EXPLORING HIGH SCHOOL STUDENTS' PARTICIPATION IN A GEAR UP AFTERSCHOOL PROGRAM

by

Brooke Marie Stafford

A Thesis

Submitted to the Faculty of Purdue University

In Partial Fulfillment of the Requirements for the degree of

Master of Science

Department of Agricultural Sciences Education and Communication

West Lafayette, Indiana

December 2021

THE PURDUE UNIVERSITY GRADUATE SCHOOL
STATEMENT OF COMMITTEE APPROVAL

Dr. Levon T. Esters, Chair

Department of Agricultural Sciences Education and Communication

Dr. Virginia Bolshakova

Department of Curriculum and Instruction

Dr. Neil Knobloch

Department of Agricultural Sciences Education and Communication

Approved by:

Dr. Mark A. Russell

In dedication to my husband and parents. I am forever grateful for your unwavering love and support through the ups and downs of life.

ACKNOWLEDGMENTS

There are numerous individuals who have been a source of encouragement, support, and guidance throughout my time in graduate school. Thank you all for the role you have played in getting me to this moment! Your kindness has not been overlooked.

I would first like to extend my sincerest thanks to my husband, Ben, for always believing in me and providing unconditional love. I am so grateful for the pep talks when I was feeling down and the many meals you cooked during late nights of schoolwork. I can't thank you enough for being by my side every step of the way.

Thank you to my parents and family who cheered me on when I decided I wanted to go to graduate school. I appreciate your constant support and always answering my phone calls and texts to keep me up to date on things going on back home.

Many thanks to my wonderful graduate school friends, new and old, who related to the struggles and triumphs of graduate school in ways only fellow graduate students would understand. Sarah, we have been through our undergraduate and now graduate years together. I am grateful for your continuous encouragement and our many crafting study breaks. You are a true friend, and I am excited to see where life takes you! Melissia, thank you for always finding time to chat and catch up on what has been going on in life. To Dr. Esters' grad student group, thank you all for being both friends and mentors guiding me through the graduate school adventure. From going on nature hikes to listening to Crime Junkie on the drives to Indy, some of my fondest memories over the past two years have been with our group!

My sincere gratitude to Dr. Esters, for serving as my advisor, mentor, and friend. Thank you for encouraging me to be the best version of myself and also letting me know when my writing could use a little work. I am grateful for the many opportunities you provided through the M.A.L.T.S., M@P, and M.E.N.T.O.R. programs and for always checking in how I was doing before discussing research. You are amazing!

To my committee members, Dr. Bolshakova and Dr. Knobloch, I appreciate your support, guidance, and feedback through each step of the thesis process. Dr. Bolshakova, I had no idea that I would gain such a wonderful friend when I first asked you to serve on my committee. Thank you for bringing a new perspective to this research project from your experience with GEAR UP. Also, thank you for allowing me to spend time with your sweet cat, Belle, when I missed my own. Dr.

Knobloch, I appreciate your support in framing and focusing my research into one cohesive idea and for finding a way to incorporate my love for pigs into our conversations. Thank you for encouraging me, especially in RDSS, to think outside the box and take a fresh look at how I could continually improve my study.

I want to express my gratitude to GEAR UP for allowing me to use your data in this thesis. Without you, this would not have been possible! Also, many thanks to Purdue Extension for offering me the tremendous opportunity to work in the local agriculture community during my graduate assistantship.

Finally, many thanks to Dr. Russell, Jenny, Craig, Richard, and all those in the ASEC department who were constantly there to answer my countless questions and keep me on the path to graduation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

In-school interactions between afterschool educators and high school youth can increase youth participation in afterschool programs. As a result of participation, afterschool programs may offer a range of academic, social, and emotional outcomes to support positive youth development and prepare high school students for post-secondary education. However, high school youth have the lowest afterschool participation rates of any age group due to competing interests such as home responsibilities, jobs, tougher academic courses, and other extracurricular activities (Afterschool Alliance, 2020). Previous research indicates repeated positive adult-youth interactions lead to the development of relationships that support the needs of the youth (Rhodes, 2002). If afterschool educators and youth have positive interactions during the school day, youth may be more likely to attend afterschool to seek academic assistance and further develop a mentoring relationship with the afterschool educator. Additionally, continuous youth afterschool participation can be shaped by the afterschool physical learning environment and an afterschool educator's self-efficacy, beliefs, and behaviors due to their impacts on the youth's afterschool experience. Therefore, this study investigated the in-school and afterschool factors predicting high school youth participation in a GEAR UP afterschool program.

The purpose of this study was to explain and predict high school student participation in a Midwestern state GEAR UP afterschool program based on the in-school adult-youth interactions, afterschool physical environment, and afterschool educator self-efficacy, behaviors, and beliefs. Participants of this study included 9th and 10th grade youth enrolled in a GEAR UP school (N = 6767) as well as GEAR UP afterschool program regional directors and building coordinators (N = 18). Quantitative data for youth participants was collected from GEAR UP database records regarding measures of in-school adult-youth interactions and afterschool participation. Quantitative data for afterschool educators was collected using a web-based survey, which gathered information about the afterschool physical learning environment and the educator's self-efficacy, beliefs, and behaviors during the afterschool program. The data was analyzed using descriptive statistics, correlations, multiple regression analysis, and inferential statistical tests.

There were five conclusions for this study. First, afterschool educators were somewhat self-efficacious, believed STEM education to be very important, demonstrated STEM behaviors occasionally, and agreed the afterschool physical learning environment was suitable. Second, free

and reduced lunch status; educator behaviors; one-on-one instruction; and counseling, advising, and academic planning predicted 5.3% variance in high school student afterschool participation. Third, individualized adult-youth interactions were positively related to afterschool participation. Fourth, youth afterschool participants reported greater hours of one-on-one instruction than nonparticipants, and nonparticipants reported greater hours of counseling, advising, and academic planning than participants. Fifth, youth afterschool participation rates and hours spent in afterschool program activities varied at the school level. Recommendations for future research, implications for theory, and practical applications for afterschool educators, afterschool program developers, and school administrators were discussed.

CHAPTER 1. INTRODUCTION

1.1 Introduction

In order to carryout successful afterschool programming, afterschool educators should adapt the learning environment to the needs of the youth in the program. A byproduct of alignment among the youth, afterschool educators, and learning environment means that youth have the opportunity to develop life skills and advance academically through consistent participation in afterschool programs (Lauer et al., 2006; Tichavakunda, 2019). The hands-on and exploratory pursuits offered in afterschool programs allow youth to become involved in non-formal learning to extend their personal development beyond the classroom.

In afterschool, adult educators serve a primary role in fostering youth engagement through their involvement, interactions, and the enrichment activities (Rhodes, 2004). Afterschool educators are responsible for delivering learning activities, which youth can accomplish during afterschool programs. However, the physical learning environment may present challenges for the afterschool educator when they have little control over how the afterschool space is arranged. Afterschool educators must be resourceful in using the materials available within the afterschool space to present a learning environment, which fosters positive youth development. For youth engagement to flourish during afterschool activities, educators must provide both youth autonomy and independence as well as consistent one-on-one and whole group adult-youth interactions (Eccles et al., 1993; Rhodes & Dubois, 2006). Additionally, the self-efficacy, beliefs, and behaviors enacted by the afterschool educator impacts program quality (Zee & Koomen, 2016). Educators with higher self-efficacy, beliefs, motivations, and goal setting abilities provide more valuable instruction and enrichment for youth (Künsting et al., 2016). When alignment exists among the afterschool educator, youth, and the learning environment, afterschool programs provide a context where youth and adult educator engagement come together for beneficial youth outcomes.

1.1.1 Overview of Afterschool Programs and Participation

Afterschool programs are community or educational based programs for youth, which offer a safe environment for organized learning activities occurring beyond the classroom (Lauer et al.,

2006). Effective afterschool programs encourage positive youth development through character building, interpersonal relationships, and positive activities (Lerner et al., 2005). Moreover, afterschool programs provide a space where youth can have adult supervision and productively use out-of-school hours. Due to the advantages for youth and parents, the demand for afterschool programs has grown in recent years. According to a study by the Afterschool Alliance (2020), 50% of youth without access to an afterschool program would participate if a program were offered in their area. Academic assistance, tutoring, community service, environment and conservation, liberal arts, and STEM are many of the common topics offered in afterschool programs (Princiotta & Fortune, 2009). Youth can also receive guidance in learning difficult school material, explore new interests, and develop life skills and proficiencies through afterschool programs.

Participation in afterschool programs, as compared to parental or non-parental supervision following the school day, provides benefits for youth academically, socially, and personally (Mahoney et al., 2005*b*). Youth in educational afterschool programs have higher academic skills, standardized test scores, and academic performance in subjects such as mathematics, science, and reading (Bae et al., 2019; Capella et al., 2018; Lee et al., 2017; Vandell et al., 2007). Afterschool programs help youth develop confidence in difficult subjects through achievable activities. For example, STEM afterschool programs empower youth to complete STEM activities which increases STEM career interest and STEM perceptions (Donmez 2021; Altan et al., 2019; Price et al., 2019). Beyond academic benefits, afterschool programs are a valuable resource to develop social competencies and non-cognitive skills. The interactive nature of afterschool programming promotes the development of social skills, self-awareness, and self-regulation in youth (Murray & Cousens, 2020). Simply, the outcomes from participation in afterschool programs are advantageous for youth in school, home life, and future endeavors.

1.1.2 GEAR UP

Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP) is a grant-funded program offered through the United States Department of Education developed to "increase the number of low-income students who are prepared to enter and succeed in postsecondary education" (ED, 2021b, Program Description). A multi-disciplinary approach to college readiness is encouraged by GEAR UP through a combination of mentoring, tutoring, college financial planning, STEM programming, career exploration, and scholarships. GEAR UP

ensures low-income students receive educational support by requiring GEAR UP schools to have, at a minimum, 50% of the student population qualified for free or reduced-price lunch (ED, 2021a). To provide a quality educational experience for students, the grant limits the number of grade levels included in the program at one time. Typically, educational programs and GEAR UP support is offered to a cohort of students from low-income schools beginning on or before seventh grade and spanning until one year after high school graduation (ED, 2021a). In this Midwestern state, GEAR UP is offered to youth at nine school districts (12 middle schools and 11 high schools) beginning in sixth or seventh grade and follows the same cohort of two grades into their first year of postsecondary education.

The GEAR UP grants are provided by the U.S. Department of Education at statewide or partnership levels for up to $5 million in funding each year (ED, 2021a; ED, 2021b). At the state level, there is only one GEAR UP grant available per state. The GEAR UP program included in this study is funded by a state-level grant which began in 2016. While the types of programming and number of youth involved vary among states, the general structure remains the same. In this Midwestern state, GEAR UP delivers in-school and afterschool academic support, STEM and college and career readiness programs, scholarship preparation, financial planning workshops, college tours, and career interest assessments.

1.1.3 Adult-Youth Interactions

Interactions between adults and youth in educational settings can positively or negatively impact youth depending on the context of the interactions. Supportive and effective adult-youth interactions lead to positive youth development in emotional, social, and behavioral capacities (DuBois et al., 2011). In turn, gains in emotional, social, and behavioral outcomes lead to improvements in other aspects of the youth's life. Youth are more likely to be engaged in school activities, hold positive beliefs about education related capabilities, and participate in activities mutually enjoyed by the adult role model and the youth (Azine & Singh, 2019; Herrera et al., 2012; Parra et al., 2002)

The perception of authority in youth interactions with adults can become a hindrance to the adult-youth relationship. For example, in formal educational settings, youth view adults as possessing significant power and authority over them limiting youth autonomy and voice (Deutsch & Jones, 2008). Youth may view these interactions with teachers as one-sided and impersonal

which may prevent them from seeking out further interactions with teachers. However, Deutsch and Jones (2008) found that youth partaking in informal educational activities, such as afterschool programs or clubs, were more likely to have bi-directional relationships with program educators and responded to their authority differently than when interacting with formal educators. With informal program educators, youth are more likely to feel heard and respected leading to positive interactions. However, some informal educators still exhibit control and authority over youth through subtle behaviors (Messias et al., 2005). GEAR UP strives to provide an environment where GEAR UP educators guide and prepare youth for post-secondary education but also give youth autonomy to learn through a variety of experiences. The challenge faced by GEAR UP educators is in providing educational programs for formal classrooms and informal afterschool programs while building upon their relationships with youth in both educational contexts. Regardless of educational setting, adult educators can promote positive youth development and engage in repeated positive interactions with youth by deemphasizing the role of authority in their relationship, connecting over interests held by adult and youth, and consistently seeking out interactions with the youth (Jones & Deutsch, 2011; Rhodes & Dubois, 2006).

1.1.4 Physical Learning Environments

Physical learning environments of schools are the various environments found throughout a school which can be used as spaces for learning such as buildings, room layouts, and structures (i.e., furniture and equipment) (Baars et al., 2020). Schools aim to provide environments conducive for learning across subjects, age ranges, and programs through the arrangement of spaces and structures. The physical learning environment is comprised of three components: naturalness, individualization, and stimulation (Baars et al., 2020). *Naturalness* includes the available lighting, audio quality, air conditions, and temperature while stimulation covers the visual aspects of the space, such as color (Barrett et al., 2015). These two components are perceived through the senses by individuals experiencing the physical learning environment. *Individualization* is the flexibility of the space to be modified based on need (Barrett et al., 2015). In schools, individualization of the physical learning environment addresses the degree to which the space is personalized for youth and meets the needs for the activities or programs taking place. Afterschool programs conducted in school settings often have little control over the physical learning environment and must operate with the classroom space and structures made available. Youth attending afterschool

programs in schools often carry over negative associations of the school day into afterschool and have difficulty separating in-school and afterschool program expectations (Polman, 2003). Afterschool educators teaching in school physical learning environments are challenged with presenting informal educational programming in a formal education setting while overcoming negative stigmas, inadequate space, and insufficient classroom structures.

The physical learning environment of educational spaces impacts the teaching style of the educator, learning activities, and youth outcomes (Baars et al., 2020). The availability of furniture (i.e., desks and tables) limits student arrangement to individual or group seating. Spaces designed to promote collaborative learning where students can sit in groups increase student engagement through interactions with peers and an enhanced sense of belonging (Matthews et al., 2011). Technology, another aspect of the physical learning environment, has become a useful tool for expanding educational opportunities. Students in technology-enhanced physical learning environments have greater perceptions of their educational experiences and academically outpace students in traditional learning environments (Brooks, 2011; Byers & Imms, 2016). While the physical learning environment is a salient component of learning, it does not solely influence youth outcomes. The educator, along with their self-efficacy and abilities to use the available educational space, play a role in the efficacy of the space, resources, and technology for students (Byers et al., 2018). Thus, the educator's use of the physical learning environment may hinder or help student learning depending on the alignment of the physical learning environment, teaching style, and learning material.

1.2 Problem Statement

Afterschool programs are created as a place for youth to receive academic support, explore educational interests, and develop social and personal competencies outside the formal classroom (Durlak et al., 2010). In addition, afterschool programs provide adult guidance and a safe space for youth during the hours following the school day. Beneficial outcomes are evident for youth who regularly attend successful afterschool programs such as gains in knowledge of academic content, academic motivations, 21st century skills, and career interests (Chittum et al., 2017; Cohen et al., 2019; Cutucache et al., 2018; Dabney et al., 2012). Unfortunately, participation in afterschool programs significantly decreases as youth progress from elementary to secondary school (Afterschool Alliance, 2020). While participation benefits have been reported extensively,

little is known about what predicts afterschool youth participation. Further, there is limited research on the role of the interaction between the afterschool educator and youth in regard to youths' decision to participate in afterschool programs. There is also limited information regarding high school students in afterschool programs. Without understanding what draws older youth to participate, afterschool programs will continue to see diminished attendance at the high school level. The present study examines whether relationships exist between youth participation in a high school afterschool program and components of the afterschool program, such as the in-school adult-youth interactions, for a more informed understanding of youth participation in afterschool programs.

1.3 Significance

This study is significant for five reasons: 1) it informs educators of factors which prompt youth participation in afterschool programs and opportunities to enhance youth interactions with STEM to advance the future STEM workforce; 2) it emphasizes the importance of physical learning environments suitable for out-of-school college and career readiness programs and out-of-school STEM learning; 3) it informs the creation of professional development trainings for afterschool educators; 4) it directs teachers and administration on the importance of in-school adult mentorship beyond the classroom; and 5) it advises educational policy on the value of funding out-of-school STEM programming.

1.3.1 Inform Afterschool Educators

First, this study can inform afterschool educators of factors which lead to youth participation in afterschool programs as well as available opportunities to advance the future STEM workforce through the enhancement of youth interactions with STEM. Participation in afterschool programs continually declines as youth get older due to increased opportunities for extra-curricular hobbies, sports, clubs, and parental approval of self-care (Afterschool Alliance, 2009*b*). In 2020, only 11% of high school students regularly attended afterschool as compared to 18% of elementary aged students (Afterschool Alliance, 2020). Through understanding the factors which contribute to greater participation by high school students, afterschool educators can tailor their programs to meet the needs, activities, and environments desired by youth for increased program attendance.

Further, increased participation in afterschool provides enhanced opportunities for positive interactions with STEM-based activities. In recent decades, there has been a lack of student interest for a future in STEM careers and decreased retention of individuals within STEM (President's Council, 2010; Lowell et al., 2009). Without consistent exposure to STEM beyond the classroom, youth interest in pursuing STEM careers may continue to decline. The information obtained in this study can assist in identifying youth motivations for attending afterschool programs and recognizing opportunities for cultivating deeper connections through the programs with topics such as STEM.

1.3.2 Emphasize Importance of Physical Learning Environments

This study can call attention to the importance of suitable physical learning environments for out-of-school learning and college and career readiness programs. Physical learning environments best suited for education occurring out-of-school may be different than physical learning environments made available during the school day due to the project-based teaching methods and hands-on, collaborative learning activities typically used in out-of-school programs. The physical learning environment affects student experiences, emotions, and abilities to learn in out-of-school programs. According to Marchand et al. (2014), students report negative moods, decreased perceptions, and less learning when they encounter uncomfortable physical learning environments. Students with bad experiences or poor perceptions of learning environments within an out-of-school program are less likely to attend future events and will not receive future benefits offered by the programs. Thus, the physical learning environment must provide a comfortable and suitable space for youth to have a positive learning experience and interest in attending future out-of-school programs. The information obtained in this study can highlight features of physical learning environments in out-of-school college and career readiness programs and STEM programs which are best suited for students and lead to increased participation in the respective programs.

1.3.3 Inform Creation of Professional Development Trainings

The information gained in this study can inform afterschool program directors in the creation of new professional development trainings specialized for afterschool educators.

Professional development trainings provide platforms for educators to further their teaching expertise. Without effective professional development centered around the student learner needs, educators cannot expand upon their proficiencies (Mizell, 2010). Thus, professional development trainings concentrated on skills required of afterschool educators can assist educators in developing new competencies and confidence for supporting youth attending afterschool programs. The knowledge obtained through this study can guide the formation of professional development trainings which can lead to effective behaviors by afterschool educators and more successful afterschool programs.

1.3.4 Role of Mentorship and Adult-Youth Relationships

This study can direct teachers and school administrators on the salience of adult-youth relationships taking place in school and the impacts in-school mentoring may have on youth attendance in afterschool learning activities. The classroom provides a space for educators to build relationships with students to support and encourage positive youth development. Mentoring relationships cultivate social, academic, and personal identity which may foster youth involvement in new school-based or hobby-based activities (DuBois et al., 2011). The mentorship can shape activities students become interested in and may guide students to participate in educational programs occurring outside of school. Consequently, it is important to know to what extent in-school mentoring impacts a student's decision to further their learning in afterschool programs. During the course of this study, teachers and school administrators may better understand how much time must be spent in building the adult-youth relationship at school for students to make the decision to attend afterschool programs. The study also compares mentoring in group settings and in one-on-one settings which may lead to more successful youth mentoring practices by educators.

1.3.5 Advise Educational Policy

The knowledge gained from this study can assist policymakers in making informed decisions regarding the value of supporting out-of-school and afterschool educational programs. With tighter budgets and funding cuts at the state and federal levels, policymakers must carefully choose where funding is directed. Often, previously established in-school expenses are supported

and policies involving out-of-school education fall to the wayside. However, according to Allen et al. (2019), afterschool programs supplement classroom learning in which students who attend afterschool develop 21st century skills and have a greater knowledge of future careers in subjects such as STEM. Afterschool programming provides a space for youth to further their education and cultivate new skills. The researcher of the study will examine key factors leading to youth attendance in afterschool programs. Increased attendance frequency in afterschool programs can provide youth with enhanced learning and can lead to deeper knowledge of disciplines taught in school. This information can be used by policymakers when assessing educational funds to support afterschool programs.

1.4 Purpose

The purpose of this study was to explain and predict high school student participation in a Midwestern state GEAR UP afterschool program based on the in-school adult-youth interactions, afterschool physical environment, and afterschool educator self-efficacy, behaviors, and beliefs.

1.5 Research Questions

1. What were the in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and high school student participation (i.e., intensity, duration, total exposure, breadth) in the GEAR UP afterschool program?
2. What were the relationships among high school student participation (i.e., intensity, duration, total exposure, breadth) and in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?
3. What percent variance is explained in participation when regressed on in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and youth demographic characteristics?

4. Were there significant differences between youth participants and nonparticipants of the GEAR UP afterschool program based on the adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?

1.6 Assumptions

The following assumptions were made for this study:

1. A positivist paradigm was held by the researcher in which the researcher pursues one objective reality "without the values of the researchers or participants influencing its development" (Park et al., 2020, p. 691).
2. A deductive approach was applied where theory serves as a structure of the research and was used to guide hypothesis creation and data collection methods (Firestone, 1987).
3. Afterschool educators utilized the curriculum, resources, and STEM materials provided by the GEAR UP program.
4. Participants answered all questions on the questionnaire to the best of their ability and provided truthful responses.
5. Youth had the opportunity to participate in all offered GEAR UP afterschool programs.
6. GEAR UP program educators accurately recorded attendance, activities, and learning environments provided for participants.

1.7 Limitations

The following limitations were recognized during this study:

1. Selection bias may be present within this study as high school students self-select to participate in the GEAR UP afterschool program. Self-selection may indicate pre-existing inclinations for STEM subjects or other underlying factors. Selection bias is a significant threat when random assignment of participants is not possible (Schutt, 2015).
2. History effects may have impacted the internal validity of this research. The COVID-19 virus caused disruption to classroom learning and afterschool programming cutting off typical means of meeting for in-person learning. To mitigate this limitation, previous school year data was included in the analysis.

3. Due to the COVID-19 virus preventing in-person programs during the 2020-2021 school year, the survey administered to afterschool educators asked participants to reflect on the previous 2019-2020 school year in-person afterschool environment. The reflective nature upon previous experiences may lead to a maturation effect in which participants respond differently than if the survey was administered during that respective school year.
4. The sample was limited to high school students in the eleven GEAR UP programs within the Midwestern state, hence findings may not be generalizable to other age groups or locations outside the Midwest.
5. STEM teaching and tutoring methods vary by school and teacher within the afterschool program. This variation may lead to inconsistent breadth of participation. Variation is minimized through the use of standardized curriculum offered to all afterschool programs.
6. Pre-tests were not administered in this study thus limiting the researcher's knowledge of baseline teacher self-efficacy, beliefs, and behaviors. Additionally, the researcher did not randomly assign participants to the treatment or control groups. As such, no causal inferences can be made.

1.8 Definition of Terms

Afterschool Program – "A program that a child regularly attends that provides a supervised, enriching environment in the hours after the school day ends, typically around 3 p.m. These programs are usually offered in schools or community centers and are different from individual activities such as sports, special lessons, or hobby clubs, and different from childcare facilities that provide supervision but not enrichment" (Afterschool Alliance, 2015, p. 6).

Formal Learning - Formal learning is any learning that occurs in a structured educational environment, typically thought of as a school, university, etc. The learning that results is usually assessed and leads to a specific outcome such as a grade or certification (Rogers, 2014).

GEAR UP – Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP) is a program funded by the U.S. Department of Education with the intention of increasing college and career readiness and STEM learning. Eleven school programs exist throughout the Midwestern state and follow a cohort of students from 7^{th} through 12^{th} grade (Indiana GEAR UP, n.d.).

Learning Activities – Directed tasks given to students by the instructor or educator in which students complete with the intention of the gaining knowledge (Chi & Wylie, 2014).

Nonparticipants – Ninth or tenth grade youth enrolled in a GEAR UP school in the Midwestern state but did not participate in the GEAR UP afterschool program during the 2019-2020 school year.

Out-of-School Programs – "A broad set of educational programs that take place before or after the school day and during non-school periods such as summer vacation" (National Research Council, 2009, p. 174)

Participants – Ninth or tenth grade youth enrolled in a GEAR UP school in the Midwestern state who participated in the GEAR UP afterschool program during the 2019-2020 school year.

Participation Breadth – The number of different types of activities an individual is involved in within the program (Roth et al., 2010).

Participation Duration – The total number of years in which an individual attends the same program (Roth et al., 2010).

Participation Intensity – An individual's program attendance frequency within one year (i.e., number of days within one year, number of hours within one year) (Roth et al., 2010).

Participation Total Exposure – The attendance frequency of an individual within a program over the total number of years the individual is enrolled in the program (Roth et. al, 2010).

Physical Learning Environments – The various environments found in a school that are meant as places for learning which include school buildings, classroom spaces, furniture, and equipment (Baars et al., 2020).

Self-Efficacy – Self-efficacy is an individual's personal and perceived belief in their abilities to perform a set of tasks needed to reach and accomplish the end goals (Bandura, 1997).

STEM Education – Any instruction or learning relevant to science, technology, engineering, and mathematics subjects (Granovskiy, 2018)

CHAPTER 2. LITERATURE REVIEW

2.1 Overview

Chapter two presents an overview of afterschool programs and details the components of youth participation in afterschool. The purpose of the study, methodology for conducting the literature review, and research questions are provided. Further, this chapter provides a review of the literature regarding the physical learning environment, afterschool educators, adult-youth interactions, and outcomes of participation in afterschool programs. The conceptual framework and theoretical framework used to inform the study are also described.

2.2 Literature Review Methodology

Using a variety of search methods, literature from academic sources were identified to inform this study. Sources were obtained through the ERIC online database, Google Scholar, Purdue University eJournal database, Purdue University library direct search, and Mendeley search. During the review of literature, search phrases and terms such as "afterschool programs," "out-of-school time," "youth participation in afterschool," "afterschool academic outcomes," "life skill development," "adult-youth interactions," "interpersonal relationship," "physical learning environment," "physical learning space," "teacher self-efficacy," and "teacher classroom behavior" were used.

2.3 Purpose of the Study

The purpose of this study was to explain and predict high school student participation in a Midwestern state GEAR UP afterschool program based on the in-school adult-youth interactions, afterschool physical environment, and afterschool educator self-efficacy, behaviors, and beliefs.

2.4 Research Questions

1. What were the in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion); afterschool physical environment; afterschool educator self-efficacy,

behaviors, and beliefs; and high school student participation (i.e., intensity, duration, total exposure, breadth) in the GEAR UP afterschool program?

2. What were the relationships among high school student participation (i.e., intensity, duration, total exposure, breadth) and in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?

3. What percent variance is explained in participation when regressed on in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and youth demographic characteristics?

4. Were there significant differences between youth participants and nonparticipants of the GEAR UP afterschool program based on the adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?

