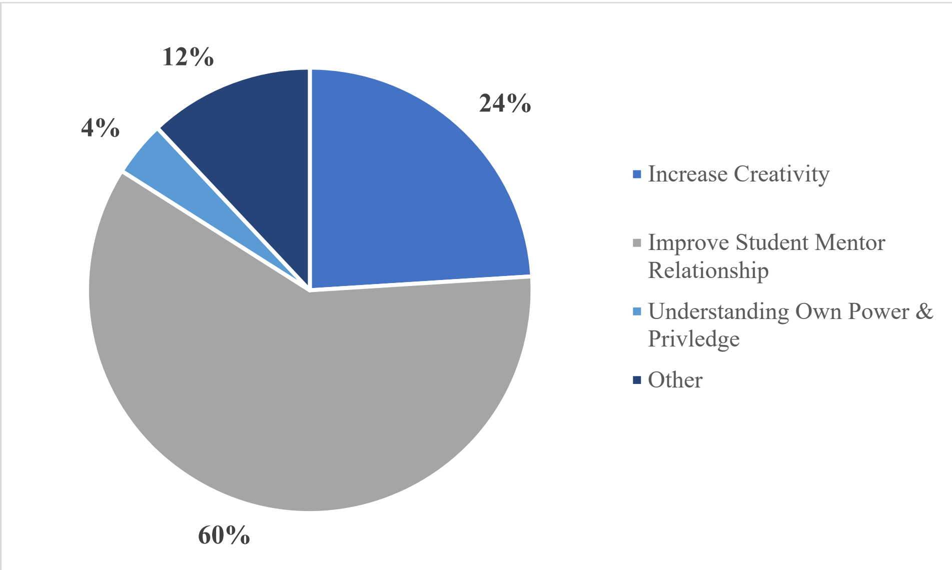
The thirteenth question on the evaluation survey read, *"What were the most valuable things you learned from today's workshop?"* and twenty-seven participants answered the question, comprising 93% return rate; it is important to note that some responses fell into two categories. Of those who answered this question 14 of those responses referred to understanding and recognizing power and privilege in themselves and in the community, resulting in 52% of the participants. 12 participants noted statements that acknowledged their intentions to improve mentor-student relationships with youth in which they work with, 44% of the participants who answered the question. 9 participants recognized that youth may have a different learning style themselves, resulting in 33% of the participants.

Figure 9: "What were the most valuable things you learned from today's workshop?"



Comparable responses were recorded in the fourteenth statement, *"As a result of attending this workshop, what do you think you will do differently in your future interactions with youth and STEM?"* Twenty-five participants responded to this question resulting in 86% return rate of those who completed the evaluation. 60% of (n=15) participants recorded a similar statement that stated their intentions to improve mentor-student relations. 6 participants acknowledged their intentions of finding new ways to increase creativity amongst the youth they work with, resulting in 24% of the participants who answered this question.

Figure 10: "As a result of attending this workshop, what do you think you will do differently in your future interactions with youth and STEM?"



In question 15 of the evaluation form it asked participants to name their preferred training style. Twenty-six participants responded to this question resulting in 90% return rate of those who completed the evaluation; it is important to note that some responses fell into two categories. The question read "*What is your preferred training style? How do you prefer to receive information?"* 17 participants recorded that they prefer a hands-on style, resulting in 65% of the participants who answered this question. 42% (n=11) participants recorded that they prefer visual learning. Remaining responses were categorized in 3 categories; theory (n=3), group work (n=2), and other (n=2).

Overall, the responses to evaluation statements were largely positive. There were a consistent number of participants who answered throughout the evaluation in the matrix. There was a digression in number of participants when it came to the questions that asked participants to fill in an answer. This could be due to fact that the majority of the fill in questions were on the back side of the evaluation, and the majority of those who didn't answer also didn't fill out information of their demographics.

Discussion

With the experiential education model in mind, the nearly 30 participants in the training had the opportunity to share their ideas on the project. Their observations, considerations, and recommendations for transforming STEM education through the application of learning sciences; culturally relevant, inclusive, and accessible learning experiences serve as the foundation for this project. This project attempted to demonstrate the need for volunteer preparation trainings amongst undergraduate students. Trainings that included pedological methods of STEM in meaningful ways and awareness of one's own culture needs to be balanced by sensitivity to the other cultures in communities utilizing the platform of after-school programing and experiential education approach with volunteers displaying the idea that we cannot teach ourselves anything in isolation; rather we learn "in community."

The findings suggest that experiential education approach to a volunteer training is an engaging approach to educating undergraduate students about the value after-school programming and their role as volunteers have on marginalized youth and communities. Furthermore, the findings imply that increased awareness and understanding of one's power and privilege and the role it plays in society. Participants strongly agreed that the workshop made them better informed. Furthermore, the findings imply that increased awareness and understanding of one's power and privilege and the role it plays in society provoked people to act in their future relationships with youth.