2.5 Theoretical Framework

The theoretical framework guiding this study is the Revised Framework for Investigating Mentoring Relationships in After-School Programs (i.e., Revised Framework). The Revised Framework was created to describe the elements involved in the development of mentoring relationships in afterschool programs as well as the outcomes and effects of the adult-youth relationships for youth and program educators (Mekinda & Hirsch, 2013). In particular, the Revised Framework (Fig. 2.1) focuses on environmental and personal background characteristics, mentoring arrangements, adult mentor behaviors, and the resulting experiences and outcomes from mentoring relationships, such as afterschool participation. Mekinda and Hirsch developed the Revised Framework by modifying a framework originally published by Hirsch and Wong (2005). The authors expanded the original framework to include mentoring relationship arrangements and the impacts of community and family members upon mentoring relationships into the model Mekinda and Hirsch (2013). In this study, the Revised Framework provides a framework for

exploring the characteristics of the youth, educator, and adult-youth relationships that serve as predictors of afterschool participation in a GEAR UP afterschool program.

The centrality of the Revised Framework focuses on the characteristics of mentoring relationships, the determining factors leading to relationship development, and the outcomes resulting from successful relationships. In the Revised Framework, environmental characteristics (i.e., programmatic and community attributes) and individual characteristics (i.e., gender, age, race, and shared interests) serve as precursors to the types of mentoring relationships developed between the youth and adult (Mekinda & Hirsch, 2013). The ratio of youth-to-staff, types of activities offered, level of parental or familial involvement, and level of involvement from the community and outside organizations are all considered environmental characteristics, which can limit or increase the frequency of interactions between adult mentors and youth. Youth who regularly have positive interactions with adults are more likely to develop mentoring relationships with adults (Rhodes, 2004). Further, the connections formed between adult and youth are impacted by the background characteristics and experiences by both individuals. Similarities in age, gender, race, and interests beyond the program may draw youth to certain afterschool educators and set the stage for building rapport toward positive mentoring relationships.

Mentoring relationships and their associated characteristics (i.e., the arrangement of the mentoring interactions and the behaviors displayed by the mentoring adult) serve as the focal point of the Revised Framework (Mekinda & Hirsch, 2013). The nature of afterschool programs allows adult mentors and youth in mentoring relationships to interact through a variety of mentoring arrangements (i.e., individual, group, collective, tri-level, and reciprocal). Individual, or one-on-one, mentoring can occur informally throughout the afterschool program or during specific activities such as tutoring or project-based activities. However, more frequently, group mentoring is carried out between one adult and several youth. In larger afterschool programs, collective mentoring (i.e., the mentoring of one youth by many adults) and tri-level mentoring (i.e., the mentoring of older adolescents by adults who, in turn, mentor younger youth) are possible (Mekinda & Hirsch, 2013). According to Mekinda and Hirsch (2013), youth can also serve as a mentor by teaching afterschool educators new skills during reciprocal mentoring.

Behaviors demonstrated within the mentoring relationship by the mentor can influence the experiences and outcomes of the youth. The three mentoring behaviors exhibited by mentors in the Revised Framework are emotional support, guidance or teaching, and sponsorship or advocacy.

Adult mentors provide emotional support by listening, showing compassion, and acting in response to the needs of youth (Mekinda & Hirsch, 2013). Kataoka and Vandell (2013) found youth who receive emotional support from educators in afterschool programs demonstrate improved social behaviors with peers and teachers in the classroom. Through guidance and teaching, mentors can role model positive behaviors and assist with academic growth. Adult mentors provide sponsorship or advocacy to youth by actively working to provide activities and experiences desired by youth for their personal growth (Mekinda & Hirsch, 2013). In return, youth in mentoring relationships exhibit learning and collaboration during reciprocal mentoring arrangements. Through this behavior, adults learn new skills from youth (Mekinda & Hirsch, 2013). Kafai et al. (2009) explored mentoring in an out-of-school organization where both the adult mentor and youth experienced learning behaviors during their interactions. The authors found these reciprocal mentoring relationships to be best described as a partnership in which both individuals in the relationship are growing and developing. For the development of successful adult-youth relationships, the adult mentors and youth must create an equal partnership using positive mentoring behaviors (i.e., emotional support, guidance or teaching, sponsorship or advocacy, and learning or collaboration).

The Revised Framework indicates the experiences and outcomes of youth in an afterschool program are determined by the extent to which mentoring relationships are established between mentoring adults and youth. Rhodes (2004) noted that the rate of youth attendance in afterschool can be affected by the adult-youth relationships existing in the afterschool program. When youth feel bonded to an afterschool educator, they may be more likely to attend and participate in afterschool. Participation in afterschool programs is necessary for youth to attain the outcomes offered by the afterschool programs. With frequent participation, positive outcomes have been reported in academic achievement, social skills, emotional competencies, and other capacities (Durlak & Weissburg, 2007; Huang et al., 2017; Murray & Cousens, 2020).

Previous researchers have used the Revised Framework to understand the role of adult-youth relationships in youth mentoring programs. Dornian, Moshirpour, and Behjat (2021) examined a virtual engineering mentor program using the Revised Framework to understand challenges affecting mentors in the program. The researchers identified four major themes of challenges weighing heavily upon program mentors: teaching, role modelling, emotional environment, and virtual space (Dornian et al., 2021). The themes revealed that mentors are conscious of their role

as a teacher, guide, and emotional support for the youth being mentored as described in the Revised Framework.

In this study, the Revised Framework for Investigating Mentoring Relationships in After-School Programs serves as the theoretical foundation for understanding how characteristics of an afterschool program (i.e., adult-youth relationships, learning environment, and educator behaviors) are linked to youth attendance and outcomes. First, the Revised Framework broadly examines the features of afterschool programs and the contribution of multiple program characteristics upon youth attendance. Furthermore, the emphasis on the centrality of the adult-youth relationship for afterschool attendance in the framework aligns with previous research which has identified adult-youth relationships as crucial for attendance and outcomes in afterschool programs (Diversi & Mecham, 2005; Rhodes, 2004). Finally, the framework highlights the salience of environmental and background characteristics in the effectiveness of mentoring relationships.

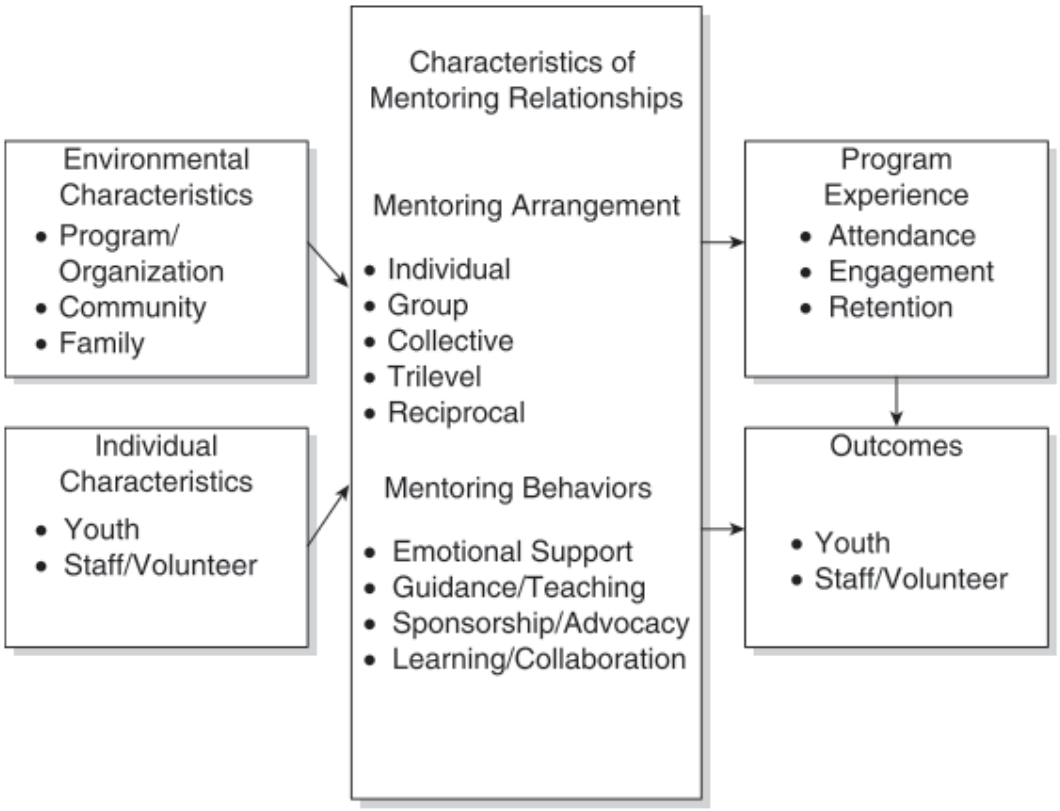

Figure 2.1 Revised Framework for Investigating Mentoring Relationships in After-School Programs (Mekinda & Hirsch, 2013)

2.6 Conceptual Framework

The theoretical framework, the Revised Framework for Investigating Mentoring Relationships in After-School Programs, guided the development of the conceptual framework for this study (Fig. 2.2). The conceptual framework provides an overview of the factors in a GEAR UP afterschool program which predict youth participation in the afterschool program. The main elements of the conceptual framework are individual characteristics, characteristics of adult-youth interactions, afterschool physical learning environment, and afterschool youth participation. Characteristics of adult-youth interactions include in-school adult-youth interaction arrangements and afterschool educator self-efficacy, beliefs, and behaviors. The independent variables featured in this study are afterschool educator self-efficacy, beliefs, and behaviors; in-school adult-youth interactions; and afterschool physical learning environment. Afterschool youth participation functions as the dependent variable. Individual characteristics of the youth and afterschool educator serve as background demographic characteristics used to describe the study participants.

The Revised Framework serves as a guide for understanding the factors predicting youth afterschool participation. In the theoretical framework, individual characteristics function as a precursor to mentoring relationships (Mekinda & Hirsch, 2013). Thus, individual characteristics of youth and afterschool educators are used in the conceptual framework as a precursor to adult-youth interactions. In this study, mentoring relationships are operationalized as adult-youth interactions. The theoretical framework classifies two variables as characteristics of mentoring relationships: mentoring arrangements and mentoring behaviors (Mekinda & Hirsch, 2013). Here, mentoring arrangements are operationalized as in-school adult-youth interaction arrangements, and mentoring behaviors are operationalized as afterschool educator self-efficacy, beliefs, and behaviors. Both in-school adult-youth interaction arrangements and afterschool educator self-efficacy, beliefs, and behaviors function as characteristics of adult-youth interactions. In-school adult-youth interaction arrangements include whole class instruction; one-on-one instruction; counseling, advising, and academic planning; and SSP activity completion. The theoretical framework indicates that mentoring relationships influence program experiences and youth outcomes (Mekinda & Hirsch, 2013). For this study, program experience is operationalized as the afterschool physical learning environment, and youth outcomes is operationalized as youth afterschool participation. Adult-youth interactions are linked to the afterschool physical learning

environment in the conceptual framework. Further, both adult-youth interactions and the afterschool physical learning environment predict afterschool youth participation.

In this study, the researcher focused on the individual characteristics of the youth and afterschool educator; the in-school adult-youth interaction arrangements; afterschool educator self-efficacy, beliefs, and behaviors; afterschool physical learning environment; and afterschool participation to explore what variables serve as predictors of afterschool participation. The researcher desired to examine the characteristics of mentoring relationships and adult-youth interactions in the theoretical and conceptual frameworks, but the researcher was limited in how these variables could be measured due to COVID-19. As a result of the COVID-19 restrictions, the researcher could not access schools, afterschool programs, or youth to obtain youth perspectives of their interactions and degree of relationships developed with afterschool educators. For this study, the adult-youth interaction arrangements were the only factors of adult-youth interactions measured. Thus, the adult-youth interaction arrangements (i.e., whole class instruction; one-on-one instruction; counseling, advising, academic planning; and SSP activity completion) were operationalized as adult-youth interactions.

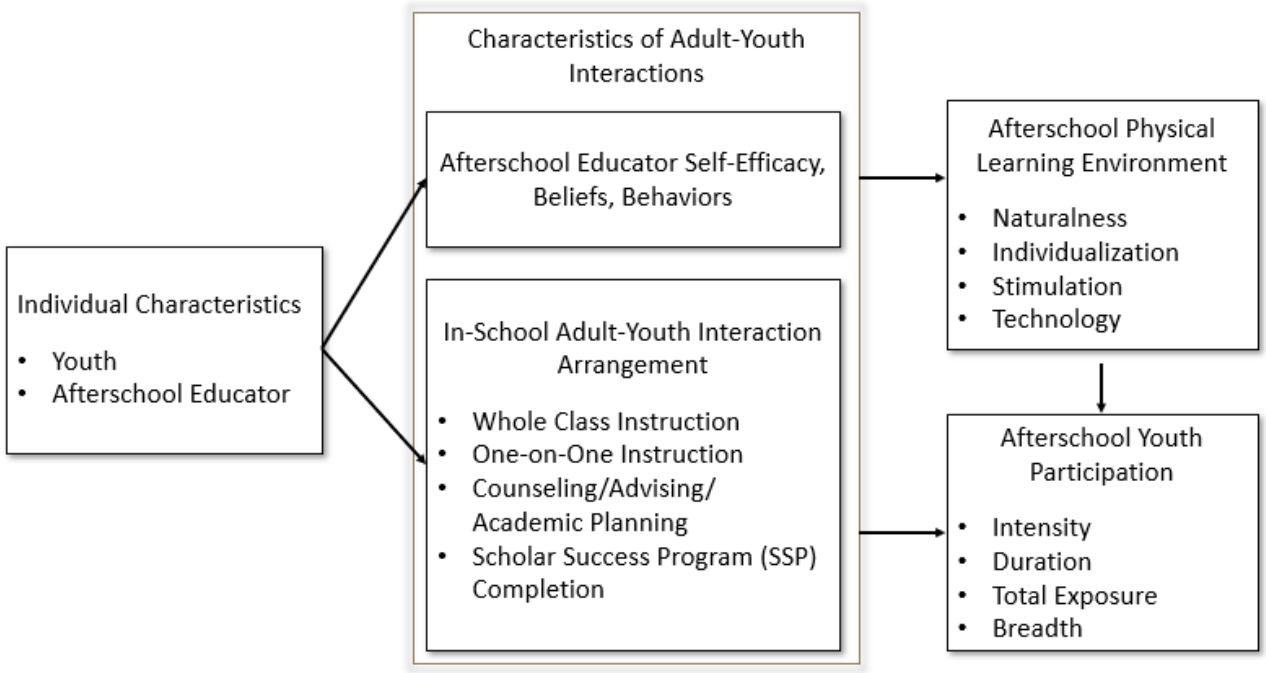

Figure 2.2 Conceptual Framework

2.7 Afterschool and Out-of-School Programs

Afterschool and out-of-school programs are most easily distinguished by the timeframe in which they are offered to youth in relation to the school day. In this study, afterschool programs are defined as recurrently scheduled programs for youth with a "supervised, enriching environment" taking place directly following the school day (Afterschool Alliance, 2015, p. 6). These programs only occur during the early evening or late afternoon during the school week and do not include youth programs taking place before the school day, on weekends, or over the summer months when school is not in session. Common extracurricular activities such as hobbies, competitive teams, clubs, lessons, and sports are not considered afterschool programs because they do not provide diverse learning (Afterschool Alliance, 2015). The term "out-of-school programs" covers a wider range of youth programming as they comprise of education-based programs occurring during any time outside of the school day (National Research Council, 2009). Afterschool programs are included under the out-of-school program umbrella, but not all out-of-school programs are afterschool programs.

Afterschool programs are often developed in response to specific school or community needs and do not follow set standards or guidelines resulting in a variety of program offerings. Potential activities provided as part of afterschool programs include tutoring, academic-based learning, team building, community or service-based projects, physical fitness, and mentoring while cover subjects such as science, technology, engineering, and mathematics (STEM), college and career readiness, art, history, environmental sciences, and healthy living (Carver et al., 2005; Mahoney et al., 2005a). Afterschool programs offer a holistic and well-rounded educational experience with activities to support and broaden classroom learning. Afterschool programs, as compared to classrooms, utilize a hands-on, exploratory approach to promote student learning using interactive activities (Sahin et al., 2014). Through afterschool programs, youth can develop new knowledge, skills, curiosities, and interests.

2.8 Afterschool Physical Learning Environment

The design of the educational physical learning environment impacts both teaching styles and students' capacity to learn (Li et al., 2005). School-based physical learning environments are the spaces in a school used for learning (i.e., buildings, rooms, furniture, and equipment) and

consist of three main components: naturalness, stimulation, and individualization (Baars et al., 2020; Barrett et al., 2015). Naturalness entails elements related to nature and the senses such as available lighting, temperature, sounds, and air quality (Barrett et al., 2015). Afterschool program educators may not have access to controlling factors of naturalness if the programs are held in spaces owned by other entities (i.e., schools, community centers, county buildings). Stimulation is comprised of color and complexity which are both the visual aspects of the physical learning environment (Barrett et al., 2015). The mood portrayed through the structures and furniture fall into the stimulation category. The third component, individualization is the flexibility of the furniture to meet the needs of those utilizing the space (Barrett et al., 2015). In afterschool programs, individualization is the degree to which the space can be adjusted for the variety of learning activities implemented on a day-to-day basis. Physical learning environments with versatile furniture allow for flexible teaching with individual or group settings (Kuuskorpi & Cabellos-Gonzalez, 2011). Naturalness, stimulation, and individualization combine to create the physical learning environment experienced during afterschool programs. When factors of the physical learning environment (i.e., lighting, temperature, furniture, and air) are not sufficiently provided, the quality of teaching and learning is hindered (Finn et al., 2003; Hardiman, 2012).

Technology is one aspect of educational physical learning environments that has become increasingly popular for diversifying learning experiences. Many beneficial outcomes result from the integration of technology into educational spaces. Youth in technology enhanced environments are afforded more opportunities for group collaboration and discussion as compared with physical learning environments lacking technology access (Brooks, 2012). Further, technology enhanced environments increase the interactive nature of learning and improve student perceptions of their educational experiences (Byers & Imms, 2016). In afterschool programs, technology can be used as a tool to explore new interests and draw real world connections. Often, access to various technologies in afterschool programs is dependent upon the space where the afterschool program takes place as well as program funding for technology-based equipment.

The physical learning environment of afterschool programs is often dictated by the location of the program and the capacity of the afterschool educator to use the space available. School-based afterschool programs benefit youth who otherwise would not have access to afterschool care or transportation to extracurricular activities at a different location (Afterschool Alliance, 2007, 2020). In spite of this, afterschool programs located in schools face additional challenges with the

physical learning environment. Traditional classrooms are designed as a static space focused on individual learning (Kuuskorpi & Cabellos-Gonzalez, 2011). As a result of the static nature of the traditional classroom layout, school settings may not be conducive for afterschool program activities involving collaboration, teamwork, or moving around the room. Although educators cannot often control the afterschool physical learning environment in school settings, they must adapt their programs to fit the space. Mulcahy et al., (2015) found that the extent to which educators are willing to modify their teaching to fit the physical learning environment varies. Further, the abilities and self-efficacy of the afterschool educator play a part in how effectively the educator uses the physical learning environment (Byers et al., 2018). The degree to which educators can align the physical learning environment, activities, and teaching impacts the youth experience at the afterschool program.

2.9 Afterschool Educators

2.9.1 Self-Efficacy

Self-efficacy is an individual's personal and perceived belief in their abilities to perform a set of tasks needed to reach and accomplish the end goals (Bandura, 1997). According to Bandura (1997), mastery experiences, vicarious experiences, emotional arousal, and verbal persuasion are the four sources of self-efficacy. Individuals can glean self-efficacy from their peers or themselves through various experiences. Mastery experiences occur when an individual views a personal experience as successful, leading to future positive views related to the task (Bandura, 1997). In education, teachers gain mastery experiences as they have more opportunities to instruct students. Vicarious experiences occur when an individual watches others complete tasks and relate their own abilities to the experience of their peers (Bandura, 1997). Individuals can use vicarious experiences to model how others accomplish tasks. The final two sources of self-efficacy, emotional arousal and verbal persuasion are connected to how a task makes an individual feel and how the verbal feedback of others affects an individual's view of the task (Bandura, 1997).

Previous research indicates the most influential source of self-efficacy for an educator is mastery experiences (Knoblauch & Chase, 2015; Tschannan-Moran et al., 1998; Usher & Pajares, 2008). As such, teacher self-efficacy increases as educators gain more years of teaching experience (Wolters & Daugherty, 2007). Afterschool educators may relate previous classroom teaching

experiences to the informal education experiences in afterschool programs. However, the environment of afterschool programs differs from the classroom. Thus, it is necessary for afterschool educators to have opportunities to develop self-efficacy through teaching in the afterschool program over time. An educator's self-efficacy should increase when the educator perceives a program as a success; however, if the educator feels an experience went poorly, their self-efficacy may decrease (Schunk & DiBenedetto, 2016). The experiences of an educator compound over time and determine their perceptions of teaching future educational programs. Furthermore, the experiences positively or negatively affect the educator's perceived belief in their teaching abilities.

2.9.2 Beliefs

For this study, afterschool educator beliefs are the individual's beliefs about the importance of STEM education and skills obtained from STEM learning. The beliefs of the afterschool educator are shaped by the background and previous experiences of the educator such as years with GEAR UP, years of teaching experience, highest education degree attained, and other demographic characteristics. Consequently, beliefs of the educator are seen as an influential component for how the afterschool physical learning environment is utilized and the resulting youth participation in afterschool programs.

The beliefs held by educators regarding the subjects they teach relates to their classroom practices and lessons presented to youth (Wang et al., 2011). Educators only implement practices they understand and view as conducive for youth learning. For example, in a study by Capps and Crawford (2013), the authors identified educators with restricted beliefs of inquiry-based learning have limited implementation of inquiry-based instruction in their classrooms. Due to educator beliefs impacting classroom practices, the educator beliefs also play a role in youth outcomes in the classroom. Youth taught by educators who hold strong beliefs in the subjects they teach see higher academic achievement than their peers taught by educators who have limited beliefs (Kunter et al., 2013; Lumpe et al., 2012).

Thi To Khuyen and colleagues (2020a) studied the STEM perceptions and beliefs of STEM educators with various years of teaching experience and educational backgrounds. The researchers found teachers with more years of experience held lower beliefs regarding the importance of youth obtaining STEM competencies (Thi To Khuyen et al., 2020a). Educators with greater teaching

experience may view other areas of education as more salient to focus resources upon leading to less attention on areas such as skill development or STEM understanding. As a result, youth have variable experiences during educational programs, which can positively or negatively impact their view of the program.

2.9.3 Behaviors

The behaviors of educators during classroom or afterschool program STEM instruction can positively or negatively affect the experiences of youth. According to Bybee (2010), the behaviors, activities, and curriculum presented by STEM educators combine to impact the STEM skills and knowledge gained by youth in STEM programs. Further an educator's behavior dictates the frequency and relevance of STEM activities during educational programs.

Moore and Yulianti (2014) studied educator behaviors and their preparedness to teach STEM related concepts. Researchers discovered a majority of teachers were not well prepared to integrate STEM or critical thinking projects into lesson plans and implement new technologies. Of all teachers surveyed, the youngest age group of teachers, age 20-29, were most prepared to employ STEM competencies of project-based learning, 21st century skill development, and project collaboration (Moore & Yulianti, 2014). Educators who do not plan to integrate STEM competencies into daily lessons do not expose youth to those STEM skills during the lessons. Further, youth in mathematics classes where educators do not prepare lesson plans in advance have significantly lower mean performance scores compared to their peers (Kariuki et al., 2019). Thus, the behaviors of educators prior to, and during, the lessons greatly affect youth experiences and outcomes.

2.10 Adult-Youth Interactions

Youth who encounter positive interactions and forge relationships with non-familial adults in structured educational environments subsequently experience positive youth development (Eccles et al., 1993). Afterschool educators serve the role of a non-familial adult influence upon youth enrolled in afterschool programs. The types of interactions between the afterschool educator and youth can leave a lasting impact on the youth beyond the program. If successful adult-youth interactions ensue, afterschool educators have the potential to assist youth in developing social,

emotional, cognitive, and communication skills (Dubois et al., 2011; Hirsch et al., 2000; Rhodes, 2002).

Adults cultivate positive interactions with youth through building connections and emphasizing shared topics of interest (Jones & Deutsch, 2011; Rhodes, 2002, 2004). The afterschool space provides an opportunity for adults and youth to discuss school, academic needs, future career goals, and commonly held interests outside of school. Additionally, adult-youth interactions present a platform for adults to share advice, resources, and skills while modelling positive behaviors (Sullivan & Larson, 2010). In turn, youth can feel safe confiding in a trustworthy adult who is not a parent or sibling. Both one-on-one and whole group adult-youth interactions are effective in generating positive youth development outcomes (Dubois et al., 2011). In addition to developing personal skills, youth who receive emotional support from successful adult-youth interactions with afterschool educators are reported to have higher engagement and improved classroom performance during the school day (Azuine & Singh, 2019; Kataoka & Vandell, 2013).

The degree to which adults and youth develop close relationships depends upon the frequency of their interactions (Rhodes, 2004). As the adult and youth spend more time together, they have additional opportunities to build mutual respect for one another and form a bond. Further, the quality of the adult-youth interactions and subsequent relationship established between adult and youth can have an effect on the rate of attendance in the afterschool program (Rhodes, 2004). If youth feel a sense of connection and belonging in the afterschool program through previous interactions with afterschool educators, they could feel more motivated to attend.

The length and duration of the interactions between adult and youth also impacts the youth in the aftermath. Grossman and Rhodes (2002) found that youth in relationships with mentoring adults lasting less than three months had diminished views of self and their abilities. Meanwhile, their study revealed that youth in adult mentoring relationships spanning longer than one year had improvements socially, academically, and personally (i.e., relationships with peers and parents, views of school and academic ability, and healthy habits). Thus, the span of the relationship between adult and youth in an afterschool program is substantial. Due to the informal nature of afterschool programs and the competing afterschool activities youth are enrolled in, afterschool educators may have a difficult time sustaining relationships with youth if attendance is variable.

Not all interactions between adults and youth are positive in the eyes of the youth. Certain behaviors and attitudes displayed by the adult educator can prevent connections and relationships from emerging within afterschool programs. Adults with negative attitudes, poor communication, and off-putting behaviors leave youth feeling detached from the program activities and the educators (Buehler et al., 2020; Dworkin & Larson, 2007). Subsequently, negative adult-youth interactions result in lower self-esteem and lower enthusiasm to accomplish the tasks at hand (Buehler et al., 2020). Youth may try to avoid interacting with unpleasant educators all together due to the negative feelings they associate with that individual leading to lower engagement or lower attendance.

Another source of negative sentiment from youth during adult-youth interactions is through the struggle between autonomy and adult authority. Youth desire autonomy to grow and learn within educational environments; however, youth often perceive formal educators to hold significant authority over them which, in turn, diminishes youths' autonomy and independence (Deutsch & Jones, 2008). In the classroom, youth do not see themselves as having a voice in the learning process. In informal educational programs, youth are more likely to view interactions with educators as a bi-directional relationship and perceive adult authority differently as compared to learning in formal classrooms (Deutsch & Jones, 2008). Youth in informal educational programs, such as afterschool programs, feel more involved in the learning process and respected for their views.

In this study, GEAR UP educators face additional challenges during adult-youth interactions as they teach programs in both the formal classroom and informal afterschool program. GEAR UP educators must balance programming, authority, and youth's desire for autonomy across all programs for continual positive adult-youth interactions. According to Jones and Deutsch (2011), the most productive ways to avoid negative adult-youth interactions and build positive relationships with youth is through reducing the perceived adult authority and focus on developing meaningful connections during each interaction.

2.11 Youth Participation in Afterschool Programs

Sustained youth participation and engagement in afterschool programs is vital for fostering developmental outcomes in youth (Dawes & Larson, 2011). However, afterschool programs for older youth have a difficult time obtaining persistent participation due to the increased number of

alternative extra-curricular activities offered. For continued interest and participation in afterschool programs, afterschool educators must focus on providing desired programs and meeting the needs of youth.