In the assessment of the effectiveness of this workshop in building relationships and working with youth, the findings suggest that this workshop was effective. Responses to the survey used words such as, "meaningful", "whole-heartedly", and "continuously". This aligns with Bronfenbrenner's theory on youth development and how relationships with others are most beneficial when they are regular, enduring, and reciprocal. (Hamilton, 2004).

Many participants commented that the hands-on approach encouraged them to push the boundaries of their bias about the community and youth in which they work with (Lawrence, MA) that existed before. As one participant commented in a reflection from an activity, "This activity was a great parallel; we were all concerned with competing and making sure our group won the challenge that we did not even worry about the other groups and the barriers that they were facing. Before, I would've never considered some factors to affect the way a student learns, interacts with others, or moves throughout their day, but now I realize what all goes into and affects a person's development." This aligns with Bronfenbrenner's ecological perspective provides solid theoretical grounding for a range of youth development principles, in particular, the importance of engagement in challenging activities and supportive relationships (Hamilton, 2004). This isn't to imply that everyone is the same. Rather, it is to foster relative understanding that our histories, experiences, and journeys are dynamic and often complicated. Experiential education and hands-on activities are a mechanism that allows people to accept this and find commonality amongst diversity.

Limitations

The findings of this workshop addressed the original project questions and supported the research that it was founded on. Despite this, there were limitations in the execution of the workshop that potentially impacted the quality of the findings. The first limitation presented with recruitment to the workshop. The workshop was highly encouraged but not mandatory for those who have a role in the Math and Science Program, with it not being required amongst undergraduate students many had little to no desire to actually attend. Moving forward, there should be careful consideration of whether implementing a mandatory workshop for undergraduate students who volunteer in youth development is of importance.

Implications

Apart from the challenges that after-school programs face, they are all consistently offering a unique approach and opportunity for education as previously described in the literature and theoretical framework of STEM Ready. Some after school programs are demonstrating that they can have a huge impact on academic performance in several ways, including moving the needle on academic achievement test scores. Utilizing this setting the Math and Science Program can continue to be beneficiary to the community in which they serve if these questions can be answered; how can after-school enrichment programs address the increasing ethnic and cultural diversity in the United States? Program leaders need to consider how to adapt their program to make it culturally relevant to the youth and families they serve. In the future it would be beneficial to invite the input of a diverse group of policymakers, funders, philanthropic organizations, nonprofits, researchers, practitioners, and community leaders in the development and ongoing refinement of a local vision for STEM education. Working together, within their local contexts, these stakeholders must come together to identify their goal for transforming STEM education; where there are biases in the system that differentially affect student participation and pathways, and local strengths that are key leverage points in meeting the diversity of their student's needs.

Moreover, the results of this workshop have significant implications to the larger field of research. The results imply that experiential education and hands-on learning, specifically, encourages people to reflect on their actions and move forward. This raises questions about the power of action based social justice education. How do we present communities with educational engagement opportunities that set them up to take action that is intentional and impactful? In what ways can we create space to process information that will allow people to engage with awareness of their own role in oppressive systems? The strength of this correlation cannot be determined by the results of a singular event. The community engagement field should continue to explore the correlation, as action is the movement necessary for social change which is imperative in the development of more inclusive and just communities. This project is meant only as a starting point for change, a foundation upon which a stronger evidence base for the approaches and experiences that work best in particular contexts and to serve and effectively engage diverse learners can be built.

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Addendum A: Agenda

3:00
- Intro of who I am
  - Reason for this training

3:05
- Ice Breaker - Write it on a sticky note and put it on the board.
  - What was their favorite science lesson as kid?

3:10
- Content
  - After-school programming
    - It's importantance for margenilized youth

3:20
- Protect the Egg Activity with Classim Lens
- Reflect

3:45
- Discussion
  - What ways people learn

3:50
- Content
  - Learning Styles

4:00
- Noodle Towers Activity
- Reflect

4:15
- Content
  - Using Learning Styles to engage youth
    - Teaching STEM in Meaningful ways

4:30
- Wrap up/Tips for the Road
- Evalutions

Addendum B: Protect the Egg Activity with Classism Lens Lesson Plan

In this activity students will use the engineering design process with in their 4 groups to design, build and test a prototype egg catcher. Each group is assigned a number which will indicate the order of when you can purchase materials from the store and then given a certain amount of money to spend on the materials. Unknowing to the groups, each group represents a different socioeconomic level.