Afterschool programs fulfill different purposes depending upon the age of the youth in attendance. Programs targeted for elementary and middle school youth are often seen as a chance to provide adult supervision, socialization with peers, and exploration of new interests (Faust & Kuperminc, 2020). However, the programming needs of youth change as they grow and develop. For high school youth, afterschool programs serve as a space for personal growth and to prepare for post-secondary life through college and career planning, homework and class assistance, and skill development (Deschenes et al., 2010). High school programs often have more individualized content appropriate for older adolescents. By high school, parents offer more freedom for youth to decide how to spend their afterschool hours (Afterschool Alliance, 2009a). With increased choice by high school youth, afterschool programs must be tailored to meet the needs of youth to see increased interest and participation result.

As youth transition into high school, more opportunities arise to fill the after school hours. Along with increased freedom, parents may rely on the youth to take on additional responsibilities after school by caring for siblings or completing chores at home (Afterschool Alliance, 2009a). Adolescents are also provided with added extra-curricular, job, and internship opportunities as they age reducing the likelihood they will attend afterschool programs. Youth participation in afterschool programs significantly decreases between middle school and high school (Afterschool Alliance, 2020). The Afterschool Alliance reported 4% less high school students participating in afterschool programs than middle school students (2020). The decreased attendance in afterschool programs by high school youth results in reduced opportunities to obtain the developmental outcomes made available through program participation. Getting youth to show up, continue participating regularly, and being engaged in the afterschool activities is critical for encouraging positive development outcomes (Dawes & Larson, 2011).

In this study, youth participation is seen as the number of hours youth partake in the GEAR UP afterschool program across time and is classified as: (1) intensity (i.e., hours of participation within one year), (2) duration (i.e., number of years of participation), (3) breadth (i.e., hours of participation in the distinct afterschool activities within the program), and (4) total exposure (i.e., total hours of participation over the extent of the entire program) (Roth et al., 2010). Roth, Malone,

and Brooks-Gunn (2010) draw attention to the complexity of participation and emphasize the importance of assessing multiple dimensions of participation to push the concept beyond attendance or lack thereof. Hence, the researcher of this study investigated the length, time, and activities involved in the youth afterschool participation.

2.12 Outcomes of Participation in Afterschool Programs

While afterschool programs are generally seen as beneficial for youth development, previous studies have reported mixed results on the effectiveness of afterschool programs in influencing youth academic, social, and emotional outcomes (Dreyer, 2010; Roth & Brooks-Gunn, 2016; Roth et al., 2010). The inconsistent results seen among studies may be due to several factors including: selection biases, lower quality methodologies, and a lack of consistent reporting for how participation is measured within studies (i.e., the number of days per week, the number of hours per week, the number of minutes per program) (Huang et al., 2017; Lauer et al., 2006). The factors causing inconsistent results not only affect study outcomes but also limit the generalizability of study findings to other afterschool programs. Differences of program characteristics within afterschool programs may also lead to inconsistent success. According to Lauer et al. (2006), program specific contexts such as the grade level of students, youth at-risk status, program activities, length of program delivery, and the amount of one-on-one interactions between adults and youth are related to the effectiveness of afterschool programs. High quality afterschool programs with positive youth outcomes have specific program characteristics. Namely, the most successful afterschool programs develop supportive relationships among staff, parents, and youth; offer a variety of academically and socially enriching activities; and use evidence-based teaching methods (Durlak & Weissberg, 2007; Vandell et al., 2007). Durlak and Weissberg (2007) compared high quality afterschool programs using evidence-based approaches with lower-quality afterschool programs not employing evidence-based approaches. Their findings revealed that all high-quality programs using evidence-based approaches saw positive outcomes for the personal and social skills measured while none of the lower-quality programs had positive outcomes. Therefore, high-quality afterschool programs are necessary for positive outcomes to result.

2.12.1 Academic Outcomes

In addition to a safe and supportive environment, high quality afterschool programs provide a space for youth to extend classroom learning and develop academic skills. Afterschool programs with homework assistance, tutoring, or academically focused components often center around core courses related to English/language arts and STEM. Youth with consistent participation in academic-based afterschool programs see significant improvements in standardized mathematics scores, achievement in mathematics, and proficiencies in reading and mathematics classes (Huang et al., 2017; Lauer et al., 2006; Vandell et al., 2007). Chan and colleagues (2020) reported that youth in afterschool programs with an emphasis on STEM demonstrated higher self-efficacy in science and mathematics subjects. STEM afterschool programs may be the first opportunity for students to experience hands-on activities and explore careers available through STEM disciplines. The increased exposure during STEM-based afterschool programs leads to greater interests in pursuing STEM majors and careers in STEM fields post-graduation (Chan et al., 2020; Dabney et al., 2012).

The academic outcomes seen as a result of attendance in high-quality afterschool programs during high school assist youth into postsecondary education. In Sanchez et al.'s (2018) study comparing GEAR UP students and non-GEAR UP students during the first year of postsecondary education, the researchers found that GEAR UP students maintained similar college GPA's as non-GEAR UP students even though GEAR UP students were more likely to come from at-risk or underprivileged backgrounds. Further, more postsecondary students who participated in GEAR UP programs were first generation college students as comparted to their peers (Sanchez et al., 2018). The academic benefits from attendance in high-quality afterschool programs, such as GEAR UP, may assist in leveling the playing field for youth who are underrepresented or from disadvantaged backgrounds.

2.12.2 Social, Emotional, and Personal Outcomes

Participation in high-quality afterschool programs can lead to positive youth development in other areas besides academics. Emotional competencies such as self-confidence, self-control, and empathy toward others can be obtained from continual involvement in afterschool programs (Murray & Cousens, 2020). Through positive interactions during afterschool participation, youth

are empowered to uphold positive views of themselves and those around them. The unique environment of the afterschool program also presents opportunities for youth to develop critical thinking skills during hands-on activities (Allen et al., 2019) which may not be possible during the school day.

Consistent participation in afterschool programs leads to increased social-emotional learning, social skills, and work habits while reducing negative behaviors such as school absences and risky activities (Durlak & Weissberg, 2007; Payton et al., 2008; Vandell et al., 2007). For example, youth in GEAR UP afterschool programs have shown a decrease in disciplinary reports during the school day (Yampolskaya et al., 2006). Negative behaviors previously demonstrated by youth decline as youth begin making better choices benefitting their personal health and the betterment of their surrounding community. Arbreton and colleges (2009) studied youth enrolled in Boys & Girls Club afterschool programs over 30 months and found youth with more frequent participation had increased measures of character and citizenship, involvement in community service, and integrity. Researchers also discovered participating youth were making healthier lifestyle choices by thinking ahead to the future and decreasing instances of drinking, smoking, and other dangerous activities (Arbreton et al., 2009). In sum, increased participation in high-quality afterschool programs is advantageous for youth academically, socially, emotionally, and personally.

2.13 Need of the Study

Research on the role of afterschool educators and the physical learning environment in influencing high school students' decision to attend afterschool programs is limited. From previous research on high quality afterschool programs, program staff have been identified as an important component for youth retention (Deschenes et al., 2010). Nevertheless, limited studies were found that examined the relationship between adult-youth interactions occurring in school and youth participation in afterschool programs. Regarding the physical learning environment, prior research indicated that accessible and safe physical learning environments support retention of youth in afterschool (Walker & Arbreton, 2004). However, Fisher (2016) found little evidence exists that specified which aspects of physical learning environments contribute to student attendance in educational programs. This study meets the need to explore youth participation in afterschool

programs as a response to in-school adult-youth interactions and factors of the afterschool physical learning environment.

Afterschool programs are frequently created in response to school or community needs resulting in small program sizes and inconsistent durations and intensity across available programs (Durlak et al., 2010). As a result, limited studies exist which involve a large sample size of youth or afterschool educators from the same afterschool program. Most studies of afterschool programs with large sample sizes include youth from unrelated programs. Further, a smaller percentage of afterschool studies include high school students as participants due to the concentration of afterschool programs with elementary or middle school aged youth (Allen et al., 2019). This study meets the need to expand available research on high school afterschool programs with a large sample of youth and afterschool educators from the same program.

This study addresses a gap in the literature by exploring the extent to which youth participation in afterschool is predicted by in-school adult-youth interactions and the physical learning environment. In particular, the present study focuses on high school-aged youth in afterschool programs, which is a population with limited research. Further, this study will extend the research on afterschool programs with a large program size for better understanding of afterschool program participation and outcomes.

2.14 Chapter Summary

In this chapter, the purpose of the study, research questions, and literature review methodology used to identify relevant previous studies were highlighted. A comprehensive review of literature was provided regarding GEAR UP; adult-youth interactions; educator self-efficacy, beliefs, and behaviors; physical learning environments; and youth participation in afterschool programs.

The theoretical framework for the study, the Revised Framework for Investigating Mentoring Relationships in After-School Programs (Mekinda & Hirsch, 2013) was introduced. For the development of the conceptual framework, the theoretical framework was operationalized using the study variables. The conceptual framework, which examined the roles of the afterschool physical learning environment; afterschool educator self-efficacy, beliefs, and behaviors; and adult-youth interactions in youth participation in the GEAR UP afterschool program was also presented. Finally, the need of the study was highlighted which showed limited studies were found

examining the relationship of adult-youth interactions occurring prior to the afterschool program and youth participation in the afterschool program.

CHAPTER 3. METHODOLOGY

3.1 Overview

This chapter presents an overview of the research methods and procedures applied in this explanatory study. Namely, this chapter will communicate the research design and selection of participants for treatment and control groups. Additionally, the development, validity, and reliability of the instrument, as well as participant response rates, are described. Finally, the data collection, management, and analysis procedures are also outlined.

3.2 Purpose of the Study

The purpose of this study was to explain and predict high school student participation in a Midwestern state GEAR UP afterschool program based on the in-school adult-youth interactions, afterschool physical environment, and afterschool educator self-efficacy, behaviors, and beliefs.

3.3 Research Questions

1. What were the in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and high school student participation (i.e., intensity, duration, total exposure, breadth) in the GEAR UP afterschool program?
2. What were the relationships among high school student participation (i.e., intensity, duration, total exposure, breadth) and in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?
3. What percent variance is explained in participation when regressed on in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and youth demographic characteristics?
4. Were there significant differences between youth participants and nonparticipants of the GEAR UP afterschool program based on the adult-youth interactions (i.e., whole class

instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?

3.4 Research Design

Through this explanatory research study, the researcher intended to explain and predict relationships between high school youth participation in a GEAR UP afterschool program and their in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; SSP completion). Further, the researcher sought to establish the extent to which the afterschool physical learning environment; afterschool educator self-efficacy, beliefs, and behaviors; and in-school adult-youth interaction variables predict youth participation in an afterschool program. A quantitative research design was used in the study which reflects alignment with the theoretical and conceptual frameworks, review of existing literature, and positivist paradigm held by the researcher. Quantitative research designs, such as survey research, allow knowledge and data to be objectively obtained while upholding the level of rigor needed under the positivist paradigm (Humphrey, 2013; Park et al., 2020).

An ex post facto research method was applied in this study as assignment of participants to treatment groups was not feasible, the participants had previously undergone the treatment (i.e., intervention), and outcomes of the treatment were assessed after the experience took place (Tuckman & Harper, 2012). Study participants had previously self-selected to participate in the afterschool program and had been enrolled in the treatment for two years prior to the beginning of the study. Further, in ex post facto studies the manipulation of independent variables is not viable due to the prior existence of the treatment (Ary et al., 1990). The researcher used surveys and previously collected quantitative data to measure the independent and dependent variables. Although there was little control over the research context and interventions, the ex post facto method still allows the researcher to test for relationships that may exists among the variables of interest (Ary et al., 1990).

3.5 Institutional Review Board Approval

The researcher completed the Collaborative Institutional Training Initiative (CITI) online course, Responsible Conduct of Research with Human Subjects, to safeguard the rights of

participants involved in the study. Next, a complete application including necessary materials and instrumentation was submitted to the Institutional Review Board (IRB) and Committee on the Use of Human Research Subjects at Purdue University. The research protocol was approved by IRB on January 12, 2021 for the study entitled "GEAR UP Out-of-School Program Participation, Youth-Adult Relationships, and Learning Environments" (IRB protocol: 2020-1775). The approval letter is located in Appendix A. As a result of including previously collected data in analyses, this study is covered under two IRB protocols. The second protocol was previously approved by IRB for research beginning on May 15, 2018 and was later modified to extend the close date of the study to May 20, 2022. The approval letter is attached in Appendix B, for the study entitled "Indiana GEAR UP STEM Study" (IRB protocol: 1803020434).

3.6 Participants

In this study, the two groups of participants were youth enrolled in GEAR UP and GEAR UP afterschool educators. The target youth population were high school students who participated in a GEAR UP afterschool program in a Midwestern state. To be included in the treatment group, participants had to meet the following criteria: 1) attend one of the 11 schools where a GEAR UP program was offered in the Midwestern state, 2) enroll in ninth or tenth grade during the 2019-2020 school year, 3) participate in the GEAR UP afterschool program and record greater than zero hours of participation. A propensity score matching method was utilized to obtain a comparison group (i.e., control group) of youth who were similar to the treatment population in grade, school, gender, race, and socioeconomic status. The youth in the control group (i.e., nonparticipants) also attended a GEAR UP school in the Midwestern state and were enrolled in 9^{th} or 10^{th} grade during the 2019-2020 school year, but did not participate in the GEAR UP afterschool program. A detailed synopsis of youth participants including school, grade, gender, race, and socioeconomic status is located in the 'Demographic Characteristics of Participants' section of Chapter 4. Youth participant data was obtained directly from the GEAR UP program database for this study. GEAR UP afterschool educators and program directors recorded attendance at each GEAR UP program and the length of time each individual student was present. Variables related to school specific information, such as school, grade, race, gender, and socioeconomic status were reported to GEAR UP each semester by school administration and entered into the GEAR UP program database. In this study, the GEAR UP youth participants signify a "slice of life" sample which assumes the

study's population upholds similar attributes to other populations, in particular, other GEAR UP youth populations (Oliver & Hinkle, 1981).

The afterschool educator population selected for this study were GEAR UP afterschool building coordinators and GEAR UP regional directors during the 2019-2020 school year. The GEAR UP afterschool building coordinators were full-time educators at their respective schools and were also employed by GEAR UP to plan and implement afterschool programming at their GEAR UP afterschool program. There were one or two coordinators per school location. The GEAR UP regional directors were master educators with teaching licenses and previous teaching experience in the classroom. Regional directors were full-time educators employed by GEAR UP to provide instructional support to teachers and students at the one or two schools under their leadership. GEAR UP regional directors led a variety of in-school and out-of-school programming at their schools, assisted with or taught afterschool programs, and were present at each afterschool program.

Afterschool educators were invited to participate in this study by completing an online survey. A series of email correspondences were sent to the educators containing an invitation letter, survey information, and follow-up reminders. The email addresses of educators were obtained from the GEAR UP program administration. Additional demographic information for adult afterschool educators, including educational background and teaching experience is provided in Chapter 4.

3.7 Instrumentation

To address the research questions, different instruments were needed to measure variables related to youth and afterschool educators. The following sections detail how data was obtained for each group of participants.

3.7.1 Youth Instrument

The variables in the study related to youth were afterschool participation, in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; SSP completion), and demographic information. Data for the youth variables was previously collected by GEAR UP educators and obtained from the statewide GEAR UP

database. During each afterschool or in-school GEAR UP program, GEAR UP educators check in all youth in attendance, document the program topic or lesson, and record the time length of the program. Youth demographic information is reported yearly to GEAR UP by school administration to ensure accuracy of student demographic information.

3.7.2 Adult Educator Instrument

Following a comprehensive literature review, no existing instrument was identified that assessed the adult educators in this study. As a result, a hybrid instrument (Switzer et al., 1999) was created through the modification of existing instruments and development of GEAR UP specific questions. Qualtrics, an internet-based survey software, was used to administer the instrument. The questionnaire (Appendix C) had a total of 60 items divided into five sections: 1) Teacher Self-Efficacy, 2) Teacher Beliefs, 3) Teacher Behaviors, 4) Physical Learning Environment, and 5) Demographic Information. Regional directors with two schools under their supervision were asked to respond to the questionnaire twice, which allowed them to separately reflect upon the school environment and interactions with youth during the afterschool program at each of the two schools. Thus, the regional directors with two schools received a questionnaire with 120 items wherein all questions from the original questionnaire were duplicated. The context of the study targeted the 2019-2020 school year. As such, afterschool educators were asked to reflect upon the GEAR UP afterschool program during the previous year when completing the questionnaire.

3.7.2.1 Teacher Self-Efficacy

The first section of the afterschool educator instrument sought responses regarding afterschool educator self-efficacy using a 12 item scale. Of the 12 items from the Teachers' Sense of Efficacy Scale (short form) by Tschannen-Moran and Woolfolk Hoy (2001), eight items were taken directly from the scale and four items were modified to fit the research context. The participants were asked to respond to questions related to "How much could you do" in various situations on a nine-point anchored rating scale: 1 = *Nothing,* 3 = *Very Little,* 5 = *Some Influence,* 7 = *Quite a Bit,* 9 = *A Great Deal*. Example statements used directly from the original scale include: "*How much can you do to motivate students who show low interest in schoolwork?*" and "*How*

much can you do to calm a student who is disruptive or noisy?" Four items were modified from the original scale for the afterschool research context. For example, the original statement "*How much can you do to get adolescents to follow classroom rules?*" was changed to "*How much can you do to get adolescents to follow afterschool program rules?*"

3.7.2.2 Teacher Beliefs

The teacher beliefs section inquired about the STEM educational beliefs and views of afterschool educators and the importance of STEM skills when working with students. The STEM-related statements which participants responded to include skill development, careers, critical thinking, problem solving, collaborative projects, and engineering design principles. The five items in this section were taken directly from the Teacher's Perception of STEM Education Survey developed by Thi To Khuyen, Van Bien, Lin, Lin, and Chang (2020b). Example items included "*STEM education can help students acquire essential skills related directly to STEM careers*," and "*STEM education can help students acquire authentic problem solving to make decisions in the real world.*" A five-point anchored rating scale: 1 = *Not Important,* 2 = *A Little Important,* 3 = *Moderate Importance*, 4 = *Very Important,* 5 = *Extremely Important* was used with these statements.

3.7.2.3 Teacher Behaviors

The third section of the instrument asked afterschool educators to react to 11 statements about how often they did certain activities during the 2019-2020 afterschool program. This section was intended to gauge the behaviors of the educators during afterschool and were divided into categories of students' technology skills, critical thinking, tutoring, and college and career readiness. The teacher behaviors section utilized a five-point anchored rating scale with responses: 1 = *Never,* 2 = *Rarely,* 3 = *Occasionally,* 4 = *Often,* and 5 = *All the Time*. The first six items were modified from a survey created by Moore and Yulianti (2014) to reflect the afterschool environment and STEM learning. For example, the statement, "*Encourage students to try new skills for each learning activity*" was revised to "*Encourage students to try new skills for each STEM learning activity*." Items seven and eight were developed from an afterschool assessment guide by Huang, Cho, Mostafavi, and Nam (2010) and inquired about tutoring practices with youth.

Afterschool educators were asked how often they "*support students in developing time management and organizational skills*" and "*help students learn test preparation techniques*." Items nine, ten, and eleven were developed from GEAR UP program college and career readiness objectives. Specifically, these statements inquired how often educators "*hold conversations with students about careers*," "*discuss life skills needed beyond high school*," and "*discuss potential college majors during STEM activities.*"

3.7.2.4 Physical Learning Environment

The physical learning environment section of the survey comprised 27 items which aimed to gain a holistic view of the physical learning environment provided in the afterschool program. The physical learning environment response statements explored safety, cleanliness, food/snack availability, space arrangement, activities, lighting, noise, furniture, and technology. These items were developed from surveys by Huang, La Torre Matrundola, and Leon (2014); Barrett, Davies, Zhang, and Barrett (2015); and Soobik (2013) as well as from GEAR UP program objectives. Responses to the items were open-ended, numeric, or selected from a four-point Likert-type scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree.* Examples of items in this section included: "Based on your experiences, how has the GEAR UP program helped students?", "On average, what was the student to staff ratio?", and "The space had windows facing outdoors where natural light could come into the room." Only 24 of the 27 physical learning environment items were included in analysis as the last three items were incorporated to better inform GEAR UP administration of their programming and were not included in the study.

3.7.2.5 Demographic Information

The final section of the instrument sought demographic information about the adult educator participants. The five questions asked about gender, GEAR UP school(s) taught at, educational degrees, years teaching youth, and teaching experience with GEAR UP. Items one and three were adapted from a survey by Shields (2010); item four was modified from the survey by Thi To Khuyen et al. (2020b); and items two and five were generated from GEAR UP program information.

3.7.3 Validity

According to Schutt (2015), validity is the degree to which an instrument accurately measures the construct it is expected to measure. Instruments created by Tschannen-Moran and Woolfolk Hoy (2001), Huang et al. (2014), and Barrett et al. (2015) had previously been tested for validity. Furthermore, a panel of experts comprised of four faculty members and four graduate students examined the adult educator instrument for face and content validity in this study. The panel of experts were selected for their expertise in survey development, quantitative research methods, STEM education, and out-of-school education. Based on the panel's recommendations, slight edits were made to improve wording and reading flow. However, no significant concerns with validity were detected.

3.7.4 Reliability

Reliability is the degree in which a measure results in consistent values at different times when measuring the same phenomenon (Schutt, 2015). The instruments by Tschannen-Moran and Woolfolk Hoy (2001), Thi To Khuyen et al. (2020b), and Moore and Yulianti (2014) used in this study had previously established reliability using Cronbach's alpha (α). The reliability measures for the original instruments are shown in Table 3.1 as reported by the authors of the instruments. A Cronbach's alpha measure of 0.70 or higher is considered sufficient for reliabilities in most studies (Nunnally, 1978). Internal consistency was not conducted for this study due to an insufficient sample size of adult educators (n = 18).

Table 3.1 Reliabilities for Original Instruments Used in this Study

Instrument	Source	Cronbach's alpha (α)
Teachers' Sense of Efficacy Scale (short form)	Tschannen-Moran & Woolfolk Hoy (2001)	0.90
Teacher's Perception of STEM Education Survey Section: STEM Competencies	Thi To Khuyen et al. (2020*b*)	0.92

(Table 3.1 Continued)

Preparedness to Deliver Integrated STEM Curricula: Establishing a Baseline in Four Indonesian High Schools Section: Technology Skills	Moore & Yulianti (2014)	0.86
Preparedness to deliver integrated STEM curricula: Establishing a baseline in four Indonesian high schools Section: Critical Thinking	Moore & Yulianti (2014)	0.91

3.8 Data Collection

In this study, data collection methods were not the same for youth and afterschool educators. Youth data were obtained from GEAR UP database records, which had previously been collected by GEAR UP educators from August 1, 2019 through February 28, 2020 during the afterschool and in-school programs. Due to the constraints of the COVID-19 virus, schools and afterschool programs began transitioning to virtual learning at various times throughout the month of March. Thus, youth data collected after February 2020 was not included in analysis. GEAR UP had a set protocol in place for record keeping and data management to ensure accuracy of reporting. At the beginning of each program, educators recorded all youth in attendance and the program topic taught. GEAR UP educators then documented the length of time of the program following its completion. For the afterschool programs, educators logged any variation in the amount of time each student participated due to arriving late or leaving early. Youth demographic data reported in GEAR UP database records was originally obtained from school administration at each of the 11 schools served by GEAR UP. Variables of gender, grade, race, and socioeconomic status were updated yearly by the schools.

Adult educator data was collected using a modified Dillman method for web-based surveys. Dillman recommends a personalized five-contact strategy in which the first email contact introduces the questionnaire to participants and the four additional emails serve as follow-up reminders (Dillman et al., 2014). This study employed a three-email contact strategy over a two week span with the first email serving as an introduction and the two subsequent emails as reminders. The introduction email was directly addressed to each participant and detailed the

purpose of the study, study information, how to complete the questionnaire, and confidentiality of the research (Appendix D). The second and third emails served as follow-up and final reminders of the approaching completion deadline (Appendix E and F). These emails expressed the value of completing the questionnaire, words of gratitude for participant's time, and included the study information from the introduction email. Additionally, each email reminded adult educators that participation in the study was voluntary and participants could choose to remove themselves at any time. Questionnaires took 10 to 15 minutes to complete. The questionnaires were also developed in a manner that allowed participants to stop the questionnaire and resume at a later time and skip over questions they did not wish to answer.

Upon reviewing the questionnaire responses, the researcher recognized the single questionnaire as inadequate for regional GEAR UP program directors who oversaw more than one school. For example, the single questionnaire did not provide regional directors covering two schools the opportunity to reflect on each school setting separately making responses to the original questionnaire inaccurate for these participants. As a result, the researcher duplicated all items from the original afterschool educator instrument creating a questionnaire which asked each question twice (Appendix G). The questionnaire with duplicated questions allowed regional directors with two schools to reflect on one afterschool program at a time when responding to questions. A fourth email was sent only to regional directors covering two schools thanking them for their time, inviting them to re-take the questionnaire, explaining the need for separate school responses, and detailing the study information from the previous three emails (Appendix H). The complete timeline for email distribution is provided in Table 3.2.

Table 3.2 Data Collection Email Distribution Timeline

Correspondence Type	Date of Distribution
Introduction Email	January 14, 2021
1st Follow-Up Email Reminder	January 22, 2021
2nd Follow-Up Email Reminder	January 27, 2021
Email to Regional Directors with Two Schools	February 12, 2021

3.8.1 Participant Response Rate

The GEAR UP program had a total of 20 afterschool educators who were program coordinators or directors at the regional level during the 2019-2020 school year. Of the 20 educators reached, there were 21 survey responses recorded resulting in a response rate exceeding 100%. After investigating further into the responses, two respondents did not meet the participant criteria for the study. One respondent had reported less than one year of teaching experience with GEAR UP, thus they were not an afterschool educator during the 2019-2020 school year and were excluded from the study. Another respondent was excluded for not meeting the study parameters as they were not a building coordinator or regional director. Based on their reported schools, it was evident this respondent held a different role within GEAR UP not included in the study. A third response was excluded from analysis due to an incomplete survey submission. After removing these three responses, the final analyses comprised of 18 participants gave an overall response rate of 90%.

The regional director supplemental survey was administered to the four afterschool educators with more than one school program under their direction. Three responses were obtained resulting in a 75% response rate for this group. For data analysis purposes, the three regional director responses from the supplemental survey replaced the original survey responses from these three participants to prevent duplicated responses. The final total number of participants included in the analyses remained at 18.

3.9 Data Management

Quantitative data from this study was safely and securely stored in abiding with IRB guidelines. The web-based survey system, Qualtrics, was utilized to collect and store data. Following data analysis, the data was securely kept in the Purdue Box© digital storage system in which files were only accessible by the researchers.

3.10 Data Analysis

Quantitative data collected in this study were analyzed using the Statistical Package for Social Scientists (SPSS), version 26, and the R software, version 4.1.1. The researcher designed codebook was used to code instrument items in SPSS (Appendix I); two items from the instrument

required reverse coding. Table 3.3 outlines the variables, scale of measurement, and statistical analyses corresponding with each research question.

For research question one, descriptive statistics were analyzed on all variables to provide the researcher with a holistic view of the in-school adult-youth interactions; afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and youth afterschool participation prior to further in-depth analyses. Means, medians, frequencies, and standard deviations were conducted depending on the level of measurement.

For research question two, correlations were computed to assess the degree of relationship among in-school adult-youth interactions and youth afterschool participation. Specifically, Pearson's correlation coefficients were utilized to describe the relationships among ratio variables in this study. Prior to running Pearson correlations, the assumptions for parametric tests were assessed. Data transformations were explored as an option for handling non-normally distributed data. The removal of outliers did not substantially improve the skewness; thus, this strategy was no longer considered an option and the outliers were returned to the sample. Spearman rank correlation coefficients were used to describe the relationships between ordinal and ratio variables.

For research question three, an exploratory multiple regression analysis was completed to investigate which study variables (i.e., demographic characteristics, adult-youth interactions, educator self-efficacy, educator beliefs, educator behaviors, and afterschool physical learning environment) were significant predictors of youth afterschool participation. Nominal scale variables were dummy coded prior to inclusion in the exploratory multiple regression analysis. A forced entry method multiple regression analysis was then conducted with the statistically significant predictor variables from the exploratory multiple regression analysis. Forced entry method was the most appropriate multiple regression method due to the small number of variables in the model and because the study variables were supported by theory (Field, 2005). The resulting linear regression equation and regression model allowed predictions to be made about the dependent variable, youth participation in the afterschool program, based on the interactions among the statistically significant predictor variables, free and reduced lunch status, educator behavior, one-on-one instruction adult-youth interaction, and counseling, advising, and academic planning adult-youth interaction.

For research question four, propensity score matching method was conducted to obtain two groups (i.e., a treatment group of youth with afterschool participation and a control group of youth

with no afterschool participation) in which both groups had the same number of participants with similar demographic characteristics. Propensity score matching method is often used in research where individuals self-select to participate and it is unknown whether the treatment and control groups are similar (Rosenbaum, 1983). In this study, youth participants were matched on gender, ethnicity, grade level, school, ratio of years of GEAR UP program participation to years of enrollment in a GEAR UP school, free and reduced lunch status, English as a second language, and the number of failing grades. During the matching process, youth participants were matched with no caliper, a caliper of 0.1 times the standard deviation between matches, and a caliper of 0.2 times the standard deviation between matches to identify which match provided the best overall balance and one-to-one fit. The resulting data from the match with no caliper was selected for inclusion in the final analyses because the match preserved the greatest number of participants in each group and provided good overall balance between the treatment and control groups.

After obtaining the matched groups, independent samples t-tests were employed with ratio scale variables and Mann-Whitney U tests were utilized with ordinal scale variables. Independent samples t-tests were used to assess whether significant differences existed between the youth participant treatment group and the nonparticipant control group based on the in-school adult-youth interaction variables of whole class instruction, one-on-one instruction, and counseling, advising, and academic planning. Mann-Whitney U tests were used to assess whether significant mean rank differences existed between groups based on the adult-youth interaction variable, SSP completion.

Table 3.3 Research Questions, Variables, Scale of Measurement, and Statistical Analysis Procedure

Research Question	Independent Variable	Dependent Variable	Scale of Measurement	Statistical Analysis
1. What were the in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion); afterschool physical environment; afterschool educator self-efficacy, behaviors, and beliefs; and high school student participation (i.e., intensity, duration, total exposure, breadth) in the GEAR UP afterschool program?	Adult-Youth Interaction	Youth Part	Ratio	Mean Median
	Afterschool PLE		Ordinal	SD Frequencies
	Educator SE		Ordinal	
	Educator Behav		Ordinal	
	Educator Beliefs		Ordinal	
2. What were the relationships among high school student participation (i.e., intensity, duration, total exposure, breadth) and in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?	Adult-Youth Interaction	Youth Part	Ratio Ordinal	Pearson Correlation Spearman Rank Correlation

(Table 3.3. Continued)

3. What percent variance is explained in participation when regressed on in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; and counseling, advising, and academic planning) ; afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and youth demographic characteristics?	Adult-Youth Interaction	Youth Part	Ratio	Forced Entry Method Multiple Regression
	Mean Afterschool PLE		Ratio	
	Mean Educator SE		Ratio	
	Mean Educator Bel		Ratio	
	Mean Educator Behav		Ratio	
	Youth Dem		Nominal	
4. Were there significant differences between youth participants and nonparticipants of the GEAR UP afterschool program based on the adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?	Adult-Youth Interaction		Ratio Ordinal	Independent Samples T-test Mann-Whitney U Test

Note. Adult-Youth Interaction = Adult-Youth Interactions; Afterschool PLE = Afterschool Physical Learning Environment; Educator SE = Afterschool Educator Self-Efficacy; Educator Behav = Afterschool Educator Behaviors; Educator Beliefs = Afterschool Educator Beliefs; Youth Dem = Youth Demographic Characteristics; Youth Part = Afterschool Youth Participation

Pearson's Correlation and Spearman rank statistical tests were used to analyze relationships among afterschool youth participation and in-school adult-youth relationships. Relationships were described using the Hopkins (2006) conventions listed in Table 3.4. The level of significance threshold of $p = .05$ was set a *priori*. Practical significance was determined using effect sizes in which medium and large effect sizes were considered practically significant. Cohen's R^2 values were calculated, and Cohen's conventions (1988) were used to describe effect sizes of relationships (Table 3.5). Independent samples t-tests and Mann-Whitney U tests were used to determine if mean differences existed between treatment group and control group participants. Cohen's *d* values were calculated and Cohen's conventions (1988) were used to describe effect sizes of mean differences (Table 3.6).

Table 3.4 Conventions for Relationships (Hopkins, 2006)

Relationship Coefficient (*r*)	Convention
0.0-0.1	Trivial
0.1-0.3	Low
0.3-0.5	Moderate
0.5-0.7	High
0.7-0.9	Very Large
0.9-1.0	Nearly Perfect

Note. Relationships were reported as positive or negative.

Table 3.5 Conventions for Effect Sizes of Relationships (Cohen, 1988)

Effect Size Coefficient (R^2)	Convention
0.01-0.08	Small
0.09-0.24	Medium
≥0.25	Large

Table 3.6 Conventions for Effect Sizes of Mean Differences (Cohen, 1988)

Effect Size Coefficient (***d***)	Convention
0.0-0.2	Trivial
0.2-0.5	Small
0.5-0.8	Moderate
< 0.8	Strong

CHAPTER 4. RESULTS

4.1 Introduction

In this chapter, the study findings will be presented. Data were analyzed using SPSS, version 26, and the R statistical software package, version 4.1.1. First, the demographic characteristics of youth and adult educator participants were reported. The findings for the four research questions are then presented.

4.2 Purpose of the Study

The purpose of this study was to explain and predict high school student participation in a Midwestern state GEAR UP afterschool program based on the in-school adult-youth interactions, afterschool physical environment, and afterschool educator self-efficacy, behaviors, and beliefs.

4.3 Research Questions

1. What were the in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and high school student participation (i.e., intensity, duration, total exposure, breadth) in the GEAR UP afterschool program?
2. What were the relationships among high school student participation (i.e., intensity, duration, total exposure, breadth) and in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?
3. What percent variance is explained in participation when regressed on in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and youth demographic characteristics?
4. Were there significant differences between youth participants and nonparticipants of the GEAR UP afterschool program based on the adult-youth interactions (i.e., whole class

instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?

4.4 Demographic Characteristics of Participants

4.4.1 Youth Demographic Characteristics of All Participants

The demographic characteristics for all the study's youth participants is presented in this section (see Tables 4.1, 4.2, and 4.3). Of the 6767 youth participants who met the study criteria (attended a GEAR UP school in the Midwestern state and enrolled in 9th or 10th grade during the 2019-2020 school year) and did not have unknown SSP participation recorded in the GEAR UP database, 3559 (52.6%) of youth were male and 3208 (47.4%) were female. The most commonly reported ethnicity was White (44.6%) followed by Black/African American (29.7%), Hispanic or Latino (16.9%), Asian (5.4%), Multiracial (2.9%), American Indian or Alaskan Native (0.2%), and Native Hawaiian or Pacific Islander (0.2%), respectively. During the 2019-2020 school year, there were 3987 (58.9%) students in the 10th grade and 2780 (41.1%) students in the 9th grade. The high schools with the greatest number of youth participants were School #7 (16.0%), School #5 (15.7%), School #11 (13.5%), and School #6 (11.6%). School #3 (3.2%) and School #10 (3.4%) had the fewest participants.

Table 4.1 Demographic Characteristics of All Youth Participants

Category	Response Option	*f*	%
Gender			
	Male	3559	52.6
	Female	3208	47.4
Ethnicity			
	American Indian or Alaskan Native	14	0.2
	Asian	364	5.4
	Black, African American	2013	29.7
	Hispanic or Latino	1141	16.9
	Native Hawaiian or Pacific Islander	14	0.2
	White	3021	44.6

(Table 4.1 continued)

	Multiracial	193	2.9
	Unknown	7	0.1
Grade Level			
	9th Grade	2780	41.1
	10th Grade	3987	58.9
School			
	School #1	552	8.2
	School #2	345	5.1
	School #3	216	3.2
	School #4	552	8.2
	School #5	1063	15.7
	School #6	788	11.6
	School #7	1083	16.0
	School #8	313	4.6
	School #9	709	10.5
	School #10	232	3.4
	School #11	914	13.5

Note. N = 6767 for all categories.

Of the 6767 youth participants, 3235 (47.8%) began enrollment in GEAR UP in 2016. Similarly, 3049 (45.1%) students reported four years of enrollment in a GEAR UP school; 874 (12.9%) were enrolled three years, 1499 (22.2%) were enrolled two years, and 1345 (19.9%) were enrolled one year in a GEAR UP school. However, nearly all students (97.9%) had zero to three years of participation in any GEAR UP program. Just 140 (2.1%) students had four years of participation in GEAR UP programs.

Table 4.2 GEAR UP Demographic Characteristics of All Youth Participants

Category	Response Option	*f*	%
First Year in GEAR UP			
	2016	3235	47.8
	2017	806	11.9
	2018	1381	20.4
	2019	1345	19.9
Years in GEAR UP			
	1	1345	19.9
	2	1499	22.2
	3	874	12.9
	4	3049	45.1
Years of Participation in any GEAR UP Program			
	0	401	5.9
	1	1750	25.9
	2	2095	31.0
	3	2381	35.2
	4	140	2.1

Note. $N = 6767$ for all categories.

When examining school-based demographic characteristics (Table 4.3), 5691 (84.1%) students were not enrolled in an Individualized Education Plan (IEP) at their school. English functioned as the native language for 5983 (88.4%) youth participants and as a second language for 753 (11.1%) youth participants. In accordance with GEAR UP's requirement to serve schools with 50% or more of the student population on Free and Reduced Lunch (FRL), 4239 (62.6%) students received FRL, while 2505 (37.0%) students were not eligible for FRL. A majority (96.9%) of youth participants were not homeless.

Table 4.3 School-based Demographic Characteristics of All Youth Participants

Category	Yes		No		Unknown	
	f	%	*f*	%	*f*	%
Individualized Education Plan (IEP)	1046	15.5	5691	84.1	30	0.4
English as a Second Language (ESL)	753	11.1	5983	88.4	31	0.5
Free and Reduced Lunch (FRL)	4239	62.6	2505	37.0	23	0.3
Homeless Status	141	2.1	6556	96.9	70	1.0

Note. $N = 6767$ for all categories.

4.4.2 Youth Demographic Characteristics of Treatment Group Participants

The demographic characteristics of the study's treatment group youth participants is presented in this section (see Tables 4.4, 4.5, 4.6, and 4.7). Of the 6767 youth in the study, 1186 satisfied the condition necessary for inclusion in the treatment group (participated in the GEAR UP afterschool program during the 2019-2020 school year). Slightly more than half (52.7%) of the treatment group youth were male and the remaining 47.3% were female. The most frequently reported ethnicity was White (51.5%) followed by Black/African American (30.3%), Hispanic or Latino (9.9%), Asian (4.6%), Multiracial (3.5%), American Indian or Alaskan Native (0.1%), and Unknown (0.1%). There were 644 (54.3%) 10^{th} grade students and 542 (45.7%) 9^{th} grade students. School #5 (16.7%) and School #6 (15.9%) had the most students represented in the treatment group, while School #1 (3.0%) had the least number of students represented.

Table 4.4 Demographic Characteristics of Treatment Group Participants

Category	Response Option	*f*	%
Gender			
	Male	625	52.7
	Female	561	47.3
Ethnicity			
	American Indian or Alaskan Native	1	0.1
	Asian	55	4.6
	Black, African American	359	30.3
	Hispanic or Latino	118	9.9
	Native Hawaiian or Pacific Islander	-	-
	White	611	51.5
	Multiracial	41	3.5
	Unknown	1	0.1
Grade Level			
	9th Grade	542	45.7
	10th Grade	644	54.3
School			
	School #1	36	3.0
	School #2	111	9.4
	School #3	93	7.8
	School #4	84	7.1
	School #5	198	16.7
	School #6	189	15.9
	School #7	83	7.0
	School #8	73	6.2
	School #9	79	6.7
	School #10	103	8.7
	School #11	137	11.6

Note. N = 1186 for all categories.

Of the 1186 treatment group youth participants, 591 (49.8%) became enrolled in GEAR UP in 2016, 127 (10.7%) became enrolled in 2017, 251 (21.2%) became enrolled in 2018, and 217 (18.3%) became enrolled in 2019. Likewise, nearly half (47.4%) of youth had four years of enrollment in a GEAR UP school. The majority (95.0%) of youth in the treatment group had between one and three years of participation in GEAR UP programs.

Table 4.5 GEAR UP Demographic Characteristics of Treatment Group Participants

Category	Response Option	*f*	%
First Year in GEAR UP			
	2016	591	49.8
	2017	127	10.7
	2018	251	21.2
	2019	217	18.3
Years in GEAR UP			
	1	217	18.3
	2	261	22.0
	3	146	12.3
	4	562	47.4
Years of Participation in any GEAR UP Program			
	0	-	-
	1	261	22.0
	2	333	28.1
	3	532	44.9
	4	60	5.1

Note. N = 1186 for all categories.

The school-based demographic data revealed that a majority (81.7%) of treatment group youth were not enrolled in an IEP during the school day. English served as a second language for only 66 (5.6%) students. Sixty-two percent of youth were eligible for FRL, whereas 38% did not meet the criteria to qualify for FRL. Nearly all (98.6%) treatment group youth were not homeless.

Table 4.6 School-based Demographic Characteristics of Treatment Group Participants

Category	Yes		No		Unknown	
	f	%	*f*	%	*f*	%
Individualized Education Plan (IEP)	216	18.2	969	81.7	1	0.1
English as a Second Language (ESL)	66	5.6	1118	94.3	2	0.2
Free and Reduced Lunch (FRL)	731	61.6	453	38.2	2	0.2
Homeless Status	15	1.3	1169	98.6	2	0.2

Note. N = 1186 for all categories.

Table 4.7 lists the frequencies of treatment group participants and total youth participants at each school. The table also depicts the percentage of the total number of youth at each school who participated in the GEAR UP afterschool program during the 2019-2020 school year. The percentage of youth who participated in the afterschool program at their respective school ranged from a high of 44.4% at School #10 to a low of 6.5% at School #1.

Table 4.7 Frequencies and Percentages of Treatment Group Participants at Each School

School	Treatment Group Participants[a] *f*	Total Youth Participants[b] *f*	% of School Total
#1	36	552	6.5
#2	111	345	32.2
#3	93	216	43.1
#4	84	552	15.2
#5	198	1063	18.6
#6	189	788	24.0
#7	83	1083	7.7
#8	73	313	23.3
#9	79	709	11.1
#10	103	232	44.4
#11	137	914	15.0

Note. [a] $N = 1186$. [b] $N = 6767$.

4.4.3 Demographic Characteristics of Afterschool Educator Participants

The demographic characteristics of the study's adult afterschool educator participants are reported in this section (see Tables 4.8 and 4.9). Eighteen afterschool educators met the criteria of the study by serving as a building coordinator or regional director at a GEAR UP afterschool program during the 2019-2020 school year in the Midwestern state. Two-thirds of the 18 afterschool educators were female and one-third were male. Most afterschool educator participants (66.7%) reported a Master's degree as the highest educational degree attained. Five participants (27.8%) had a Bachelor's degree and one participant (5.6%) had a Ph.D. Three afterschool educator participants responded as teaching at two GEAR UP afterschool programs. A majority

(72.7%) of the 11 schools had two educators represented in the afterschool educator responses. School #6 and School #9 had one (4.8%) afterschool educator represented in the sample, and School #11 had three (14.3%) afterschool educators represented.

Table 4.8 Demographic Characteristics of Afterschool Educator Participants

Category	Response Option	*f*	%
Gender			
	Male	6	33.3
	Female	12	66.7
Highest Educational Degree Completed			
	GED	-	-
	High School Diploma	-	-
	Associate's Degree	-	-
	Bachelor's Degree	5	27.8
	Master's Degree	12	66.7
	Ph.D.	1	5.6
School			
	School #1	2	9.5
	School #2	2	9.5
	School #3	2	9.5
	School #4	2	9.5
	School #5	2	9.5
	School #6	1	4.8
	School #7	2	9.5
	School #8	2	9.5
	School #9	1	4.8
	School #10	2	9.5
	School #11	3	14.3

Note. N = 18 for all categories. There are 21 responses in the School category due to 3 educators reporting multiple responses.

Of the 18 afterschool educator participants, nearly all (94.4%) had six years or more of teaching experience. Only one participant reported teaching five years or less. Five (27.8%) participants responded they had more than 20 years of experience teaching youth. The most

frequent responses for years of teaching experience with GEAR UP were two years (38.9%) and three years (50.0%). One (5.6%) participant reported four years of teaching experience with GEAR UP and one (5.6%) participant had one year of teaching experience with GEAR UP.

Table 4.9 Teaching Demographic Characteristics

Category	Response Option	*f*	%
Years of Total Teaching Experience			
	5 or less	1	5.6
	6 to 10	4	22.2
	11 to 15	6	33.3
	16 to 20	2	11.1
	More than 20	5	27.8
Years of Teaching Experience with GEAR UP			
	1	1	5.6
	2	7	38.9
	3	9	50.0
	4	1	5.6

Note. $N = 18$ for all categories.

4.5 Results for Research Question 1

Research question one was: *"What were the in-school adult-youth interactions (i.e., whole class instruction, one-on-one instruction, counseling/advising/academic planning, Scholar Success Program (SSP) completion); afterschool physical environment; afterschool educator self-efficacy, behaviors, and beliefs; and high school student participation (i.e., intensity, duration, total exposure, breadth) in the GEAR UP afterschool program?"*

In-school adult-youth interactions and afterschool participation data of youth participants in the treatment group (i.e., youth who participated in the 2019-2020 GEAR UP afterschool program) was previously reported by GEAR UP educators and obtained from GEAR UP records for this research question. Additionally, the afterschool educator survey was used to measure the

afterschool physical learning environment and afterschool educator self-efficacy, behaviors, and beliefs.

4.5.1 In-School Adult-Youth Interactions

The in-school adult-youth interaction variable is comprised of four types of interactions which occurred between GEAR UP adult educators and youth during the school day. These interactions include whole class instruction; one-on-one instruction; counseling, advising, and academic planning; and SSP activity completion. GEAR UP educators recorded the type of interaction, subject focus (e.g., English, mathematics, etc.), and amount of time spent in each interaction in the GEAR UP database following each program. Of the 1186 youth participants in the treatment group, 700 (59.0%) had interacted with GEAR UP educators through counseling, advising, and academic planning programs for an average of 0.63 hours (SD = 0.79). Across subjects, a majority of youth participants (57.3%) spent the most time interacting with GEAR UP educators during math-based whole class instruction (M = 10.86 hours, SD = 17.06). Youth participants had the lowest frequency (f = 62, 5.2%) and lowest average hours (M = 0.21, SD = 1.51) of interaction with GEAR UP educators in social studies-based whole class instruction. On average, students (72.8%) spent a total of 18.74 hours (SD = 23.13) interacting with GEAR UP educators via whole class instruction.

Of the 1186 youth participants in the treatment group, 197 (16.6%) received one-on-one instruction from a GEAR UP educator in one or more subjects for a total mean of 0.54 hours (SD = 2.36). The mean hours of math-based one-on-one instruction was 0.24 (SD = 1.21). Youth participants averaged 0.11 hours of both English-based (SD = 0.80) and science-based (SD = 0.72) one-on-one instruction. Only eight youth participants (0.7%) engaged in social studies-based one-on-one instruction with GEAR UP educators for an average of 0.02 hours.

Table 4.10 Frequency of Adult-Youth Interactions for Treatment Group Youth

Category	Subject	*M* (hours)	SD	*f*	%
Whole Class Instruction					
	English	2.97	7.62	370	31.2%
	Math	10.86	17.06	679	57.3%
	Science	3.54	7.96	413	34.8%
	Social Studies	0.21	1.51	62	5.2%
	Other	1.16	4.76	252	21.2%
	Total	18.74	23.13	863	72.8%
One-on-One Instruction					
	English	0.11	0.80	48	4.1%
	Math	0.24	1.21	116	9.8%
	Science	0.11	0.72	59	5.0%
	Social Studies	0.02	0.25	8	0.7%
	Other	0.07	0.37	76	6.4%
	Total	0.54	2.36	197	16.6%
Counseling, Advising, and Academic Planning		0.63	0.79	700	59.0%

Note. N = 1186 for all categories.

GEAR UP educators offer in-school Scholar Success programming to assist high school students in fulfilling the three activity requirements per year to maintain 21st Century Scholarship eligibility. Regarding 9th grade SSP activity completion, 738 (62.2%) youth participants finished all three of the required activities, while 338 (28.5%) youth had not completed any 9th grade SSP activities. Of the 1186 youth participants, 434 (36.6%) accomplished three 10th grade SSP activities, 72 (6.1%) finished two 10th grade SSP activities, and 67 (5.6%) had finished one of the 10th grade SSP activities. A majority of students (94.0%) had not fulfilled any of the 11th grade SSP activity requirements. Only 4 (0.3%) youth participants accomplished one 12th grade SSP activity.

Table 4.11 Frequency of SSP Activity Completion for Treatment Group Youth

Grade	Number of Activities Completed	*f*	%
9th			
	0	338	28.5%
	1	42	3.5%
	2	68	5.7%
	3	738	62.2%
10th			
	0	613	51.7%
	1	67	5.6%
	2	72	6.1%
	3	434	36.6%
11th			
	0	1115	94.0%
	1	51	4.3%
	2	15	1.3%
	3	5	0.4%
12th			
	0	1182	99.7%
	1	4	0.3%
	2	-	-
	3	-	-

Note. N = 1186 for all categories. No youth participants completed two or three of the 12th grade SSP activities.

Table 4.12 lists the means, standard deviations, and medians of the four adult-youth interaction categories by school. The table depicts the differences in youth participant population, hours of adult-youth interactions, and SSP activity completion across schools. School #8 had the highest average hours of whole class instruction (M = 41.43, SD = 20.56) and one-on-one instruction (M = 4.58, SD = 6.44). Schools #1 and #4 had the highest mean hours of counseling, advising, and academic planning with 1.78 hours (SD = 1.54) and 1.71 (SD = 0.77), respectively. Most schools had a median of three 9th grade SSP activities completed except school #1, #5, and #10.

Table 4.12 Frequency of Adult-Youth Interactions by School for Treatment Group Youth

School		Whole Class Instruction	One-on-One Instruction	CAP	Scholar Success Program (SSP) Completion (Grade)			
					9th	10th	11th	12th
#1 (*N* = 36)								
	M (hours)	6.16	0.28	1.78				
	SD	6.04	1.00	1.54				
	Median				0	0	0	0
#2 (*N* = 111)								
	M (hours)	10.42	0.00	0.00				
	SD	15.28	0.00	0.00				
	Median				3	0	0	0
#3 (*N* = 93)								
	M (hours)	13.94	1.99	0.81				
	SD	11.28	4.06	0.25				
	Median				3	3	0	0
#4 (*N* = 84)								
	M (hours)	24.38	0.00	1.71				
	SD	36.82	0.02	0.77				
	Median				3	3	0	0
#5 (*N* = 198)								
	M (hours)	8.81	0.00	0.00				
	SD	19.31	0.00	0.00				
	Median				0	0	0	0
#6 (*N* = 189)								
	M (hours)	33.17	0.28	0.83				
	SD	28.70	1.38	0.21				
	Median				3	0	0	0
#7 (*N* = 83)								
	M (hours)	6.74	0.22	1.26				
	SD	9.76	0.76	0.98				
	Median				3	2	0	0
#8 (*N* = 73)								
	M (hours)	41.43	4.58	0.56				
	SD	20.56	6.44	0.38				
	Median				3	0	0	0
#9 (*N* = 79)								
	M (hours)	30.74	0.03	0.23				
	SD	24.94	0.14	0.16				
	Median				3	2	0	0

(Table 4.12 continued)

#10 (*N* = 103)								
	M (hours)	17.48	0.29	0.75				
	SD	9.12	0.64	0.86				
	Median				2	0	0	0
#11 (*N* = 137)								
	M (hours)	12.21	0.10	0.47				
	SD	10.60	0.52	0.87				
	Median				3	2	0	0

Note. CAP = Counseling, Advising, and Academic Planning

4.5.2 Afterschool Physical Learning Environment

The adult educator survey included 24 questions concerning the afterschool physical learning environment. The afterschool educator participants responded to statements inquiring the degree to which participants agreed with the statements about the afterschool physical learning environment using a Likert-type scale of *strongly disagree* (1), *disagree* (2), *agree* (3), and *strongly agree* (4). Afterschool educator participants were asked to respond to the physical learning environment questions when thinking about each GEAR UP afterschool program in which they taught. Three participants taught at two different GEAR UP afterschool programs; thus, they completed the survey questions once for each afterschool program resulting in a sample size of 18 with 21 total responses. Fourteen (66.7%) educator participants "strongly agreed" the program space was safe, clean, and secure, six (28.6%) participants "agreed" the space was safe, clean, and secure, and one (4.8%) participant "disagreed" that the program space was safe, clean, and secure. Of the 21 responses, five (23.8%) "strongly agreed" and 14 (66.7%) "agreed" students were able to select and choose from various learning methods and activities, while two (9.5%) "disagreed" with the statement. Most afterschool educators "agreed" (57.1%) or "strongly agreed" (28.6%) healthy and nutritious snacks were provided for students during the afterschool program. Regarding the afterschool program's indoor and outdoor space, 18 (85.7%) educators "strongly agreed" or "agreed" the space met the needs of the program activities, while three (14.3%) "disagreed." When asked about Makerspace Cart availability for students to freely access, the most frequent responses were "agree" (*n* = 8, 38.1%) and "strongly disagree" (*n* = 6, 28.6%).

Table 4.13 Frequencies and Percentages of Afterschool Educator Responses for Afterschool Physical Learning Environment (Items One through Eleven)

To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	1 Strongly Disagree *f* (%)	2 Disagree *f* (%)	3 Agree *f* (%)	4 Strongly Agree *f* (%)
1. The program space was safe, clean, and secure.	-	1 (4.8%)	6 (28.6%)	14 (66.7%)
2. Students were carefully supervised.	-	1 (4.8%)	8 (38.1%)	12 (57.1%)
3. Students were able to select and choose from various learning methods and activities.	-	2 (9.5%)	14 (66.7%)	5 (23.8%)
4. The program environment enhanced students' health.	-	1 (4.8%)	16 (76.2%)	4 (19.0%)
5. Healthy and nutritious snacks were provided for students (e.g., healthy and nutritious snacks include: fruits, vegetables, protein sources).	-	3 (14.3%)	12 (57.1%)	6 (28.6%)
6. Dinner meal options were provided on other afterschool days in addition to GEAR UP Diner Nights.	7 (33.3%)	5 (23.8%)	4 (19.0%)	5 (23.8%)
7. The program's indoor and outdoor space met the needs of all program activities.		3 (14.3%)	10 (47.6%)	8 (38.1%)
8. The space was arranged well for a range of activities.	1 (4.8%)	3 (14.3%)	9 (42.9%)	8 (38.1%)
9. The space was arranged well for simultaneous activities.	1 (4.8%)	5 (23.8%)	9 (42.9%)	6 (28.6%)
10. The room and wall area helped to facilitate varied learning methods.	1 (4.8%)	4 (19.0%)	10 (47.6%)	6 (28.6%)
11. Makerspace Carts were present in the room for students to freely access and tinker whenever desired.	6 (28.6%)	5 (23.8%)	8 (38.1%)	2 (9.5%)

Note. $N = 18$ for all categories with 21 responses.