Materials

Items for groups

- 4 Index cards or Paper with predetermined order and amount of money they can spend
- Egg

Items to be used for Egg

- Bubble wrap
- Plastic cups
- Rolls of tape
- Rolls of string
- Stickers
- Tissue paper
- Paper
- Rubber bands

Items that are useful

Tarp or tub to perform egg drop

Step Stool

Things to Have Prepared

Envelopes

- Envelope 1: Upper-Class
    - $150 to represent the $150,000 + income
- Envelope 2: Middle-Class
    - $100 to represent the $45,000 - $140,000 income

- Envelope 3: Middle-Class
    - $100 to represent the $45,000 - $140,000 income
- Envelope 4: Low-Income
    - $25 to represent the $20,000 - $45,000 income

Activity

Rules

1. Don't converse with other groups. Keep the card, your budget, and your plan within your group.
2. You have only the amount in your envelope to spend
3. You will have 2 minutes to plan then you have 1 minute to spend your money in the order on your card.
4. You can only purchase materials in the order numbered on your card.
5. You can start once you get back to your table once you have your materials.

- Allow the students to work for 5-7 minutes start timer once the last group gets back from the "store" with their materials
    - This will also help show classism and privilege
- Test the prototype by dropping an egg from pre-agreed height
- After testing all the designs, discussion/reflection questions

Facilitator hints:

- Facilitator should be the "chicken" and preform the drop
- Designs can be placed in a tub lined with a plastic bag for easy clean-up
- Dropping on concrete or tiled floor is best. Carpeting tends to "cushion" the fall of the egg creating a multitude of successful designs.

Protect the Egg Activity

Rules:

- Don't converse with other groups. Keep the card, your budget, and your plan within your group.
- You have only the amount in your envelope to spend
- You will have 2 minutes to plan then you have 1 minute to spend your money in the order on your card.
- You can only purchase materials in the order numbered on your card.

Materials	**Price**
1 sheet of bubble wrap	$20
1 plastic cup	$15
1 roll of tape	$5
1 roll of string	$3
3 stickers	$2
1 sheet of tissue paper	$2
1 sheet of binder paper	$1
1 rubber bands	$1

Addendum C: Evaluation Survey

Thank you for participating in the Volunteer Training Workshop. This post-event evaluation is being conducted as part of a student research capstone. The purpose of this evaluation is to gain your thoughts and opinions on the workshop. This evaluation should take no more than 5 minutes to complete. Please **DO NOT** write your name on the evaluation and all answers provided will be kept confidential.

First, please tell us your thoughts about the workshop:

1. Overall, how would you rate this workshop?
   ◯ Excellent ◯ Good ◯ Fair ◯ Poor

	Strongly Agree	Agree	Disagree	Strongly Disagree
2. The goals of the workshop were clear to me	◯	◯	◯	◯
3. The content was relevant to me and my work	◯	◯	◯	◯
4. The activities helped me understand STEM better	◯	◯	◯	◯
5. The activities helped me better understand how youth engage in learning STEM	◯	◯	◯	◯
6. The discussions stayed on track with the theme	◯	◯	◯	◯
7. As a result of this workshop, I now have a better understanding of how after school programs can be meaningful to youth	◯	◯	◯	◯
8. The activities made sense for the topic	◯	◯	◯	◯
9. The activities were inspiring to me	◯	◯	◯	◯
10. The activities made me think about an interaction I had with youth prior to the workshop	◯	◯	◯	◯
11. This workshop has made me better informed	◯	◯	◯	◯
12. This workshop has inspired me to find new ways/activities to work with youth	◯	◯	◯	◯

13. What were the most valuable things you learned from today's workshop?

____

14. As a result of attending this workshop, what do you think you will do differently in your future interactions with youth and STEM?

____

15. What is your preferred training style? How do you prefer to receive information?

____

16. How could the workshop be improved?

____

Finally, please tell us a little bit about yourself:

17. What is year are you in school?

◯ Freshman ◯ Sophomore ◯ Junior ◯ Senior

18. What is your age?

◯ Under 25
◯ 25-34
◯ 35-44
◯ 45-54
◯ 55 and older

19. How do you define your gender? *Check all that apply.*

☐ Male
☐ Female
☐ Trans or Non-binary
☐ Other: ____

20. Which categories describe you? *Check all that apply.*

☐ Caucasian / White
☐ Hispanic / Latino / Latina / Spanish Origin
☐ Black / African American
☐ Asian
☐ American Indian / Alaskan Native
☐ Middle Eastern / North African
☐ Native Hawaiian / Pacific Islander
☐ Other (not listed)

Thank you for taking the time to participate in this post-event evaluation. Your responses will help our research and give us insight into developing and promoting future workshops. Please put your completed evaluation in the designated spot.