When asked the number of days per week Makerspace Carts were utilized in the afterschool program, six (30.0%) participants responded two days per week, nine (45.0%) participants responded one day per week, four (20.0%) participant responded less than one day per week, and one (5.0%) participant responded zero days per week. One participant did not respond to one of the 24 physical learning environment questions (item 12).

Table 4.14 Frequencies and Percentages of Afterschool Educator Responses for Afterschool Physical Learning Environment (Item Twelve)

	1 0 days *f* (%)	2 Less than 1 day *f* (%)	3 1 day *f* (%)	4 2 days *f* (%)
12. How many days per week were Makerspace Carts utilized?	1 (5.0%)	4 (20.0%)	9 (45.0%)	6 (30.0%)

Note. $N = 17$ for Question 12 with 20 responses. One participant did not respond to the question.

Of the 20 responses, most afterschool educators "strongly agreed" ($n = 6$, 30.0%) or "agreed" ($n = 12$, 60.0%) there was an ideal student-staff ratio in their afterschool program. One participant did not respond to one of the 24 physical learning environment questions (item 13).

Table 4.15 Frequencies and Percentages of Afterschool Educator Responses for Afterschool Physical Learning Environment (Item Thirteen)

To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	1 Strongly Disagree *f* (%)	2 Disagree *f* (%)	3 Agree *f* (%)	4 Strongly Agree *f* (%)
13. There was an ideal student-staff ratio.	1 (5.0%)	1 (5.0%)	12 (60.0%)	6 (30.0%)

Note. $N = 17$ for Question 13 with 20 responses. One participant did not respond to the question.

Regarding the average number of students to one staff member in the afterschool program, two (10.5%) educators reported nine or 10 students, six (31.6%) educators reported seven or eight students, seven (36.8%) educators reported five or six students, and four (21.1%) educators reported three or four students per one staff member. Two participants did not respond to one of the 24 physical learning environment questions (item 14).

Table 4.16 Frequencies and Percentages of Afterschool Educator Responses for Afterschool Physical Learning Environment (Item Fourteen)

	1 3-4 students *f* (%)	2 5-6 students *f* (%)	3 7-8 students *f* (%)	4 9-10 students *f* (%)
14. On average, what was the student to staff ratio?	4 (21.1%)	7 (36.8%)	6 (31.6%)	2 (10.5%)

Note. $N = 16$ for Question 14 with 19 responses. Two participants did not respond to the question.

Questions 15 through 23 in the physical learning environment section of the afterschool educator survey inquired about the naturalness and technology usage in the afterschool program. A majority (66.7%) of afterschool educator participants "strongly agreed" the afterschool space had windows facing outdoors as a source of natural lighting. Of the 21 responses, 11 (52.4%) "strongly disagreed" and eight (38.1%) "disagreed" that the students had a difficult time clearly hearing the instructor or their peers during the afterschool program. Regarding the furniture and room equipment providing comfort, the most frequent responses were "agree" (n = 10, 47.6%) and "disagree" (n = 6, 28.6%). Nine (42.9%) participants "strongly agreed" and 10 (47.6%) "agreed" the afterschool space had a strong and reliable internet connection. One (4.8%) participant "disagreed" and one (4.8%) participant "strongly disagreed" the space had a strong and reliable internet connection.

Table 4.17 Frequencies and Percentages of Afterschool Educator Responses for Afterschool Physical Learning Environment (Items Fifteen through Twenty-Three)

To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	1 Strongly Disagree *f* (%)	2 Disagree *f* (%)	3 Agree *f* (%)	4 Strongly Agree *f* (%)
15. The space had windows facing outdoors where natural light could come into the room.		3 (14.3%)	4 (19.0%)	14 (66.7%)
16. The lighting of the space was easily controllable.	1 (4.8%)	5 (23.8%)	4 (19.0%)	11 (52.4%)
17. Noise disturbances were frequently heard from spaces external to the afterschool program or outside the building.*	7 (33.3%)	11 (52.4%)	1 (4.8%)	2 (9.5%)
18. Students had a difficult time clearly hearing the instructor or other peers.*	11 (52.4%)	8 (38.1%)	1 (4.8%)	1 (4.8%)
19. The furniture and room equipment provided comfort.		6 (28.6%)	10 (47.6%)	5 (23.8%)
20. The furniture and room equipment were appropriate for the age group of students.		1 (4.8%)	14 (66.7%)	6 (28.6%)
21. The colors of the space portrayed a calming mood.		5 (23.8%)	14 (66.7%)	2 (9.5%)
22. The space had strong and reliable internet connection.	1 (4.8%)	1 (4.8%)	10 (47.6%)	9 (42.9%)
23. Electronic devices (e.g., GEAR UP iPads, school laptops, etc.) were used as a learning tool.		1 (4.8%)	12 (57.1%)	8 (38.1%)

Note. $N = 18$ for all categories with 21 responses. *Items were reverse coded for Grand Mean (SD) analysis.

When asked the number of times per month electronic devices were utilized, half ($n = 10$, 50.0%) of the educators indicated "all the time." One participant did not respond to one of the 24 physical learning environment questions (item 24). The mean for the individual afterschool

physical learning environment items as reported by the afterschool educator participants was 3.09 (*SD* = 0.34).

Table 4.18 Grand Mean and Frequencies of Afterschool Educator Responses for the Afterschool Physical Learning Environment (Item Twenty-Four)

	1 None *f* (%)	2 Some of the time *f* (%)	3 Most of the time *f* (%)	4 All the Time *f* (%)
24. How many times per month were electronic devices utilized?		6 (30.0%)	4 (20.0%)	10 (50.0%)
Grand Mean (SD): 3.09 (0.34)				

Note. N = 17 for Question 24 with 20 responses. One participant did not respond to the question.

Table 4.19 depicts the means and standard deviations of the educator responses for the afterschool physical learning environment by school. Educators at School #1 reported the highest mean of 3.40 with a standard deviation of 0.38. Educators at School #6 reported the lowest mean of 2.71 (*SD* = N/A) for the afterschool physical learning environment.

Table 4.19 Means and Standard Deviation of the Afterschool Educator Responses for Afterschool Physical Learning Environment Across Schools

School	Physical Learning Environment	
	M	SD
#1	3.40	0.38
#2	3.27	0.62
#3	3.35	0.21
#4	2.85	0.21
#5	2.98	0.80
#6	2.71	-
#7	3.25	0.24
#8	2.79	0.06
#9	3.00	-
#10	2.97	0.31
#11	3.15	0.29

Note. N = 18 for all categories with 21 responses. School #6 and School #9 have no standard deviation reported due to only one participant per school. The physical learning environment was measured on a four-point scale.

4.5.3 Afterschool Educator Self-Efficacy, Behaviors, and Beliefs

The adult educator survey included 12 questions concerning teaching self-efficacy, five questions concerning STEM education beliefs, and 11 questions concerning educator behaviors while teaching in the GEAR UP afterschool program. The self-efficacy questions elicited responses regarding how much afterschool educators could do during the afterschool program with youth using a nine-point scale (1 = *nothing*, 3 = *very little*, 5 = *some influence*, 7 = *quite a bit*, and 9 = a *great deal*). Nearly half (n = 10, 47.6%) of educators reported they could do "quite a bit" to control disruptive behavior in the afterschool program. A majority (n = 11, 52.45%) of participants indicated they could do "quite a bit" to craft good questions for students. When asked how much they could do to get students to follow the rules in the afterschool program, the most frequent responses were "quite a bit" (n = 10, 47.6%), "a great deal" (n = 3, 14.3%), and "some influence" (n = 3, 14.3%). Most educators indicated they could do "quite a bit" (n = 9, 42.9%) or "a great deal" (n = 7, 33.3%) to provide an alternative example for students who are confused. Regarding how much afterschool educators could do to implement alternative teaching strategies, the most frequent responses were "quite a bit" (n = 5, 23.8%), "a great deal" (n = 4, 19.0%), between "some influence" and "quite a bit" (n = 4, 19.0%), and between "quite a bit" and "a great deal" (n = 3, 14.3%). The mean for the individual self-efficacy items as reported by the afterschool educators was 6.06 (SD = 1.29). On average, afterschool educators perceived they could have between "some influence" and "quite a bit" of influence on students in the afterschool program.

Table 4.20 Frequencies and Percentages of Afterschool Educator Teaching Self-Efficacy

	How much can you do to…	1 Nothing *f* (%)	2 *f* (%)	3 Very Little *f* (%)	4 *f* (%)	5 Some Influence *f* (%)	6 *f* (%)	7 Quite a Bit *f* (%)	8 *f* (%)	9 A Great Deal *f* (%)
1.	Control disruptive behavior in the afterschool program?	1 (4.8%)	-	3 (14.3%)	-	1 (4.8%)	2 (9.5%)	10 (47.6%)	2 (9.5%)	2 (9.5%)
2.	Motivate students who show low interest in school work?	1 (4.8%)	1 (4.8%)	3 (14.3%)	1 (4.8%)	9 (42.9%)	2 (9.5%)	4 (19.0%)	-	-
3.	Get students to believe they can do well in school work?	-	-	1 (4.8%)	2 (9.5%)	3 (14.3%)	6 (28.6%)	5 (23.8%)	3 (14.3%)	1 (4.8%)
4.	Help your students value learning?	-	1 (4.8%)	1 (4.8%)	3 (14.3%)	6 (28.6%)	4 (19.0%)	6 (28.6%)	-	-
5.	Craft good questions for your students?	-	1 (4.8%)	-	2 (9.5%)	1 (4.8%)	1 (4.8%)	11 (52.4%)	2 (9.5%)	3 (14.3%)
6.	Get adolescents to follow afterschool program rules?	-	1 (4.8%)	-	1 (4.8%)	3 (14.3%)	2 (9.5%)	10 (47.6%)	1 (4.8%)	3 (14.3%)
7.	Calm a student who is disruptive or noisy?	-	1 (4.8%)	1 (4.8%)	1 (4.8%)	4 (19.0%)	3 (14.3%)	8 (38.1%)	3 (14.3%)	-
8.	Establish a classroom management system with your students?	-	1 (4.8%)	1 (4.8%)	1 (4.8%)	5 (23.8%)	2 (9.5%)	6 (28.6%)	1 (4.8%)	4 (19.0%)
9.	Use a variety of assessment strategies?	3 (14.3%)	1 (4.8%)	3 (14.3%)	3 (14.3%)	2 (9.5%)	2 (9.5%)	4 (19.0%)	1 (4.8%)	2 (9.5%)
10.	Provide an alternative explanation or example when students are confused?	-	-	-	-	-	2 (9.5%)	9 (42.9%)	3 (14.3%)	7 (33.3%)
11.	Assist families in helping their children do well in school?	1 (4.8%)	-	3 (14.3%)	2 (9.5%)	7 (33.3%)	1 (4.8%)	3 (14.3%)	3 (14.3%)	1 (4.8%)
12.	Implement alternative teaching strategies in your afterschool program?	1 (4.8%)	1 (4.8%)	-	1 (4.8%)	2 (9.5%)	4 (19.0%)	5 (23.8%)	3 (14.3%)	4 (19.0%)
Grand Mean (SD): 6.06 (1.29)										

Note. N = 18 for all categories with 21 responses.

The afterschool educator participants responded to five items pertaining to their beliefs about the importance of STEM education on a five-point scale of *not important* (1), *a little important* (2), *moderate importance* (3), *very important* (4), and *extremely important* (5). Nearly half (*n* = 10, 47.6%) reported acquiring essential skills related to STEM careers as "extremely important". The most frequent responses to the importance of acquiring critical thinking skills were "extremely important" (n = 9, 42.9%) and "very important" (*n* = 6, 28.6%). Regarding the importance of authentic problem solving in the real world, eight (38.1%) educators indicated authentic problem solving as "extremely important," six (28.6%) educators indicated "very important," six (28.6%) educators indicated "moderate importance," and one (4.8%) educator indicated "not important." Afterschool educator participants reported acquiring engineering design abilities as "extremely important" (n = 9, 42.9%) followed by "moderate importance" (*n* = 6, 23.8%) as the second most frequent response. The mean for the individual beliefs items as reported by the afterschool educators was 3.99 (*SD* = 0.97). On average, afterschool educators believed the various aspects of STEM education were "very important" for students.

Table 4.21 Frequencies and Percentages of Afterschool Educator Beliefs

STEM education can help students…	1 Not Important *f* (%)	2 A Little Important *f* (%)	3 Moderate Importance *f* (%)	4 Very Important *f* (%)	5 Extremely Important *f* (%)
1. Acquire essential skills related directly to STEM careers.	-	2 (9.5%)	4 (19.0%)	5 (23.8)	10 (47.6)
2. Acquire critical thinking that is usually conducted by scientists, technologists, engineers, and mathematicians.	1 (4.8%)	-	5 (23.8%)	6 (28.6%)	9 (42.9%)
3. Acquire authentic problem solving to make decisions in the real world.	1 (4.8%)	-	6 (28.6%)	6 (28.6%)	8 (38.1%)
4. Leverage collaboration with others to execute STEM learning projects.	-	3 (14.3%)	5 (23.8%)	6 (28.6%)	7 (33.3%)
5. Acquire engineering design abilities (define the needs, design, and make a certain product) to make helpful products.	-	1 (4.8%)	6 (28.6%)	5 (23.8%)	9 (42.9%)
Grand Mean (SD): 3.99 (0.97)					

Note. *N* = 18 for all categories with 21 responses.

The afterschool educator participants were asked to respond to the frequency of their behaviors during the afterschool program as *never* (1), *rarely* (2), *occasionally* (3), *often* (4), or *all the time* (5). A majority of educator participants reported "often" (n = 11, 52.4%) facilitating the

exploration of new technologies to assist with STEM learning. Regarding encouraging students to try new skills during STEM activities, 11 (52.4%) educators "often" encouraged students, seven (33.3%) educators "occasionally" encouraged students, and three (14.3%) encouraged students "all the time." The most frequent responses to how often the educator helped students create products and solutions to problems were "occasionally" (n = 10, 47.6%), "rarely" (n = 4, 19.0%), and "often" (n = 4, 19.0%). When asked how often educators held conversations about careers, 10 (47.6%) participants indicated "occasionally" followed by "often" (n = 5, 23.8%) and "all the time" (n = 5, 23.8%) as the next most frequent responses. Nearly half (n = 10, 47.6%) of educators discussed college majors during STEM activities. The mean for the individual behavior items as reported by the afterschool educators was 3.46 (SD = 0.63). On average, afterschool educators demonstrated STEM behaviors between "occasionally" and "often" during the afterschool program.

Table 4.22 Frequencies and Percentages of Afterschool Educator Behaviors

How often did you do the following during the 2019-2020 GEAR UP afterschool program?	1 Never *f* (%)	2 Rarely *f* (%)	3 Occasionally *f* (%)	4 Often *f* (%)	5 All the Time *f* (%)
1. Facilitate open exploration of new technologies to help them learn STEM.	-	2 (9.5%)	7 (33.3%)	11 (52.4%)	1 (4.8%)
2. Support use of varied resources (e.g., peers, internet) to learn new skills in students.	-	1 (4.8%)	6 (28.6%)	10 (47.6%)	4 (19.0%)
3. Encourage students to try new skills for each STEM learning activity	-	-	7 (33.3%)	11 (52.4%)	3 (14.3%)
4. Support students in creating original products and solutions that reflect their own unique ideas.	2 (9.5%)	3 (14.3%)	8 (38.1%)	6 (28.6%)	2 (9.5%)
5. Help students create products and solutions that communicate clear messages and help solve problems.	1 (4.8%)	4 (19.0%)	10 (47.6%)	4 (19.0%)	2 (9.5%)
6. Facilitate groups of students in managing open-ended, complex projects.	2 (9.5%)	4 (19.0%)	6 (28.6%)	8 (38.1%)	1 (4.8%)
7. Support students in developing time management and organizational skills.	1 (4.8%)	5 (23.8%)	7 (33.3%)	6 (28.6%)	2 (9.5%)
8. Help students learn test preparation techniques.	1 (4.8%)	4 (19.0%)	8 (38.1%)	7 (33.3%)	1 (4.8%)
9. Hold conversations with students about careers.	-	1 (4.8%)	10 (47.6%)	5 (23.8%)	5 (23.8%)
10. Discuss life skills needed beyond high school with students.	-	-	5 (23.8%)	11 (52.4%)	5 (23.8%)
11. Discuss potential college majors during STEM activities.	-	3 (14.3%)	5 (23.8%)	10 (47.6%)	3 (14.3%)
Grand Mean (SD): 3.46 (0.63)					

Note. $N = 21$ for all categories.

Table 4.23 presents the means and standard deviations of the afterschool educators' self-efficacy, beliefs, and behaviors by school. The mean self-efficacy values varied from a high of 7.25 (*SD* = 0.12) at School #10 to a low of 4.54 (*SD* = 2.30) at School #4. Educators at School #9 reported the highest mean (*M* = 5.00) and educators at School #4 reported the lowest mean (*M* = 2.90, *SD* = 0.14) for beliefs. The mean values for afterschool educator behaviors ranged from a high of 4.18 (*SD* = 0.51) at School #5 to a low of 2.45 at School #4.

Table 4.23 Means and Standard Deviations of Afterschool Educators' Self-Efficacy, Beliefs, and Behaviors Across Schools

School	Self-Efficacy *M* (*SD*)	Beliefs *M (SD*)	Behaviors *M (SD*)
#1	5.83 (0.24)	4.70 (0.42)	3.82 (0.26)
#2	7.17 (1.06)	4.50 (0.71)	3.64 (0.51)
#3	6.42 (1.77)	4.50 (0.71)	3.82 (0.26)
#4	4.54 (2.30)	2.90 (0.14)	2.45 (0.77)
#5	5.96 (3.01)	3.30 (2.40)	4.18 (0.51)
#6	6.42 (-)	4.20 (-)	3.73 (-)
#7	5.92 (0.71)	3.20 (0.28)	3.14 (0.19)
#8	5.13 (0.06)	3.40 (1.13)	2.95 (0.58)
#9	7.00 (-)	5.00 (-)	2.73 (-)
#10	7.25 (0.12)	4.50 (0.71)	4.05 (0.45)
#11	5.78 (0.64)	4.20 (0.72)	3.36 (0.48)

Note. *N* = 21 for all categories. School #6 and School #9 have no standard deviation reported due to only one participant per school. Self-efficacy was measured on a nine-point scale. Beliefs and behaviors were measured on a five-point scale.

4.5.4 High School Youth Participation

The youth afterschool participation variable is comprised of four measures of participation including intensity (i.e., total hours of afterschool participation during the 2019-2020 school year), duration (i.e., number of years of afterschool participation), total exposure (i.e., total hours of afterschool participation from 2016-2020), and breadth (i.e., total hours of afterschool participation during the 2019-2020 school year spent in academic support and STEM activities). The mean of participation intensity was 11.90 (*SD* = 15.09) hours. Of the 1186 youth participants, most (67.5%)

had participated in the GEAR UP afterschool program for one year. On average, youth participants had 17.57 (*SD* = 23.39) hours of total exposure in the afterschool program. Regarding participation breadth, the mean hours of academic support (*M* = 7.60, *SD* = 9.71) were higher than STEM activities (*M* = 4.30, *SD* = 6.52).

Table 4.24 Means and Frequencies of GEAR UP Afterschool Participation

Participation Category	*M* (hours)	SD	*f*	%
Intensity	11.90	15.09	-	-
Duration				
1 Year	-	-	801	67.5%
2 Years	-	-	301	25.4%
3 Years	-	-	78	6.6%
4 Years	-	-	6	0.5%
Total Exposure	17.57	23.39	-	-
Breadth				
Academic Support	7.60	9.71	1126	94.9%
STEM Activities	4.30	6.52	957	80.7%

Note. *N* = 1186 for all categories.

Table 4.25 presents the means and standard deviations of the youth participants' afterschool participation intensity by school. The mean hours of participation intensity varied from a high of 17.28 (SD = 17.66) at School #3 to a low of 5.47 (SD = 10.80) at School #1.

Table 4.25 Means of GEAR UP Afterschool Participation Intensity by School

School	*M* (hours)	SD
#1 (*N* = 36)	5.47	10.80
#2 (*N* = 111)	13.00	15.82
#3 (*N* = 93)	17.28	17.66
#4 (*N* = 84)	15.53	17.05
#5 (*N* = 198)	12.00	15.95
#6 (*N* = 189)	12.10	16.03
#7 (*N* = 83)	8.18	10.82

(Table 4.25 continued)

#8 (*N* = 73)	11.64	11.55
#9 (*N* = 79)	6.96	13.53
#10 (*N* = 103)	13.02	13.68
#11 (*N* = 137)	10.77	13.65
Total (*N* = 1186)	11.90	15.09

Table 4.26 presents the frequencies for the number of years of afterschool participation by school. School #1 (88.9%) and School #10 (81.6%) had the highest percentage of students with one year of participation, which suggests most students at these schools began attending the afterschool program during the 2019-2020 year. Youth at School #6 (*n* = 6, 3.2%) participated in the afterschool program the longest as compared to youth at the other schools which may be due to School #6 serving as a pilot afterschool program in 2016-2017 beginning their afterschool program a year before most other schools.

Table 4.26 Frequencies and Percentages of GEAR UP Afterschool Participation Duration by School

School	Number of Years of Participation			
	1 *f* (%)	2 *f* (%)	3 *f* (%)	4 *f* (%)
#1 (*N* = 36)	32 (88.9%)	2 (5.6%)	2 (5.6%)	-
#2 (*N* = 111)	63 (56.8%)	30 (27.0%)	18 (16.2%)	-
#3 (*N* = 93)	59 (63.4%)	25 (26.9%)	9 (9.7%)	-
#4 (*N* = 84)	46 (54.8%)	28 (33.3%)	10 (11.9%)	-
#5 (*N* = 198)	123 (62.1%)	61 (30.8%)	14 (7.1%)	-
#6 (*N* = 189)	126 (66.7%)	49 (25.9%)	8 (4.2%)	6 (3.2%)
#7 (*N* = 83)	65 (78.3%)	15 (18.1%)	3 (3.6%)	-
#8 (*N* = 73)	48 (65.8%)	17 (23.3%)	8 (11.0%)	-
#9 (*N* = 79)	50 (63.3%)	24 (30.4%)	5 (6.3%)	-
#10 (*N* = 103)	84 (81.6%)	19 (18.4%)	-	-
#11 (*N* = 137)	105 (76.6%)	31 (22.6%)	1 (0.7%)	-

Table 4.27 presents the means and standard deviations of youth participants' total exposure hours in the afterschool program from 2016-2020 by school. The mean hours ranged

from a high of 24.03 (*SD* = 29.95) at School #3 to a low of 7.01 (*SD* = 12.88) at School #1. On average, students at School #3 had the most hours of exposure in the GEAR UP afterschool program compared to students at other schools.

Table 4.27 Means of GEAR UP Afterschool Participation Total Exposure From 2016-2020 by School

School	*M* (hours)	SD
#1 (*N* = 36)	7.01	12.88
#2 (*N* = 111)	21.60	28.64
#3 (*N* = 93)	24.03	29.95
#4 (*N* = 84)	21.61	21.55
#5 (*N* = 198)	17.63	23.48
#6 (*N* = 189)	19.37	25.40
#7 (*N* = 83)	11.96	17.37
#8 (*N* = 73)	19.65	23.07
#9 (*N* = 79)	12.40	22.37
#10 (*N* = 103)	16.24	19.31
#11 (*N* = 137)	13.97	17.69
Total (*N* = 1186)	17.57	23.39

Table 4.28 presents the frequencies, means, and standard deviations of youth participants' academic support and STEM activities in the GEAR UP afterschool program by school. Regarding academic support, youth participants at School #2 had the highest average hours (*M* = 12.37, *SD* = 15.07) and youth at School #1 had the lowest average hours (*M* = 3.13, *SD* = 6.08). The mean values of STEM activities ranged from a low of 0.63 (*SD* = 0.95) hours to a high of 6.04 (*SD* = 8.11) hours. Overall, the mean hours of STEM activities were lower than the mean hours of academic support at all schools except School #4 and School #5. All (100%) students at School #7 and School #8 who participated in the afterschool program received academic support during the 2019-2020 school year. However, no schools had 100% participation in STEM activities.

Table 4.28 Frequencies and Mean Hours of GEAR UP Afterschool Participation Breadth During the 2019-2020 School Year by School

School	Academic Support		STEM Activities	
	M (SD)	*f*(%)	*M* (SD)	*f*(%)
#1 (*N* = 36)	3.13 (6.08)	31 (86.1%)	2.34 (4.86)	25 (69.4%)
#2 (*N* = 111)	12.37 (15.07)	110 (99.1%)	0.63 (0.95)	53 (47.7%)
#3 (*N* = 93)	10.84 (10.82)	92 (98.9%)	6.45 (7.01)	79 (84.9%)
#4 (*N* = 84)	7.30 (8.00)	79 (94.0%)	8.23 (9.11)	82 (97.6%)
#5 (*N* = 198)	5.96 (7.93)	170 (85.9%)	6.04 (8.11)	188 (95%)
#6 (*N* = 189)	7.08 (9.75)	179 (94.7%)	5.02 (6.40)	182 (96.3%)
#7 (*N* = 83)	5.67 (7.18)	83 (100%)	2.50 (3.82)	48 (56.5%)
#8 (*N* = 73)	9.57 (9.71)	72 (98.6%)	2.07 (2.06)	61 (83.6%)
#9 (*N* = 79)	4.32 (7.09)	75 (94.9%)	2.64 (6.58)	57 (72.2%)
#10 (*N* = 103)	10.15 (9.56)	103 (100%)	2.87 (4.60)	63 (61.2%)
#11 (*N* = 137)	6.08 (7.55)	132 (96.4%)	4.69 (6.22)	119 (86.9%)
Total (*N* = 1186)	7.60 (9.71)	1126 (94.9%)	4.30 (6.52)	957 (80.7%)

Note. Academic support and STEM activities were measured in hours.

4.6 Results for Research Question 2

Research question two was: *"What were the relationships among high school student participation (i.e., intensity, duration, total exposure, breadth) and in-school adult-youth interactions (i.e., whole class instruction, one-on-one instruction, counseling/advising/academic planning, Scholar Success Program (SSP) completion)?"*

This research question sought to understand whether the hours of adult-youth interaction are related to youth participation in the afterschool program. Pearson correlations were performed among variables with a ratio scale of measure, and Spearman-rank correlations were completed between variables with ordinal and ratio scales of measure. To describe the resulting relationship coefficients (*r*), Hopkins (2006) conventions were applied. Further, effect sizes were calculated, and practical significance was established using Cohen's (1988) conventions.

Following the Pearson correlation analysis, significant relationships were identified between one-on-one instruction and three participation variables as well as between counseling, advising, and academic planning and four participation variables. One-on-one instruction had a

positive, trivial relationship (r = 0.08) with both participation intensity and total exposure. The small effect size (R^2 = 0.01) for both relationships reveal the correlations are not practically significant. The low correlation (r = 0.11) between one-on-one instruction and academic support was not practically significant due to the small effect size (R^2 = 0.01). There was a positive, low relationship (r = 0.18) and small effect size (R^2 = 0.03) between counseling, advising, and academic planning and intensity resulting in a relationship that was not practically significant. Counseling, advising, and academic planning had a positive, low relationship (r = 0.14) with both total exposure and academic support. The correlations for both set of variables had a small effect size (R^2 = 0.02) and were not practically significant. Additionally, there was a positive, low relationship (r = 0.21) and small effect size (R^2 = 0.04) between counseling, advising, and academic planning and STEM activities.

Table 4.29 Pearson Correlations Between Adult-Youth Interaction Variables and Participation Variables

Variables	WCI[a]	OOI[a]	CAP[a]
Intensity[b]	0.01	0.08**	0.18**
Total Exposure[b]	0.05	0.08**	0.14**
Academic Support[b]	0.03	0.11**	0.14**
STEM Activities[b]	-0.03	0.03	0.21**

Note. WCI = Whole Class Instruction, OOI = One-on-One Instruction, CAP = Counseling, Advising, and Academic Planning. ** p<0.01. [a]Adult-Youth Interaction Variables, Independent Variables; [b]Participation Variables, Dependent Variables.

Following the Spearman rank correlation analyses, a significant relationship was identified between 10th grade SSP activity completion and participation duration. Tenth grade SSP activity completion had a low correlation (r = 0.11) with duration. As a result of the small effect size (R^2 = 0.01), the correlation was not practically significant. No other significant relationships were identified between SSP activity completion and participation or between adult-youth interactions and participation duration (Tables 4.29 and 4.30).

Table 4.30 Spearman Rank Correlations Between SSP Activity Completion Variables and Participation Variables

Variables	9th Grade SSP[a]	10th Grade SSP[a]	11th Grade SSP[a]	12th Grade SSP[a]
Intensity[b]	0.04	0.01	0.03	-0.04
Duration[b]	0.05	0.11**	0.04	-0.04
Total Exposure[b]	0.06	0.04	0.01	-0.05
Academic Support[b]	0.05	0.00	0.04	-0.02
STEM Activities[b]	0.05	0.02	-0.06	-0.04

Note. SSP = Scholar Success Program. [a]Adult-Youth Interaction Variables, Independent Variables; [b]Participation Variables, Dependent Variables. ** $p<0.01$.

Table 4.31 Spearman-Rank Correlations Between Adult-Youth Interaction Variables and Participation Duration

Variables	WCI[a]	OOI[a]	CAP[a]
Duration[b]	0.03	0.00	0.02

Note. WCI = Whole Class Instruction, OOI = One-on-One Instruction, CAP = Counseling, Advising, and Academic Planning. [a]Adult-Youth Interaction Variables, Independent Variables; [b]Participation Variable, Dependent Variable.

4.7 Results for Research Question 3

Research question three was: *"What percent variance is explained in participation when regressed on in-school adult-youth interactions (i.e., whole class instruction, one-on-one instruction, and counseling/advising/academic planning); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and youth demographic characteristics?"*

A forced entry method exploratory multiple regression analysis was performed with twelve predictor variables (i.e., gender, ethnicity, free and reduced lunch status, school size, grade, educator self-efficacy, educator beliefs, educator behaviors, afterschool physical learning environment, whole class instruction, one-on-one instruction, and counseling, advising, and academic planning) and one dependent variable (i.e., participation intensity). The resulting regression model was statistically significant ($p < 0.01$) for explaining variance in participation intensity. The percent variance explained in participation when regressed on gender, ethnicity, free and reduced lunch status, school size, grade, educator self-efficacy, educator beliefs, educator behaviors, afterschool physical learning environment, whole class instruction, one-on-one

instruction, and counseling, advising, and academic planning was 5.9% (R^2 = 0.059). This low percent variance indicates the regression model is a weak fit for explaining afterschool participation.

Table 4.32 Exploratory Multiple Regression Analysis Model Summary for Twelve Predictor Variables

	R	R^2	Adjusted R^2	p
Model	0.24	0.059	0.049	0.000

Note. Predictor Variables = Gender, Ethnicity, Free and Reduced Lunch Status, School Size, Grade, Educator Self-Efficacy, Educator Beliefs, Educator Behaviors, Afterschool Physical Learning Environment, Whole Class Instruction, One-on-One Instruction, and Counseling, Advising, and Academic Planning. Dependent Variable = Participation Intensity

Free and reduced lunch status, educator behaviors, one-on-one instruction, and counseling, advising, and academic planning were statistically significant predictor variables ($p \leq 0.05$) in the exploratory multiple regression analysis.

Table 4.33 Exploratory Multiple Regression Analysis Results for Predictor Variables

Variable	Unstandardized Coefficients B	Std. Error	*t*	p
(Constant)	1.60	8.02	0.20	0.842
Gender	0.75	0.86	0.87	0.385
Ethnicity	−0.40	0.91	−0.44	0.663
Free and Reduced Lunch	1.79	0.91	1.96	0.050
School Size	1.55	0.97	1.60	0.110
Grade	−1.18	0.97	−1.22	0.221
Educator Self-Efficacy	0.89	1.20	0.75	0.456
Educator Beliefs	−0.74	1.28	−0.57	0.566
Educator Behaviors	2.58	1.03	2.50	0.012
Afterschool PLE	−1.68	2.34	−0.72	0.474
Whole Class Instruction	−0.02	0.02	−0.92	0.359
One-on-One Instruction	0.51	0.19	2.63	0.009
CAP	3.94	0.59	6.65	0.000

Note. CAP = Counseling, Advising, and Academic Planning. Afterschool PLE = Afterschool Physical Learning Environment.

Following the exploratory regression analysis, a forced entry method multiple regression analysis was performed with the four statistically significant predictor variables (i.e., free and reduced lunch status, educator behaviors, one-on-one instruction, and counseling, advising, and academic planning) and one dependent variable (i.e., participation intensity). The resulting regression model was statistically significant ($p < 0.01$) for explaining variance in participation intensity. The percent variance explained in participation when regressed on free and reduced lunch status, educator behaviors, one-on-one instruction, and counseling, advising, and academic planning was 5.3% ($R^2 = 0.053$). The low percent variance indicates the regression model is a weak fit for explaining afterschool participation.

Table 4.34 Multiple Regression Analysis Model Summary for Statistically Significant Predictor Variables

	R	R^2	Adjusted R^2	p
Model	0.23	0.053	0.049	0.000

Note. Predictor Variables = Free and Reduced Lunch Status, Educator Behaviors, One-on-One Instruction, and Counseling, Advising, and Academic Planning. Dependent Variable = Participation Intensity

Free and reduced lunch status, educator behaviors, one-on-one instruction, and counseling, advising, and academic planning were statistically significant predictor variables ($p \leq 0.05$). For the multiple regression model, the linear equation was $Y' = -3.13 + 1.81x_1 + 3.14x_2 + 0.55x_3 + 3.93x_4$ where 1 = free and reduced lunch, 2 = educator behaviors, 3 = one-on-one instruction, and 4 = counseling, advising, and academic planning.

Table 4.35 Multiple Regression Analysis Results for Statistically Significant Predictor Variables

Variable	Unstandardized Coefficients B	Std. Error	*t*	p
(Constant)	−3.13	3.30	−0.95	0.343
Free and Reduced Lunch	1.81	0.89	2.05	0.041
Educator Behaviors	3.14	0.87	3.63	0.000
One-on-One Instruction	0.55	0.18	3.00	0.003
CAP	3.93	0.57	6.96	0.000

Note. CAP = Counseling, Advising, and Academic Planning.

4.8 Results for Research Question 4

Research question four was: "*Were there significant differences between youth participants and nonparticipants of the GEAR UP afterschool program based on the adult-youth interactions (i.e., whole class instruction, one-on-one instruction, counseling/advising/academic planning, and SSP completion)?"*

Prior to completing the data analysis for research question four, propensity score matching method was performed to obtain a sample of students from the control group (i.e., nonparticipants of the afterschool program) who had similar characteristics to the treatment group (i.e., participants of the afterschool program). Chapter three provides additional details on the matching methods and match criteria. The match produced a total sample of 2,318 students with 1,159 students in each of the participant and nonparticipant groups. An independent samples t-test was used to analyze group differences for ratio scale adult-youth interaction variables. A Mann-Whitney U test was conducted to analyze differences between participant and nonparticipant groups with the ordinal scale adult-youth interaction variable, SSP completion.

The independent samples t-test results indicated there was a statistically significant difference ($p < 0.01$) between afterschool participants and nonparticipants for mean hours of one-on-one instruction. Comparing participants and nonparticipants, afterschool participants had higher average hours of one-on-one instruction. However, the difference between groups for mean hours of one-on-one instruction had a trivial effect size ($d = 0.14$), which is not practically significant. There was also a statistically significant difference ($p \leq 0.05$) between groups for mean hours of counseling, advising, and academic planning in which nonparticipants had higher average hours of interaction than participants. As a result of the trivial effect size ($d = 0.08$), the mean differences for counseling, advising, and academic planning are not practically significant.

Table 4.36 Independent Samples t-Test Results for Adult-Youth Interactions of GEAR UP Afterschool Participants and Nonparticipants

Adult-Youth Interaction Category	*M* (hours)	*SD*	*t*	p	Cohen's *d*
Whole Class Instruction					
Participants	18.86	23.23	0.36	0.72	-
Nonparticipants	19.20	23.17			
One-on-One Instruction					
Participants	0.56	2.38	−3.44	0.00**	0.14

(Table 4.36 Continued)

Nonparticipants	0.25	1.90			
CAP					
Participants	0.63	0.79	1.94	0.05*	0.08
Nonparticipants	0.70	0.95			

Note. N = 1159 for each group. CAP = Counseling, Advising, and Academic Planning. ** $p<0.01$. * $p\leq0.05$.

The Mann-Whitney U test result indicated there were no statistically significant differences between participants and nonparticipants for any grade level of SPP activity completion. Participants and nonparticipants have similar mean ranks for the number of SSP activities finished.

Table 4.37 Mann-Whitney U Test Results for SSP Activity Completion of GEAR UP Afterschool Participants and Nonparticipants

SSP Activity Completion Grade Level	Mean Rank	Mann-Whitney U	p	Z
9th Grade				
Participants	1163.12	667443.50	0.761	−0.31
Nonparticipants	1155.88			
10th grade				
Participants	1172.43	656657.00	0.301	−1.04
Nonparticipants	1146.57			
11th grade				
Participants	1164.79	665511.00	0.338	−0.96
Nonparticipants	1154.21			
12th grade				
Participants	1158.99	671055.00	0.736	−0.34
Nonparticipants	1160.01			

Note. N = 1159 for each group.

CHAPTER 5. CONCLUSIONS AND DISCUSSION

5.1 Introduction

In this chapter, the study conclusions will be presented and connections will be drawn between the conclusions and previous research. The implications for theory, research, and practice will then be highlighted. The chapter will conclude with recommendations for future research.

5.2 Purpose of the Study

The purpose of this study was to explain and predict high school student participation in a Midwestern state GEAR UP afterschool program based on the in-school adult-youth interactions, afterschool physical environment, and afterschool educator self-efficacy, behaviors, and beliefs.

5.3 Research Questions

1. What were the in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and high school student participation (i.e., intensity, duration, total exposure, breadth) in the GEAR UP afterschool program?
2. What were the relationships among high school student participation (i.e., intensity, duration, total exposure, breadth) and in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?
3. What percent variance is explained in participation when regressed on in-school adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning); afterschool physical learning environment; afterschool educator self-efficacy, behaviors, and beliefs; and youth demographic characteristics?
4. Were there significant differences between youth participants and nonparticipants of the GEAR UP afterschool program based on the adult-youth interactions (i.e., whole class instruction; one-on-one instruction; counseling, advising, and academic planning; Scholar Success Program (SSP) completion)?

5.4 Conclusions and Discussion

There were five conclusions for the study that related to the afterschool physical learning environment; educator self-efficacy, beliefs, and behaviors; relationships between adult-youth interactions and participation; variance explained by adult-youth interactions; differences in hours of adult-youth interactions between youth participants and nonparticipants; and variable afterschool program participation rates and hours spent in afterschool activities are the school level. A discussion related to the contribution to the literature and connection to previous studies is also provided for each conclusion.

5.5 Conclusion 1

Afterschool educators were somewhat self-efficacious, believed STEM education to be very important, demonstrated STEM behaviors occasionally, and agreed the afterschool physical learning environment was suitable.

5.5.1 Discussion

Results from the study indicated afterschool educators were somewhat self-efficacious. On average, participants responded they had greater than some influence when engaging or instructing students in the afterschool program. The high self-efficacy reported by participants in this study supports previous research on the teaching self-efficacy of educators with a greater number of years in the profession (Klassen & Chiu, 2010; Wolters & Daugherty, 2007). According to Wolters and Daugherty (2007), an educator's self-efficacy increases as they gain years of teaching experience. Almost all afterschool educators in this study had more than five years of teaching experience, indicating the participants were not novice teachers. The number of mastery teaching experiences achieved by afterschool educators may have also impacted their self-efficacy. Previous research shows mastery experiences, or teaching experiences an educator views as successful, influence an educator's resulting self-efficacy (Bandura, 1997; Knoblauch & Chase, 2015; Usher & Pajares, 2008). Mastery experiences can be attained through continued positive teaching experiences and develops over time. While most of the afterschool educators had extensive previous classroom teaching experience, teaching in afterschool programs is different than teaching in a classroom due to the informal context. Thus, mastery experiences obtained from

teaching in the afterschool program may also have a strong link to the self-efficacy of afterschool educators. Most afterschool educators reported more than one year of teaching experience in the GEAR UP afterschool program indicating the afterschool educators may have a greater number of previous mastery teaching experiences in the afterschool program leading to higher self-efficacy.

The results of this study revealed that afterschool educators had positive beliefs and behaviors regarding STEM learning. On average, participants believed STEM education to be very important, and educators implemented STEM-based learning strategies in the afterschool program between occasionally and often. The connection of STEM learning beliefs and behaviors support the results of previous studies which emphasize that the beliefs maintained by educators are related to their behaviors and educational practices utilized during their instruction (Capps & Crawford, 2013; Wang et al., 2011). The afterschool educators in this study believed STEM education to be very important; thus, their behaviors regarding the implementation of STEM-based learning strategies were also positive. However, the positive STEM related behaviors reported by the afterschool educators contradicts previous research on the preparedness and behaviors of STEM educators. Moore and Yulianti (2014) found that most STEM educators were not well prepared to use STEM-based learning strategies in STEM classes. If educators do not feel prepared to integrate learning strategies, they are less likely to use the strategies during instruction. The afterschool educators in this study may have reported higher levels of STEM beliefs and STEM integration behaviors because several of the afterschool educators have specializations in STEM subjects or prior experience teaching STEM. The background and previous experiences of the afterschool educators could contribute to their beliefs and behaviors in the GEAR UP afterschool program.

Overall, educator participants agreed the physical learning environment of the school buildings was suitable for the GEAR UP afterschool program. However, nearly one-third of respondents indicated the afterschool space was not arranged well for simultaneous activities and the furniture was uncomfortable for students. Previous physical learning environment research suggests that educators adjust their lesson plans and teaching to conform to the physical space provided, regardless of whether the physical learning environment was ideal for the educator (Deed et al., 2014; Mulcahy et al., 2015; Woolner et al., 2014). Additionally, educators adapted the room equipment and resources of their educational space to best suit their needs (Saltmarsh et al., 2015). Afterschool educators in this study may have also modified their teaching and afterschool activities in response to the furniture and room equipment available in the physical

learning environment. As such, educators may have been restricted to teaching lessons that worked within the afterschool space provided. The results of this study indicate that afterschool educators find the physical learning environment suitable, but the results do not indicate whether the space allowed for afterschool educators to teach the lessons and activities they desired. Therefore, the physical learning environment was not truly suitable for the afterschool program if afterschool educators could not implement the lessons they wanted to teach.

The results indicating generally favorable views of the afterschool physical learning environments contradicts Polman's (2003) findings that school-based afterschool programs struggle to obtain needed resources from the schools where the programs are held causing challenges for the afterschool program implementation. In this study, the GEAR UP program provided resources such as lesson materials, Makerspace Carts, and iPads for educators to use in their afterschool programs. While the GEAR UP afterschool programs in this study were school-based, the afterschool educators did not rely on the schools to provide resources beyond the space and furniture. Thus, afterschool educators may have reported more favorable views of the physical learning environment because educators were not depending on the schools for all of the afterschool resources as GEAR UP provided some of the physical learning environment materials.

5.6 Conclusion 2

Free and reduced lunch status; educator behaviors; one-on-one instruction; and counseling, advising, and academic planning predicted 5.3% variance in high school student afterschool participation.

5.6.1 Discussion

The study results revealed that a low percentage of the change in high school student afterschool participation was explained by four factors: (1) free and reduced lunch status, (2) educator behaviors, (3) one-on-one instruction, and (4) counseling, advising, and academic planning. Thus, the study variables were not strong predictors of participation in the GEAR UP afterschool program.

Results of this study indicate individualized adult-youth interactions (i.e., one-on-one instruction and counseling, advising, and academic planning) and educator behaviors weakly

predicted youth afterschool participation, which may have been due to both positive and negative adult-youth interactions and behaviors being included in the study. Relationships between educators and youth are developed over time through repeated interactions. Rhodes (2002) emphasizes that effective mentoring relationships stem from positive adult-youth interactions and supportive adult behaviors. However, not all adult-youth interactions are positive. Educators demonstrating negative behaviors, overbearing authority, and poor attitudes cause youth to separate themselves from the educator and limit future interactions from taking place (Buehler et al., 2020; Dworkin & Larson, 2007; Deutsch & Jones, 2008). For example, Buehler and colleagues (2020) found that youth felt uncomfortable being around educators who were disrespectful or unpleasant. Negative interactions experienced by youth in this study may have resulted in lower participation in the afterschool program as youth wanted to avoid further negative interactions with the educator during the afterschool program. The adult-youth interactions measured in this study did not distinguish between positive and negative interactions, which is a limitation. Another limitation is that the educator behaviors were only measured by the educators themselves and not by the youth in the afterschool program. Positive adult-youth interactions and educator behaviors from the viewpoint of the youth may serve as stronger predictors of afterschool participation.

The study results reveal free and reduced lunch status also weakly predicted youth afterschool participation which may be due to program specific factors of the GEAR UP program examined in the study. GEAR UP serves schools in predominately low-income communities as greater than 50% of the students in GEAR UP schools qualify for free and reduced lunch (ED, 2021a). As such, the educators at the GEAR UP afterschool programs may have been conscious of the barriers faced by low-income families and provided resources to reduce the financial barriers. Program cost and transportation home following the afterschool program are two of the primary barriers experienced by low-income families wanting to send their youth to afterschool programs (Afterschool Alliance, 2020). The GEAR UP afterschool program is free for all youth to attend, which reduces cost associated limitations. Additionally, many of the GEAR UP afterschool programs provide snacks or meals for their students and bus transportation home at the end of the program. However, this study did not examine which afterschool programs provided transportation, which is a limitation of this study.

Results from this study indicate other factors of the GEAR UP afterschool program may serve as more salient predictors of participation than in-school adult-youth interactions. For

example, in-school adult-youth interactions may not have as strong of a relationship with afterschool participation as the adult-youth interactions taking place during the afterschool program. Previous research indicates that relationships developed between afterschool educators and youth during the afterschool program affects the attendance rate and other outcomes obtained by youth (Rhodes, 2004). Thus, adult-youth interactions occurring prior to the afterschool program may be less salient than adult-youth interactions taking place during the afterschool program. The adult-youth interactions in this study may have served as a more significant predictor of afterschool participation if the adult-youth interactions were measured during the afterschool program. Previous literature also supports the notion of other program factors, such as program activities and educational content, playing a substantial role in predicting afterschool participation (Deschenes et al., 2010; Fredricks et al., 2014; Greene et al., 2013). Deschenes and colleagues (2010) found that continued participation in a high school afterschool program was predicted by the availability of leadership activities for students. This study did not examine the types of afterschool activities offered to students. Future research may benefit from further investigating program activities as a predictor of afterschool participation.

5.7 Conclusion 3

Individualized adult-youth interactions were positively related to afterschool participation.

5.7.1 Discussion

In this study, the two individualized adult-youth interactions (i.e., one-on-one instruction and counseling, advising, and academic planning) had more statistically significant relationships with afterschool participation than the two group-based adult-youth interactions (i.e., whole class instruction and SSP activity completion). One-on-one instruction was related to three variables of afterschool participation (i.e., intensity, total exposure, and academic support), and counseling, advising, and academic planning was related to four variables of afterschool participation (i.e., intensity, total exposure, academic support, and STEM activities). The relationship between 10^{th} grade SSP activity completion and afterschool participation duration was the only relationship identified involving group-based adult-youth interactions. Results of this study indicated individualized adult-youth interactions were most salient for afterschool participation. However,

caution is warranted regarding the practical application of these results as none of the relationships between adult-youth interactions and afterschool participation were practically significant.

The study results support previous research which highlights the salience of individualized adult-youth interactions for youth outcomes, participation, and engagement in afterschool programs (Jones & Deutsch, 2011; Lerner et al., 2006; Rhodes, 2002; Rhodes, 2004). Jones and Deutsch (2011) found one-on-one adult-youth interactions develop into supportive relationships when educators emphasize shared experiences, incorporate culture into discussions, and encourage frequent conversations. In one-on-one interactions, adults can use past experiences to relate to the events youth are facing and share advice on how to overcome challenges. Individualized adult-youth interactions allow youth and educators to build deeper connections that extend into the afterschool program, which would not be possible in larger group settings.

The conclusion that group-based adult-youth interactions were not important in this study contradicts research by Dubois and colleagues (2011) who found group-based and individualized adult-youth interactions promote positive youth development outcomes. Group-based adult-youth interactions may be influential for other beneficial outcomes such as academic and behavioral improvements (Dubois et al., 2011; Hanlon et al., 2009; Jent & Niec, 2009) but not for participation. The results of this study did not support previous research which may be due to the high student to educator ratio during group-based adult-youth interactions. Previous research indicates that group-based adult-youth interactions result in positive youth development outcomes when the ratio of youth to adults is low (Jent & Niec, 2009; Hanlon et al., 2009). For example, Jent and Niec (2009) reported youth increased their problem solving abilities following group-based interactions with two to four youth per adult. Additionally, Hanlon and colleagues (2009) found that group-based interactions comprised of one adult with 10 at-risk youth resulted in improved grade point averages and in-school behaviors. Both of these studies suggest small group sizes, consisting of 10 students or less per educator, are needed for outcomes to result. In this study, group-based adult-youth interactions (i.e., whole class instruction and SSP activity completion) involved a large student to educator ratio with a class of 20 to 30 students per educator. Smaller group sizes of 10 students or less may be needed for group-based interactions to be related to youth afterschool participation.

The largest relationship identified among the variables of adult-youth interactions and afterschool participation was between counseling, advising, and academic planning and STEM

activities. During counseling, advising, and academic planning interactions, educators and youth discuss school-related concerns, post-secondary opportunities, and/or future careers. As GEAR UP provided STEM programming in the afterschool program, it is likely educators and youth talked about STEM fields during conversations about future career opportunities. Previous research indicates an increased exposure to STEM disciplines through activities, discussions, and programs positively influences youth interest in pursuing STEM careers (Dabney et al., 2012, Lin et al., 2021; Nugent et al., 2015). Thus, these findings may indicate that youth who have engaged in discussions with afterschool educators about careers and future academic opportunities may use the GEAR UP afterschool space to further explore STEM related interests and careers.

5.8 Conclusion 4

Youth afterschool participants reported greater hours of one-on-one instruction than nonparticipants, and nonparticipants reported greater hours of counseling, advising, and academic planning than participants.

5.8.1 Discussion

The study results revealed that the differences in the average number of hours of individualized adult-youth interactions (i.e., one-on-one instruction and counseling, advising, and academic planning) between youth afterschool participants and nonparticipants were statistically significant. Afterschool participants reported higher average hours of one-on-one instruction, and nonparticipants reported higher average hours of counseling, advising, and academic planning. However, the differences between groups for the hours of adult-youth interactions were not practically significant, so caution is warranted regarding the practical application of these results in afterschool programs.

Repeated adult-youth interactions are necessary for relationships to develop between adults and youth, which, in turn, promotes future interactions (Parra 2002, Rhodes 2004). The results of this study partially support previous research by Parra (2002) and Rhodes (2004) as afterschool participants reported higher hours of one-on-one adult-youth interactions than nonparticipants. Due to the higher number of hours of one-on-one adult-youth interactions, youth afterschool

participants may have developed a stronger relationship with the afterschool educator than nonparticipants. Thus, afterschool participants may have chosen to participate in the afterschool program as a result of the close relationship youth developed with the afterschool educator during their one-on-one interactions. Youth may have perceived the afterschool program as an opportunity to continue building a mentoring relationship with the afterschool educator.

Conversely, nonparticipants in this study averaged more time spent in in-school counseling, advising, and academic planning with afterschool educators than participants indicating the amount of in-school adult-youth interactions may not shape youth's decision to participate in the afterschool program. Students who self-selected to participate in the GEAR UP afterschool program may have pre-existing interests and positive attitudes toward STEM impacting their decision to participate regardless of the in-school adult-youth interactions (Vallett et al., 2018). Even though participants had lower number of hours of counseling, advising, and academic planning, their interests in the STEM afterschool activities may have served as a stronger predictor of their decision to attend the afterschool program than the hours of in-school adult-youth interactions. Therefore, students with pre-existing STEM interests may participate in the afterschool program due of their STEM interests and not their relationships with the afterschool educator.

While adult-youth interactions are precursors to the development of relationships between educators and youth, mentoring relationships are difficult to achieve without consistent communication and contact over time (Parra, 2002; Rhodes, 2002, 2004). On average, participants received 34 minutes of one-on-one instruction and nonparticipants received 15 minutes of one-on-one instruction during the 2019-2020 school year. Regarding counseling, advising, and academic planning interactions, participants averaged 38 minutes and nonparticipants averaged 42 minutes throughout the school year. As a result of the low average time spent in individualized adult-youth interactions, it is likely most students did not develop meaningful relationships with educators which could contribute to the differences between participants and nonparticipants having a trivial effect size.

The limited hours of adult-youth interaction also suggest inconsistent contact occurred between educators and youth. Therefore, even if adult-youth relationships developed, the relationships were short lived. Grossman and Rhodes (2002) found that relationships between youth and mentoring adults spanning less than three months negatively impacted youth

developmental outcomes, which may have impacted youths' decision to participate in the afterschool program. School-based afterschool programs, and the accompanying in-school adult-youth interactions, only occur during the school year. The length of school year limits the effectiveness of relationships between afterschool educators and youth due to the extended summer and winter breaks when educators and youth do not interact (Dubois et al., 2011). As a result, sustained relationships between afterschool educators and youth in this study may not have been possible due to inconsistent in-school adult-youth interactions during summer and winter breaks. The extent to which relationships were developed and sustained between afterschool educators and youth was not measured in this study and is a limitation for understanding the effectiveness of in-school adult-youth interactions. More consistent adult-youth interactions may be needed for relationships to develop between afterschool educators and youth and for practical differences to be seen between participants and nonparticipants.

5.9 Conclusion 5

Youth afterschool participation rates and hours spent in afterschool program activities varied at the school level.

5.9.1 Discussion

Results from the study revealed there were school level differences in the percentage of the student population that attended the GEAR UP afterschool program. The percentage of students attending the afterschool program at their respective school ranged from around 7% to nearly 45%. The results indicate that the school context of the afterschool program may play a role in afterschool participation. Previous literature suggests that afterschool participation is affected by afterschool educators, program activities, and social ecologies found in the school and surrounding neighborhoods where the afterschool program occurs (Durlak et al., 2010). The differences seen in youth participation at the school level support the research by Durlak and colleagues (2010) as the schools where GEAR UP afterschool programs took place varied in geographical location, school size, setting (i.e., rural or urban), afterschool educators, and time spent in the different afterschool activities. Afterschool participation may have also differed by school location depending on the number of alternative afterschool activities offered at each school. GEAR UP

afterschool programs may have seen higher student participation at schools with few other afterschool opportunities as compared to schools with more afterschool program options. Additionally, afterschool participation may have been hindered in the GEAR UP afterschool programs taking place in rural schools and schools geographically located far from where students live due to transportation barriers faced by the youth. Further research is needed to understand how the school context is related to afterschool participation.

The study results revealed that the hours spent in academic support activities and STEM activities in the GEAR UP afterschool programs varied by school location. Several schools (i.e., School #2, School #8, and School #10) reported nearly all of the afterschool time spent in academic support activities, while other schools (i.e., School #4 and School #5) averaged more hours of STEM activities than academic support activities. The variation in afterschool program activities by school location supports previous research which states that afterschool programs are developed to address the needs of the local community, school, and youth in attendance (Lerner et al., 2006; Durlak et al., 2010). While GEAR UP provides general afterschool program guidelines, each school ultimately decides how the afterschool program time is spent. Afterschool educators may have provided students with the autonomy to voice their opinions and decide whether they desired academic support activities or STEM activities resulting in variation across schools as students at different locations desired different activities. Alternatively, the afterschool educators may have determined whether the afterschool time was spent mainly in academic support activities, predominately in STEM activities, or evenly divided between academic support and STEM. An educator's beliefs and perceptions regarding the subjects they teach are linked to the activities and practices implemented in the lessons (Thi To Khuyen et al., 2020; Wang et al., 2011). Thus, the afterschool educators may have chosen to focus on academic support activities or STEM activities based on their beliefs about STEM or the importance of academic activities for the youth. However, the relationships among the afterschool educators' self-efficacy, beliefs, behaviors, and hours spent in each afterschool activity could not be assessed in this study due to the limited number of educators. Additionally, study limitations prevented the researcher from further investigating school differences among the afterschool programs, which opens the door for future studies to explore afterschool program variation at the school level.

5.10 Implications for Theory

The Revised Framework for Investigating Mentoring Relationships in Afterschool Programs (i.e., Revised Framework) states that the relationships between afterschool educators and youth, along with their individual and environmental characteristics, influence youth afterschool participation and other youth outcomes (Mekinda & Hirsch, 2013). The Revised Framework served as the theoretical perspective used to guide the study, inform the study variables, and interpret the findings. The results of this study indicate individualized in-school adult-youth interactions and educator and youth individual characteristics (i.e., educator behaviors and free and reduced lunch status) play a role in youth participation, which supports the Revised Framework.

This study supported the central principle of the Revised Framework which states that adult-youth interactions and the subsequent relationships developed between afterschool educators and youth foster youth afterschool participation. In this study, the hours of adult-youth interactions were positively related to youth participation in the afterschool program. However, the Revised Framework emphasizes that multiple arrangements of adult-youth interactions (i.e., individual, group, collective, etc.) contribute to participation. Results of this study did not support the importance of multiple adult-youth interaction arrangements portrayed in the theoretical framework as only individual adult-youth interactions (i.e., one-on-one and counseling, advising, and academic planning) were significantly related to afterschool participation. Youth may not develop personal connections with afterschool educators in group settings with a large number of other students as seen in whole class instruction. Thus, in this study, individualized interactions may be necessary for afterschool educators to build deeper mentoring relationships with youth.

The Revised Framework indicates that individual characteristics, environmental characteristics, and adult-youth interactions occurring during the afterschool program serve as a predictors of afterschool participation. The results of this study indicate in-school adult-youth interactions may not be the main predictor of afterschool participation which is supported by the Revised Framework. Additionally, adult-youth interactions explained a small change in afterschool participation suggesting other variables may be better predictors of afterschool participation. Within the GEAR UP afterschool program, youth individual characteristics may serve as a more significant predictor of afterschool participation than in-school adult-youth interactions. For example, GEAR UP high school students may be referred to the GEAR UP

afterschool program by their teachers to receive homework assistance during the afterschool program's academic support time due to low course grades. Additionally, students may be interested in pursuing a STEM career, so they choose to participate in the GEAR UP afterschool program for the STEM activities.

The findings from this study provide new evidence to demonstrate that adult-youth interactions occurring in school may contribute to afterschool participation. The Revised Framework focuses on adult-youth interactions occurring in the context of the afterschool program and does not address the adult-youth interactions between afterschool educators and youth taking place before the afterschool program begins. Further, limited prior studies were identified that investigated adult-youth interactions happening prior to the afterschool program and additional research was needed to measure in-school adult-youth interactions and identify if the hours of interaction differed between afterschool participants and nonparticipants. As compared to nonparticipants, youth with afterschool participation had a greater number of hours of one-on-one interaction. As a result, youth engaged in a greater number of hours of one-on-one interactions with GEAR UP afterschool educators during the school day may attend the afterschool program to follow up from in-school discussions or seek additional academic help from an educator who understands their needs.

5.11 Implications for Practice

There are three primary practical implications from this study. First, afterschool educators can use the results of this study to better understand the importance of their interactions with students beyond the afterschool program. Second, high school afterschool program developers can improve the design of afterschool programs to better meet the needs of youth. Lastly, school administrators can use the information obtained regarding the afterschool physical learning environments to provide better spaces and resources for school-based afterschool programs.

The study's results can inform afterschool educators on the importance of their in-school interactions with youth upon youth's decision to participate in the afterschool program. For example, in this study individualized in-school adult-youth interactions (i.e., one-on-one and counseling, advising, and academic planning) were positively related to youth afterschool participation. Afterschool educators can leverage their interactions to increase youth participation in the afterschool program by directing efforts toward increasing the amount of one-on-one

mentoring taking place during the school day. Additionally, educators may consider prioritizing one-on-one interactions over large group interactions. Previous researchers identified that the frequency of adult-youth interactions also shapes the connections developed between adults and youth which can impact future interactions (Parra, 2002; Rhodes, 2002). As such, afterschool educators should make an effort to increase the frequency of their interactions with youth for positive outcomes to result.

Afterschool program developers can improve the design of high school afterschool programs to meet the needs of the students. Results of this study indicate youth participants spent more time in academic support activities than in STEM activities during the afterschool program. Further, a greater number of youth only participated in academic support activities as compared to STEM activities. Youth in the GEAR UP afterschool program chose which activities to participate in and the length of time spent at the afterschool program. Thus, the results suggest more students attended the afterschool program for academic-related assistance than for STEM exploration activities. High school afterschool program developers can use this information to create additional academic-based afterschool programs with homework instruction and tutors available to provide personalized support. Additionally, high school afterschool program developers may consider engaging academic content experts to teach difficult curriculum and focus on topics students struggle with on standardized tests. As GEAR UP strives to prepare youth for postsecondary education, GEAR UP afterschool program developers may consider implementing academic programs that go beyond homework help to teach strategies on studying, note taking, and time management in preparation for college. High school afterschool program developers can use this information to expand existing academic-based afterschool programming and create additional opportunities to meet the needs of youth seeking academic support.

School administrators can use the results of this study to understand the physical learning environment needs of school-based afterschool programs and provide the afterschool programs with the proper school space and resources. The results of this study indicated that the space provided by the school did not meet the afterschool program needs for some afterschool educators. For example, several educators reported the space was not arranged well for simultaneous activities. Further, a few educators indicated the afterschool space did not have reliable internet even though all educators reported electronic devices were used during the afterschool program. Previous research suggests school-based afterschool programs often struggle to obtain proper

resources and spaces from the schools where the afterschool programs are held (Polman, 2003). School administrators can use this information to provide afterschool programs with spaces that can be easily arranged for various activities and that supply needed resources, such as technology. It may be beneficial for school administrators to discuss the afterschool program needs with afterschool educators prior to assigning the spaces where the afterschool program will take place.

5.12 Recommendations for Future Research

While most studies of afterschool programs have concentrated on the outcomes of participation, this study is part of a limited number that have focused on the role of afterschool program characteristics in youth participation. Moreover, limited previous studies were found to predict afterschool participation based on in-school adult-youth interactions. There were also several study limitations in data collection as data was collected a year after the program took place and youth perspectives were not obtained. Due to the limitations and uniqueness of the study, there are opportunities for additional afterschool program research that extend beyond this study. For example, the following recommendations are suggested for future research.

1. This study only measured the relationships between in-school adult-youth interactions and afterschool participation. Future studies should assess the relationships among the afterschool physical learning environment; afterschool educator self-efficacy, beliefs, and behaviors; and youth afterschool participation to determine if the physical learning environment or afterschool educator self-efficacy, beliefs, and behaviors are related to youth afterschool participation.
2. Future studies should incorporate a qualitative research design, such as focus groups or interviews. Qualitative research would help extend the results of this study by exploring the experiences of afterschool educators in the afterschool physical learning environment and the experiences of youth during in-school adult-youth interactions.
3. Future studies should obtain youth perspectives on the afterschool physical learning environment and their experiences during adult-youth interactions for a holistic understanding of youth participation. Youth perspectives also allow for comparisons to be made between the views of the afterschool educator and the youth regarding the afterschool program.

4. Students who self-select to participate in STEM programs have pre-existing interests and positive attitudes toward STEM subjects (Vallett et al., 2018). As such, youth may be more likely to participate in STEM-based afterschool programs due to underlying motivations rather than a result of adult-youth interactions. Future research should measure youth motivations and the relationship between afterschool participation and motivation to determine if motivation is more strongly related to afterschool participation than adult-youth interactions.
5. According to Sanderson and Richards (2010), transportation and home responsibilities serve as barriers for low-income youth to participate in afterschool programs. Future studies should consider measuring the need for transportation following afterschool programs, familial support, and involvement in other extra-curricular activities as predictors for afterschool participation to expand upon the predictors measured in this study.
6. This study only assessed adult-youth interactions taking place during the school day. Measuring the adult-youth interactions occurring in the afterschool program would be beneficial in future studies to determine if afterschool adult-youth interactions are a greater predictor of program participation than in-school adult-youth interactions.

APPENDIX A. IRB APPROVAL (#2020-1775)

PURDUE
UNIVERSITY

This Memo is Generated From the Purdue University Human Research Protection Program System, Cayuse IRB.

*****THIS LETTER IS BEING ISSUED DURING THE FACE TO FACE RESTRICTION ON HUMAN SUBJECTS RESEARCH STUDIES RELATED TO COVID-19. THIS DOCUMENT SERVES AS PROTOCOL APPROVAL FROM THE HRPP/IRB, BUT DOES NOT PERMIT FACE TO FACE RESEARCH UNTIL AN APPROVED UNIVERSITY COVID-19 RESEARCH SPACE SOP PERMITS RESEARCH OPERATIONS. ******

Date: January 12, 2021
PI: VIRGINIA BOLSHAKOVA
Re: Initial - IRB-2020-1775
GEAR UP Out-of-School Program Participation, Youth-Adult Relationships, and Learning Environments

The Purdue University Human Research Protection Program (HRPP) has determined that the research project identified above qualifies as exempt from IRB review, under federal human subjects research regulations 45 CFR 46.104. The Category for this Exemption is listed below . Protocols exempted by the Purdue HRPP do not require regular renewal. However, the administrative check-in date is January 11, 2024. The IRB must be notified when this study is closed. If a study closure request has not been initiated by this date, the HRPP will request study status update for the record.

Specific notes related to your study are found below.
Decision: Exempt
Category:
Category 2.(i). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording).
The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects.

Findings: n/a
Research Notes: n/a

Any modifications to the approved study must be submitted for review through Cayuse IRB. All approval letters and study documents are located within the Study Details in Cayuse IRB.

What are your responsibilities now, as you move forward with your research?

Document Retention: The PI is responsible for keeping all regulated documents, including IRB correspondence such as this letter, approved study documents, and signed consent forms for at least three (3) years following protocol closure for audit purposes. Documents regulated by HIPAA, such as Release Authorizations, must be maintained

APPENDIX B. IRB APPROVAL (#1803020434)

PURDUE UNIVERSITY

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	VIRGINIA BOLSHAKOVA PTC
From:	JEANNIE DICLEMENTI, Chair Social Science IRB
Date:	05/15/2018
Committee Action:	**Expedited Approval - Category**(6) (7)
IRB Approval Date	05/15/2018
IRB Protocol #	1803020434
Study Title	INDIANA GEAR UP STEM STUDY
Expiration Date	05/14/2019
Subjects Approved:	300

The above-referenced protocol has been approved by the Purdue IRB. This approval permits the recruitment of subjects up to the number indicated on the application and the conduct of the research as it is approved.

The IRB approved and dated consent, assent, and information form(s) for this protocol are in the Attachments section of this protocol in CoeusLite. Subjects who sign a consent form must be given a signed copy to take home with them. Information forms should not be signed.

Record Keeping: The PI is responsible for keeping all regulated documents, including IRB correspondence such as this letter, approved study documents, and signed consent forms for at least three (3) years following protocol closure for audit purposes. Documents regulated by HIPAA, such as Authorizations, must be maintained for six (6) years. If the PI leaves Purdue during this time, a copy of the regulatory file must be left with a designated records custodian, and the identity of this custodian must be communicated to the IRB.

Change of Institutions: If the PI leaves Purdue, the study must be closed or the PI must be replaced on the study through the Amendment process. If the PI wants to transfer the study to another institution, please contact the IRB to make arrangements for the transfer.

Changes to the approved protocol: A change to any aspect of this protocol must be approved by the IRB before it is implemented, except when necessary to eliminate apparent immediate hazards to the subject. In such situations, the IRB should be notified immediately. To request a change, submit an Amendment to the IRB through CoeusLite.

Continuing Review/Study Closure: No human subject research may be conducted without IRB approval. IRB approval for this study expires on the expiration date set out above. The study must be close or re-reviewed (aka continuing review) and approved by the IRB before the expiration date passes. Both Continuing Review and Closure may be requested through CoeusLite.

Unanticipated Problems/Adverse Events: Unanticipated problems involving risks to subjects or others, serious adverse events, and serious noncompliance with the approved protocol must be reported to the IRB immediately through CoeusLite. All other adverse events and minor protocol deviations should be reported at the time of Continuing Review.

for six (6) years.

Site Permission: If your research is conducted at locations outside of Purdue University (such as schools, hospitals, or businesses), you must obtain written permission from all sites to recruit, consent, study, or observe participants. Generally, such permission comes in the form of a letter from the school superintendent, director, or manager. You must maintain a copy of this permission with study records.

Training: All researchers collecting or analyzing data from this study must renew training in human subjects research via the CITI Program (www.citiprogram.org) every 4 years. New personnel must complete training and be added to the protocol before beginning research with human participants or their data.

Modifications: Change to any aspect of this protocol or research personnel must be approved by the IRB before implementation, except when necessary to eliminate apparent immediate hazards to subjects or others. In such situations, the IRB should still be notified immediately.

Unanticipated Problems/Adverse Events: Unanticipated problems involving risks to subjects or others, serious adverse events, and
noncompliance with the approved protocol must be reported to the IRB immediately through an incident report. When in doubt, consult with the HRPP/IRB.

Monitoring: The HRPP reminds researchers that this study is subject to monitoring at any time by Purdue's HRPP staff, Institutional Review Board, Research Quality Assurance unit, or authorized external entities. Timely cooperation with monitoring procedures is an expectation of IRB approval.

Change of Institutions: If the PI leaves Purdue, the study must be closed or the PI must be replaced on the study or transferred to a new IRB. Studies without a Purdue University PI will be closed.

Other Approvals: This Purdue IRB approval covers only regulations related to human subjects research protections (e.g. 45 CFR 46). This determination does not constitute approval from any other Purdue campus departments, research sites, or outside agencies. The Principal Investigator and all researchers are required to affirm that the research meets all applicable local/state/ federal laws and university policies that may apply.

If you have questions about this determination or your responsibilities when conducting human subjects research on this project or any other, please do not hesitate to contact Purdue's HRPP at irb@purdue.edu or 765-494-5942. We are here to help!

Sincerely,

Purdue University Human Research Protection Program/ Institutional Review Board
Login to Cayuse IRB

APPENDIX C. FINAL INSTRUMENT

GEAR UP Afterschool Educator Survey

Section I

Directions: Please respond to the following questions by indicating your opinion on how much you could do as a Building Coordinator or Regional Director of the GEAR UP afterschool program during the previous 2019-2020 school year. Your responses will be kept confidential.

How much can you do?	**Nothing**		**Very Little**		**Some Influence**		**Quite a Bit**		**A Great Deal**
1. How much can you do to control disruptive behavior in the afterschool program?	1	2	3	4	5	6	7	8	9
2. How much can you do to motivate students who show low interest in school work?	1	2	3	4	5	6	7	8	9
3. How much can you do to get students to believe they can do well in school work?	1	2	3	4	5	6	7	8	9
4. How much can you do to help your students value learning?	1	2	3	4	5	6	7	8	9
5. To what extent can you craft good questions for your students?	1	2	3	4	5	6	7	8	9
6. How much can you do to get adolescents to follow afterschool program rules?	1	2	3	4	5	6	7	8	9
7. How much can you do to calm a student who is disruptive or noisy?	1	2	3	4	5	6	7	8	9
8. How well can you establish a classroom management system with your students?	1	2	3	4	5	6	7	8	9
9. How much can you use a variety of assessment strategies?	1	2	3	4	5	6	7	8	9
10. To what extent can you provide an alternative explanation or example	1	2	3	4	5	6	7	8	9

when students are confused?									
11. How much can you assist families in helping their children do well in school?	1	2	3	4	5	6	7	8	9
12. How well can you implement alternative teaching strategies in your afterschool program?	1	2	3	4	5	6	7	8	9

Section II

Directions: Please respond to the following questions related to STEM education.

To what extent are the following important with students?	**Not Important**	**A Little Important**	**Moderate Importance**	**Very Important**	**Extremely Important**
1. STEM education can help students acquire essential skills related directly to STEM careers.	1	2	3	4	5
2. STEM education can help students acquire critical thinking that is usually conducted by scientists, technologists, engineers, and mathematicians.	1	2	3	4	5
3. STEM education can help students acquire authentic problem solving to make decisions in the real world.	1	2	3	4	5
4. STEM education can help students leverage collaboration with	1	2	3	4	5

others to execute STEM learning projects.					
5. STEM education can help students acquire engineering design abilities (define the needs, design, and make a certain product) to make helpful products.	1	2	3	4	5

Section III

Directions: Please respond to the following questions related to the GEAR UP afterschool program during the previous 2019-2020 school year.

How often did YOU do the following during the 2019-2020 GEAR UP afterschool program?	**Never**	**Rarely**	**Occasionally**	**Often**	**All the Time**
Students' Technology Skills					
1. Facilitate open exploration of new technologies to help them learn STEM.	1	2	3	4	5
2. Support use of varied resources (e.g., peers, internet) to learn new skills in students.	1	2	3	4	5
3. Encourage students to try new skills for each STEM learning activity.	1	2	3	4	5
Students' Critical Thinking					

4. Support students in creating original products and solutions that reflect their own unique ideas.	1	2	3	4	5
5. Help students create products and solutions that communicate clear messages and help solve problems.	1	2	3	4	5
6. Facilitate groups of students in managing open-ended, complex projects.	1	2	3	4	5

How often did <u>YOU</u> do the following during the 2019-2020 GEAR UP afterschool program?	**Never**	**Rarely**	**Occasionally**	**Often**	**All the Time**
Students' Tutoring					
7. Support students in developing time management and organizational skills.	1	2	3	4	5
8. Help students learn test preparation techniques.	1	2	3	4	5
Students' College and Career Readiness					
9. Hold conversations with students about careers.	1	2	3	4	5
10. Discuss life skills needed beyond high school with students.	1	2	3	4	5
11. Discuss potential college majors during STEM activities.	1	2	3	4	5

Section IV

Directions: Please respond to the following questions related to the GEAR UP afterschool program physical learning environment during the previous 2019-2020 school year.

Physical learning environments are the various environments found in a school that are intended as learning places which include school buildings, learning spaces, and their spatial structure, furniture, fittings, and equipment.

To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
1. The program space was safe, clean, and secure.	1	2	3	4
2. Students were carefully supervised.	1	2	3	4
3. Students were able to select and choose from various learning methods and activities.	1	2	3	4
4. The program environment enhanced students' health.	1	2	3	4
5. Healthy and nutritious snacks were provided for students (e.g., healthy and nutritious snacks include: fruits, vegetables, protein sources).	1	2	3	4
6. Dinner meal options were provided on other afterschool days in addition to GEAR UP Diner Nights.	1	2	3	4
7. The program's indoor and outdoor space met the needs of all program activities.	1	2	3	4
To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
8. The space was arranged well for a range of activities.	1	2	3	4
9. The space was arranged well for simultaneous activities.	1	2	3	4
10. The room and wall area helped to facilitate varied learning methods.	1	2	3	4
11. Makerspace Carts were present in the room for students	1	2	3	4

to freely access and tinker whenever desired.				
12. How many days per week were Makerspace Carts utilized? _____				
13. There was an ideal student-staff ratio.	1	2	3	4
14. On average, what was the student to staff ratio? (For example, 10:1) _____				
15. The space had windows facing outdoors where natural light could come into the room.	1	2	3	4
16. The lighting of the space was easily controllable.	1	2	3	4
17. Noise disturbances were frequently heard from spaces external to the afterschool program or outside the building.	1	2	3	4
18. Students had a difficult time clearly hearing the instructor or other peers.	1	2	3	4
19. The furniture and room equipment provided comfort.	1	2	3	4
20. The furniture and room equipment were appropriate for the age group of students.	1	2	3	4
21. The colors of the space portrayed a calming mood.	1	2	3	4
22. The space had strong and reliable internet connection.	1	2	3	4
23. Electronic devices (e.g. GEAR UP iPad's, school laptops, etc.) were used as a learning tool.	1	2	3	4
24. How many times per month were electronic devices utilized? _____				
25. OPEN ENDED QUESTION: Please share anything else important about your afterschool program's physical learning environment? _____				
26. OPEN ENDED QUESTION: Based on your experiences, how has the GEAR UP program helped students? _____				
27. OPEN ENDED QUESTION: Based on your experiences, how could the GEAR UP program be improved to have a greater impact on students? _____				

Demographic Information

Please answer the following questions to the best of your ability.

1. Gender: _____

2. School(s): _____

3. Highest educational degree completed:

☐ GED ☐ High School Diploma ☐ Associate's Degree

☐ Bachelor's Degree ☐ Master's Degree ☐ Ph.D.

4. How many years have you been teaching K-12 students, including this year? ___ year(s)

5. Teaching Experience with GEAR UP:

   ☐ less than 1 year ☐ 1 year ☐ 2 years ☐ 3 years ☐ 4 years

   ☐ more than 4 years

APPENDIX D. INTRODUCTION EMAIL

Greetings,

My name is Brooke Stafford, and I am a graduate student in the Department of Agricultural Sciences Education and Communication at Purdue University. I recently spoke with Building Coordinators and Regional Directors during the November 7th GEAR UP PITSCO Professional Development about a research project I am working on with my advisor, Dr. Levon Esters, and GEAR UP Director, Dr. Virginia Bolshakova, focused on the experiences, resources, and environments in the GEAR UP afterschool program during the 2019-2020 school year. We are inviting you to participate in this study and complete a short online survey reflecting on the previous school year, 2019-2020. This study will help us gain a better understanding of the learning experiences of students and educators within afterschool programs as well as help grow GEAR UP programming going forward.

Please consider helping us with this research by completing this survey only once. The survey will take around 10 minutes to complete.

Participation in this study is voluntary, and you can skip any questions for any reason. Your responses are anonymous, cannot be traced back to you, and will be kept confidential. You must be 18 years or older to participate.

You have the right to withdraw from this study at any point and for any reason. If you would like to discuss this project with the Principal Investigator of this study, please contact Dr. Virginia Bolshakova at (765)496-1862 or via email at vbolshakova@purdue.edu; or Brooke Stafford via email at bsiefert@purdue.edu. If you have any concerns you may also contact the Institutional Review Board at Purdue University at (765)494-5942 or via email at irb@purdue.edu. This study is titled 'GEAR UP Out-of-School Program Participation, Youth-Adult Relationships, and Learning Environments,' IRB #2020-1775.

This study involves no more risks than encountered in everyday life.

Please complete the survey by Friday, January 29, 2021.

Click the link below to begin this survey:
https://purdue.ca1.qualtrics.com/jfe/form/SV_eyub6GEdzhl2No1

If you have any questions, feel free to contact me at bsiefert@purdue.edu, Dr. Levon Esters at lesters@purdue.edu, or Dr. Virginia Bolshakova at vbolshakova@purdue.edu.

We appreciate you and your time in reading this and providing feedback on the program.

Sincerely,
Brooke Stafford

APPENDIX E. FIRST FOLLOW UP EMAIL

Greetings GEAR UP Building Coordinators and Regional Directors,

Thank you to those of you who have already completed the GEAR UP afterschool program survey reflecting on the 2019-2020 school year! I am grateful for your time and willingness to participate in the GEAR UP study.

I wanted to send out a brief reminder to those who have not yet completed the survey. There is still time to participate. It is very important to hear from as many Regional Directors and Building Coordinators as possible so the results can truly represent the Indiana GEAR UP program.

Please complete the survey by Friday, January 29, 2021.

Thanks again!

Study Information Below:

The research project I am working on with my advisor, Dr. Levon Esters, and GEAR UP Director, Dr. Virginia Bolshakova, focused on the experiences, resources, and environments in the GEAR UP afterschool program during the 2019-2020 school year. We are inviting you to participate in this study and complete a short online survey reflecting on the previous school year, 2019-2020. This study will help us gain a better understanding of the learning experiences of students and educators within afterschool programs as well as help grow GEAR UP programming going forward.

Please consider helping us with this research by completing this survey only once. The survey will take around 10 minutes to complete.

Participation in this study is voluntary, and you can skip any questions for any reason. Your responses are anonymous, cannot be traced back to you, and will be kept confidential. You must be 18 years or older to participate.

You have the right to withdraw from this study at any point and for any reason. If you would like to discuss this project with the Principal Investigator of this study, please contact Dr. Virginia Bolshakova at (765)496-1862 or via email at vbolshakova@purdue.edu; or Brooke Stafford via email at bsiefert@purdue.edu. If you have any concerns you may also contact the Institutional Review Board at Purdue University at (765)494-5942 or via email at irb@purdue.edu. This study is titled 'GEAR UP Out-of-School Program Participation, Youth-Adult Relationships, and Learning Environments,' IRB #2020-1775.

This study involves no more risks than encountered in everyday life.

Click the link below to begin this survey:

https://purdue.ca1.qualtrics.com/jfe/form/SV_eyub6GEdzhl2No1

If you have any questions, feel free to contact me at bsiefert@purdue.edu, Dr. Levon Esters at lesters@purdue.edu, or Dr. Virginia Bolshakova at vbolshakova@purdue.edu.

We appreciate you and your time in reading this and providing feedback on the program.

Sincerely,
Brooke Stafford

APPENDIX F. SECOND FOLLOW UP EMAIL

Greetings GEAR UP Building Coordinators and Regional Directors,

Thank you to those of you who have already completed the GEAR UP afterschool program survey reflecting on the 2019-2020 school year! I am grateful for your time and willingness to participate in the GEAR UP study.

I wanted to send out one final reminder to those who have not yet completed the survey. There is still an opportunity to participate, but time is running out! It is very important to hear from as many Regional Directors and Building Coordinators as possible so the results can truly represent the Indiana GEAR UP program.

The last day to complete the survey is this Friday, January 29, 2021.

Thanks again!

Study Information Below:

The research project I am working on with my advisor, Dr. Levon Esters, and GEAR UP Director, Dr. Virginia Bolshakova, focused on the experiences, resources, and environments in the GEAR UP afterschool program during the 2019-2020 school year. We are inviting you to participate in this study and complete a short online survey reflecting on the previous school year, 2019-2020. This study will help us gain a better understanding of the learning experiences of students and educators within afterschool programs as well as help grow GEAR UP programming going forward.

Please consider helping us with this research by completing this survey only once. The survey will take around 10 minutes to complete.

Participation in this study is voluntary, and you can skip any questions for any reason. Your responses are anonymous, cannot be traced back to you, and will be kept confidential. You must be 18 years or older to participate.

You have the right to withdraw from this study at any point and for any reason. If you would like to discuss this project with the Principal Investigator of this study, please contact Dr. Virginia Bolshakova at (765)496-1862 or via email at vbolshakova@purdue.edu; or Brooke Stafford via email at bsiefert@purdue.edu. If you have any concerns you may also contact the Institutional Review Board at Purdue University at (765)494-5942 or via email at irb@purdue.edu. This study is titled 'GEAR UP Out-of-School Program Participation, Youth-Adult Relationships, and Learning Environments,' IRB #2020-1775.

This study involves no more risks than encountered in everyday life.

Click the link below to begin this survey:
https://purdue.ca1.qualtrics.com/jfe/form/SV_eyub6GEdzhl2No1

If you have any questions, feel free to contact me at bsiefert@purdue.edu, Dr. Levon Esters at lesters@purdue.edu, or Dr. Virginia Bolshakova at vbolshakova@purdue.edu.

We appreciate you and your time in reading this and providing feedback on the program.

Sincerely,
Brooke Stafford

APPENDIX G. FINAL INSTRUMENT FOR REGIONAL DIRECTORS WITH TWO SCHOOLS

GEAR UP Afterschool Educator Survey

School 1

Demographic Information

Please answer the following questions to the best of your ability. For the first half of the survey, only select one of the schools under your direction and reflect solely on that school. These questions will repeat in the second half of the survey for reflection on the second school.

6. Gender: _____

7. School: _____

8. Highest educational degree completed:

☐ GED ☐ High School Diploma ☐ Associate's Degree

☐ Bachelor's Degree ☐ Master's Degree ☐ Ph.D.

9. How many years have you been teaching K-12 students, including this year? ___ year(s)

10. Teaching Experience with GEAR UP:

☐ less than 1 year ☐ 1 year ☐ 2 years ☐ 3 years ☐ 4 years

☐ more than 4 years

Section I

Directions: Please respond to the following questions by indicating your opinion on how much you could do as a Regional Director of the GEAR UP afterschool program at school 1 during the previous 2019-2020 school year. Your responses will be kept confidential.

How much can you do?	**Nothing**		**Very Little**		**Some Influence**		**Quite a Bit**		**A Great Deal**
1. How much can you do to control disruptive behavior in the afterschool program?	1	2	3	4	5	6	7	8	9
2. How much can you do to motivate students who show low interest in school work?	1	2	3	4	5	6	7	8	9
3. How much can you do to get students to believe they can do well in school work?	1	2	3	4	5	6	7	8	9
4. How much can you do to help your students value learning?	1	2	3	4	5	6	7	8	9
5. To what extent can you craft good questions for your students?	1	2	3	4	5	6	7	8	9
6. How much can you do to get adolescents to follow afterschool program rules?	1	2	3	4	5	6	7	8	9
7. How much can you do to calm a student who is disruptive or noisy?	1	2	3	4	5	6	7	8	9
8. How well can you establish a classroom management system with your students?	1	2	3	4	5	6	7	8	9
9. How much can you use a variety of assessment strategies?	1	2	3	4	5	6	7	8	9
10. To what extent can you provide an alternative	1	2	3	4	5	6	7	8	9

explanation or example when students are confused?									
11. How much can you assist families in helping their children do well in school?	1	2	3	4	5	6	7	8	9
12. How well can you implement alternative teaching strategies in your afterschool program?	1	2	3	4	5	6	7	8	9

Section II

Directions: Please respond to the following questions related to STEM education at school 1.

To what extent are the following important with students?	**Not Important**	**A Little Important**	**Moderate Importance**	**Very Important**	**Extremely Important**
1. STEM education can help students acquire essential skills related directly to STEM careers.	1	2	3	4	5
2. STEM education can help students acquire critical thinking that is usually conducted by scientists, technologists, engineers, and mathematicians.	1	2	3	4	5
3. STEM education can help students acquire authentic problem solving to make decisions in the real world.	1	2	3	4	5
4. STEM education can help students leverage collaboration with others to execute STEM learning projects.	1	2	3	4	5
5. STEM education can help students acquire engineering design abilities (define the needs, design, and make a certain product) to make helpful products.	1	2	3	4	5

Section III

Directions: Please respond to the following questions related to the GEAR UP afterschool program at school 1 during the previous 2019-2020 school year.

How often did YOU do the following during the 2019-2020 GEAR UP afterschool program?	Never	Rarely	Occasionally	Often	All the Time
Students' Technology Skills					
1. Facilitate open exploration of new technologies to help them learn STEM.	1	2	3	4	5
2. Support use of varied resources (e.g., peers, internet) to learn new skills in students.	1	2	3	4	5
3. Encourage students to try new skills for each STEM learning activity.	1	2	3	4	5
Students' Critical Thinking					
4. Support students in creating original products and solutions that reflect their own unique ideas.	1	2	3	4	5
5. Help students create products and solutions that communicate clear messages and help solve problems.	1	2	3	4	5
6. Facilitate groups of students in managing open-ended, complex projects.	1	2	3	4	5

How often did YOU do the following during the 2019-2020 GEAR UP afterschool program?	Never	Rarely	Occasionally	Often	All the Time
Students' Tutoring					
7. Support students in developing time management and organizational skills.	1	2	3	4	5
8. Help students learn test preparation techniques.	1	2	3	4	5
Students' College and Career Readiness					
9. Hold conversations with students about careers.	1	2	3	4	5
10. Discuss life skills needed beyond high school with students.	1	2	3	4	5
11. Discuss potential college majors during STEM activities.	1	2	3	4	5

Section IV

Directions: Please respond to the following questions related to the GEAR UP afterschool program physical learning environment at school 1 during the previous 2019-2020 school year.

Physical learning environments are the various environments found in a school that are intended as learning places which include school buildings, learning spaces, and their spatial structure, furniture, fittings, and equipment.

To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
1. The program space was safe, clean, and secure.	1	2	3	4
2. Students were carefully supervised.	1	2	3	4
3. Students were able to select and choose from various learning methods and activities.	1	2	3	4
4. The program environment enhanced students' health.	1	2	3	4
5. Healthy and nutritious snacks were provided for students (e.g., healthy and nutritious snacks include: fruits, vegetables, protein sources).	1	2	3	4
6. Dinner meal options were provided on other afterschool days in addition to GEAR UP Diner Nights.	1	2	3	4
7. The program's indoor and outdoor space met the needs of all program activities.	1	2	3	4
To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
8. The space was arranged well for a range of activities.	1	2	3	4
9. The space was arranged well for simultaneous activities.	1	2	3	4
10. The room and wall area helped to facilitate varied learning methods.	1	2	3	4
11. Makerspace Carts were present in the room for students	1	2	3	4

to freely access and tinker whenever desired.				
12. How many days per week were Makerspace Carts utilized? _____				
13. There was an ideal student-staff ratio.	1	2	3	4
14. On average, what was the student to staff ratio? (For example, 10:1) _____				
15. The space had windows facing outdoors where natural light could come into the room.	1	2	3	4
16. The lighting of the space was easily controllable.	1	2	3	4
17. Noise disturbances were frequently heard from spaces external to the afterschool program or outside the building.	1	2	3	4
18. Students had a difficult time clearly hearing the instructor or other peers.	1	2	3	4
19. The furniture and room equipment provided comfort.	1	2	3	4
20. The furniture and room equipment were appropriate for the age group of students.	1	2	3	4
21. The colors of the space portrayed a calming mood.	1	2	3	4
22. The space had strong and reliable internet connection.	1	2	3	4
23. Electronic devices (e.g. GEAR UP iPad's, school laptops, etc.) were used as a learning tool.	1	2	3	4
24. How many times per month were electronic devices utilized? _____				
25. OPEN ENDED QUESTION: Please share anything else important about your afterschool program's physical learning environment? _____				
26. OPEN ENDED QUESTION: Based on your experiences, how has the GEAR UP program helped students? _____				
27. OPEN ENDED QUESTION: Based on your experiences, how could the GEAR UP program be improved to have a greater impact on students? _____				

GEAR UP Afterschool Educator Survey

School 2

Demographic Information

Please answer the following questions to the best of your ability. For the second half of the survey, only select the second school under your direction and reflect solely on that school..

1. Gender: _____

2. School: _____

3. Highest educational degree completed:

☐ GED ☐ High School Diploma ☐ Associate's Degree

☐ Bachelor's Degree ☐ Master's Degree ☐ Ph.D.

4. How many years have you been teaching K-12 students, including this year? ___ year(s)

5. Teaching Experience with GEAR UP:

   ☐ less than 1 year ☐ 1 year ☐ 2 years ☐ 3 years ☐ 4 years

   ☐ more than 4 years

Section I

Directions: Please respond to the following questions by indicating your opinion on how much you could do as a Regional Director of the GEAR UP afterschool program at school 2 during the previous 2019-2020 school year. Your responses will be kept confidential.

How much can you do?	**Nothing**		**Very Little**		**Some Influence**		**Quite a Bit**		**A Great Deal**
1. How much can you do to control disruptive behavior in the afterschool program?	1	2	3	4	5	6	7	8	9
2. How much can you do to motivate students who show low interest in school work?	1	2	3	4	5	6	7	8	9
3. How much can you do to get students to believe they can do well in school work?	1	2	3	4	5	6	7	8	9
4. How much can you do to help your students value learning?	1	2	3	4	5	6	7	8	9
5. To what extent can you craft good questions for your students?	1	2	3	4	5	6	7	8	9
6. How much can you do to get adolescents to follow afterschool program rules?	1	2	3	4	5	6	7	8	9
7. How much can you do to calm a student who is disruptive or noisy?	1	2	3	4	5	6	7	8	9
8. How well can you establish a classroom management system with your students?	1	2	3	4	5	6	7	8	9
9. How much can you use a variety of assessment strategies?	1	2	3	4	5	6	7	8	9
10. To what extent can you provide an	1	2	3	4	5	6	7	8	9

alternative explanation or example when students are confused?									
11. How much can you assist families in helping their children do well in school?	1	2	3	4	5	6	7	8	9
12. How well can you implement alternative teaching strategies in your afterschool program?	1	2	3	4	5	6	7	8	9

Section II

Directions: Please respond to the following questions related to STEM education at school 2.

To what extent are the following important with students?	**Not Important**	**A Little Important**	**Moderate Importance**	**Very Important**	**Extremely Important**
1. STEM education can help students acquire essential skills related directly to STEM careers.	1	2	3	4	5
2. STEM education can help students acquire critical thinking that is usually conducted by scientists, technologists, engineers, and mathematicians.	1	2	3	4	5
3. STEM education can help students acquire authentic problem solving to make decisions in the real world.	1	2	3	4	5
4. STEM education can help students leverage collaboration with others to execute STEM learning projects.	1	2	3	4	5
5. STEM education can help students acquire engineering design abilities (define the needs, design, and make a certain product) to make helpful products.	1	2	3	4	5

Section III

Directions: Please respond to the following questions related to the GEAR UP afterschool program at school 2 during the previous 2019-2020 school year.

How often did YOU do the following during the 2019-2020 GEAR UP afterschool program?	Never	Rarely	Occasionally	Often	All the Time
Students' Technology Skills					
1. Facilitate open exploration of new technologies to help them learn STEM.	1	2	3	4	5
2. Support use of varied resources (e.g., peers, internet) to learn new skills in students.	1	2	3	4	5
3. Encourage students to try new skills for each STEM learning activity.	1	2	3	4	5
Students' Critical Thinking					
4. Support students in creating original products and solutions that reflect their own unique ideas.	1	2	3	4	5
5. Help students create products and solutions that communicate clear messages and help solve problems.	1	2	3	4	5
6. Facilitate groups of students	1	2	3	4	5

in managing open-ended, complex projects.					

How often did YOU do the following during the 2019-2020 GEAR UP afterschool program?	Never	Rarely	Occasionally	Often	All the Time
Students' Tutoring					
7. Support students in developing time management and organizational skills.	1	2	3	4	5
8. Help students learn test preparation techniques.	1	2	3	4	5
Students' College and Career Readiness					
9. Hold conversations with students about careers.	1	2	3	4	5
10. Discuss life skills needed beyond high school with students.	1	2	3	4	5
11. Discuss potential college majors during STEM activities.	1	2	3	4	5

Section IV

Directions: Please respond to the following questions related to the GEAR UP afterschool program physical learning environment at school 2 during the previous 2019-2020 school year.

Physical learning environments are the various environments found in a school that are intended as learning places which include school buildings, learning spaces, and their spatial structure, furniture, fittings, and equipment.

To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	Strongly Disagree	Disagree	Agree	Strongly Agree
1. The program space was safe, clean, and secure.	1	2	3	4
2. Students were carefully supervised.	1	2	3	4
3. Students were able to select and choose from various learning methods and activities.	1	2	3	4
4. The program environment enhanced students' health.	1	2	3	4

5. Healthy and nutritious snacks were provided for students (e.g., healthy and nutritious snacks include: fruits, vegetables, protein sources).	1	2	3	4
6. Dinner meal options were provided on other afterschool days in addition to GEAR UP Diner Nights.	1	2	3	4
7. The program's indoor and outdoor space met the needs of all program activities.	1	2	3	4
To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
8. The space was arranged well for a range of activities.	1	2	3	4
9. The space was arranged well for simultaneous activities.	1	2	3	4
10. The room and wall area helped to facilitate varied learning methods.	1	2	3	4
11. Makerspace Carts were present in the room for students to freely access and tinker whenever desired.	1	2	3	4
12. How many days per week were Makerspace Carts utilized? _____				
13. There was an ideal student-staff ratio.	1	2	3	4
14. On average, what was the student to staff ratio? (For example, 10:1) _____				
15. The space had windows facing outdoors where natural light could come into the room.	1	2	3	4
16. The lighting of the space was easily controllable.	1	2	3	4
17. Noise disturbances were frequently heard from spaces external to the afterschool program or outside the building.	1	2	3	4
18. Students had a difficult time clearly hearing the instructor or other peers.	1	2	3	4
19. The furniture and room equipment provided comfort.	1	2	3	4

20. The furniture and room equipment were appropriate for the age group of students.	1	2	3	4
21. The colors of the space portrayed a calming mood.	1	2	3	4
22. The space had strong and reliable internet connection.	1	2	3	4
23. Electronic devices (e.g. GEAR UP iPad's, school laptops, etc.) were used as a learning tool.	1	2	3	4
24. How many times per month were electronic devices utilized? _____				
25. OPEN ENDED QUESTION: Please share anything else important about your afterschool program's physical learning environment? _____				
26. OPEN ENDED QUESTION: Based on your experiences, how has the GEAR UP program helped students? _____				
27. OPEN ENDED QUESTION: Based on your experiences, how could the GEAR UP program be improved to have a greater impact on students? _____				

APPENDIX H. EMAIL TO REGIONAL DIRECTORS REGARDING SURVEY RE-TAKE

Good morning,

Thank you for your willingness to participate in the GEAR UP study and all the time you have put into the GEAR UP program!

When the GEAR UP study survey was first sent out, we had hoped to receive insight into the GEAR UP programs at each location across Indiana. We had overlooked the fact that some Regional Directors, such as yourself, cover more than one school, and we did not provide the opportunity for you to reflect on each school individually. My apologies if this led to any confusion or difficulty in completing the survey.

It would be a tremendous help if you would be willing to take the survey below which contains the same questions as the original survey. However, the questions have been duplicated allowing you to reflect on one program location at a time. During the first half of the survey, please only respond to questions when thinking about the one school location you first identify. The transition to answering questions about the second school location during the latter half of the survey will be clearly marked.

I know this will take up a little more of your time, but your feedback would be helpful for the results to truly represent the Indiana GEAR UP program.

The study details are included below for your reference. Please reach out with any questions, comments, or concerns.

Click the link below to begin this survey:
https://purdue.ca1.qualtrics.com/jfe/form/SV_0St36mvOZljXVtA

Thanks again for your time and consideration!

Study Information Below:

The research project I am working on with my advisor, Dr. Levon Esters, and GEAR UP Director, Dr. Virginia Bolshakova, focused on the experiences, resources, and environments in the GEAR UP afterschool program during the 2019-2020 school year. We are inviting you to participate in this study and complete a short online survey reflecting on the previous school year, 2019-2020. This study will help us gain a better understanding of the learning experiences of students and educators within afterschool programs as well as help grow GEAR UP programming going forward.

Please consider helping us with this research by completing this survey only once. The survey will take around 10 minutes to complete.

Participation in this study is voluntary, and you can skip any questions for any reason. Your responses are anonymous, cannot be traced back to you, and will be kept confidential. You must be 18 years or older to participate.

You have the right to withdraw from this study at any point and for any reason. If you would like to discuss this project with the Principal Investigator of this study, please contact Dr. Virginia Bolshakova at (765)496-1862 or via email at vbolshakova@purdue.edu; or Brooke Stafford via email at bsiefert@purdue.edu. If you have any concerns you may also contact the Institutional Review Board at Purdue University at (765)494-5942 or via email at irb@purdue.edu. This study is titled 'GEAR UP Out-of-School Program Participation, Youth-Adult Relationships, and Learning Environments,' IRB #2020-1775.

This study involves no more risks than encountered in everyday life.

Click the link below to begin this survey:

https://purdue.ca1.qualtrics.com/jfe/form/SV_0St36mvOZljXVtA

If you have any questions, feel free to contact me at bsiefert@purdue.edu, Dr. Levon Esters at lesters@purdue.edu, or Dr. Virginia Bolshakova at vbolshakova@purdue.edu.

We appreciate you and your time in reading this and providing feedback on the program.

Sincerely,
Brooke Stafford

APPENDIX I. SURVEY CODEBOOK

GEAR UP Afterschool Educator Survey

Section I

Directions: Please respond to the following questions by indicating your opinion on how much you could do as a Building Coordinator or Regional Director of the GEAR UP afterschool program during the previous 2019-2020 school year. Your responses will be kept confidential.

How much can you do?	**Nothing 1**		**Very Little 3**		**Some 5 Influence**		**Quite a Bit 7**		**A Great Deal 9**
1. How much can you do to control disruptive behavior in the afterschool program? **SE1**	1	2	3	4	5	6	7	8	9
2. How much can you do to motivate students who show low interest in school work? **SE2**	1	2	3	4	5	6	7	8	9
3. How much can you do to get students to believe they can do well in school work? **SE3**	1	2	3	4	5	6	7	8	9
4. How much can you do to help your students value learning? **SE4**	1	2	3	4	5	6	7	8	9
5. To what extent can you craft good questions for your students? **SE5**	1	2	3	4	5	6	7	8	9
6. How much can you do to get adolescents to follow afterschool program rules? **SE6**	1	2	3	4	5	6	7	8	9
7. How much can you do to calm a student who is disruptive or noisy? **SE7**	1	2	3	4	5	6	7	8	9
8. How well can you establish a classroom management system with your students? **SE8**	1	2	3	4	5	6	7	8	9
9. How much can you use a variety of assessment strategies? **SE9**	1	2	3	4	5	6	7	8	9
10. To what extent can you provide an alternative explanation or example when students are confused? **SE10**	1	2	3	4	5	6	7	8	9
11. How much can you assist families in helping their children do well in school? **SE11**	1	2	3	4	5	6	7	8	9
12. How well can you implement alternative teaching strategies in your afterschool program? **SE12**	1	2	3	4	5	6	7	8	9

Section II

Directions: Please respond to the following questions related to STEM education.

To what extent are the following important with students?	**Not Important 1**	**A Little Important 2**	**Moderate Importance 3**	**Very Important 4**	**Extremely Important 5**
1. STEM education can help students acquire essential skills related directly to STEM careers. **Bel1**	1	2	3	4	5
2. STEM education can help students acquire critical thinking that is usually conducted by scientists, technologists, engineers, and mathematicians. **Bel2**	1	2	3	4	5
3. STEM education can help students acquire authentic problem solving to make decisions in the real world. **Bel3**	1	2	3	4	5
4. STEM education can help students leverage collaboration with others to execute STEM learning projects. **Bel4**	1	2	3	4	5
5. STEM education can help students acquire engineering design abilities (define the needs, design, and make a certain product) to make helpful products. **Bel5**	1	2	3	4	5

Section III

Directions: Please respond to the following questions related to the GEAR UP afterschool program during the previous 2019-2020 school year.

How often did YOU do the following during the 2019-2020 GEAR UP afterschool program?	Never 1	Rarely 2	Occasionally 3	Often 4	All the Time 5
Students' Technology Skills					
1. Facilitate open exploration of new technologies to help them learn STEM. **Behav1**	1	2	3	4	5
2. Support use of varied resources (e.g., peers, internet) to learn new skills in students. **Behav2**	1	2	3	4	5
3. Encourage students to try new skills for each STEM learning activity. **Behav3**	1	2	3	4	5
Students' Critical Thinking					
4. Support students in creating original products and solutions that reflect their own unique ideas. **Behav4**	1	2	3	4	5
5. Help students create products and solutions that communicate clear messages and help solve problems. **Behav5**	1	2	3	4	5
6. Facilitate groups of students in managing open-ended, complex projects. **Behav6**	1	2	3	4	5

How often did YOU do the following during the 2019-2020 GEAR UP afterschool program?	Never 1	Rarely 2	Occasionally 3	Often 4	All the Time 5
Students' Tutoring					
7. Support students in developing time management and organizational skills. **Behav7**	1	2	3	4	5
8. Help students learn test preparation techniques. **Behav8**	1	2	3	4	5
Students' College and Career Readiness					
9. Hold conversations with students about careers. **Behav9**	1	2	3	4	5

10. Discuss life skills needed beyond high school with students. **Behav10**	1	2	3	4	5
11. Discuss potential college majors during STEM activities. **Behav11**	1	2	3	4	5

Section IV

Directions: Please respond to the following questions related to the GEAR UP afterschool program physical learning environment during the previous 2019-2020 school year.

Physical learning environments are the various environments found in a school that are intended as learning places which include school buildings, learning spaces, and their spatial structure, furniture, fittings, and equipment.

To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	**Strongly Disagree 1**	**Disagree 2**	**Agree 3**	**Strongly Agree 4**
1. The program space was safe, clean, and secure. **PLE1**	1	2	3	4
2. Students were carefully supervised. PLE2	1	2	3	4
3. Students were able to select and choose from various learning methods and activities. PLE3	1	2	3	4
4. The program environment enhanced students' health. PLE4	1	2	3	4
5. Healthy and nutritious snacks were provided for students (e.g., healthy and nutritious snacks include: fruits, vegetables, protein sources). PLE5	1	2	3	4
6. Dinner meal options were provided on other afterschool days in addition to GEAR UP Diner Nights. PLE6	1	2	3	4
7. The program's indoor and outdoor space met the needs of all program activities. PLE7	1	2	3	4
To what extent do you agree or disagree with the following statements when thinking about the 2019-2020 GEAR UP afterschool program?	**Strongly Disagree 1**	**Disagree 2**	**Agree 3**	**Strongly Agree 4**

8. The space was arranged well for a range of activities. PLE8	1	2	3	4
9. The space was arranged well for simultaneous activities. PLE9	1	2	3	4
10. The room and wall area helped to facilitate varied learning methods. PLE10	1	2	3	4
11. Makerspace Carts were present in the room for students to freely access and tinker whenever desired. PLE11	1	2	3	4
12. How many days per week were Makerspace Carts utilized? PLE12 _____				
13. There was an ideal student-staff ratio. PLE13	1	2	3	4
14. On average, what was the student to staff ratio? (For example, 10:1) PLE14_____				
15. The space had windows facing outdoors where natural light could come into the room. PLE15	1	2	3	4
16. The lighting of the space was easily controllable. PLE16	1	2	3	4
17. Noise disturbances were frequently heard from spaces external to the afterschool program or outside the building. PLE17 *Reverse Code*	1	2	3	4
18. Students had a difficult time clearly hearing the instructor or other peers. PLE18 *Reverse Code*	1	2	3	4
19. The furniture and room equipment provided comfort. PLE19	1	2	3	4
20. The furniture and room equipment were appropriate for the age group of students. PLE20	1	2	3	4
21. The colors of the space portrayed a calming mood. PLE21	1	2	3	4
22. The space had strong and reliable internet connection. PLE22	1	2	3	4
23. Electronic devices (e.g. GEAR UP iPad's, school	1	2	3	4

laptops, etc.) were used as a learning tool. PLE23				
24. How many times per month were electronic devices utilized? PLE24 _____				
25. OPEN ENDED QUESTION: Please share anything else important about your afterschool program's physical learning environment? **OpEnd1** _____				
26. OPEN ENDED QUESTION: Based on your experiences, how has the GEAR UP program helped students? **OpEnd2** _____				
27. OPEN ENDED QUESTION: Based on your experiences, how could the GEAR UP program be improved to have a greater impact on students?**OpEnd3** _____				

Demographic Information

Please answer the following questions to the best of your ability.

1. Gender: _____ D1

2. School(s): _____ D2

3. Highest educational degree completed: D3

☐ GED 1 ☐ High School Diploma 2 ☐ Associate's Degree 3

☐ Bachelor's Degree 4 ☐ Master's Degree 5 ☐ Ph.D. 6

4. How many years have you been teaching K-12 students, including this year? _____ year(s) D4

5. Teaching Experience with GEAR UP: D5

☐ less than 1 year 0 ☐ 1 year 1 ☐ 2 years 2 ☐ 3 years 3 ☐ 4 years 4

☐ more than 4 years 5

REFERENCES

Afterschool Alliance. (2007). *Afterschool programs: Helping kids succeed in rural america* (Issue 4). https://www.afterschoolalliance.org/issue_briefs/issue_rural_4.pdf

Afterschool Alliance. (2020). *America after 3PM: Demand grows, opportunity shrinks*. http://afterschoolalliance.org/documents/AA3PM-2020/AA3PM-National-Report.pdf

Afterschool Alliance. (2009*a*). *Afterschool innovations in brief: Focusing on older youth* (Afterschool alert issue brief no. 36, 37, 38, 40) (Issue December). https://afterschoolalliance.org/documents/Afterschool_In_Brief_09_FINAL.pdf

Afterschool Alliance. (2009*b*). *America after 3PM: The most in-depth study of how America's children spend their afternoons.* http://www.afterschoolalliance.org/AA3_Full_Report.pdf

Afterschool Alliance. (2015). *Full STEM ahead: Afterschool programs step up as key partners in STEM education*. http://afterschoolalliance.org/AA3PM/STEM.pdf

Allen, P. J., Chang, R., Gorrall, B. K., Waggenspack, L., Fukuda, E., Little, T. D., & Noam, G. G. (2019). From quality to outcomes: a national study of afterschool STEM programming. *International Journal of STEM Education*, *6*(1). https://doi.org/10.1186/s40594-019-0191-2

Altan, E. B., Üçüncüoğlu, İ., & Öztürk, N. (2019). Preparation of out-of-school learning environment based on science, technology, engineering, and mathematics education and investigating its effects. *Science Education International*, *30*(2), 138–148. https://doi.org/10.33828/sei.v30.i2.7

Arbreton, A., Bradshaw, M., Sheldon, J., & Pepper, S. (2009). *Making every day count: Boys & Girls Clubs' role in promoting positive outcomes for teens*. Public/Private Ventures.

Ary, D., Razavieh, A., & Jacobs, L. . (1990). *Introduction to research in education (4th ed.)*. Holt, Rinehart, and Winston.

Azuine, R. E., & Singh, G. K. (2019). Mentoring, bullying, and educational outcomes among U.S. school-aged children 6-17 years. *Journal of School Health*, *89*(4), 267–278. https://doi.org/10.1111/josh.12735

Baars, S., Schellings, G. L. M., Krishnamurthy, S., Joore, J. P., den Brok, P. J., & van Wesemael, P. J. V. (2020). A framework for exploration of relationship between the psychosocial and physical learning environment. *Learning Environments Research, 23*. https://doi.org/10.1007/s10984-020-09317-y

Bae, S. H., Park, H., Kwak, E. J., Cho, E., & Jung, H. (2019). Global pattern of extended education and its impact on educational outcomes: The case of science education. *International Journal for Research on Extended Education, 7*(1), 86–106. https://doi.org/10.3224/ijree.v7i1.07

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman and Company.

Barrett, P., Davies, F., Zhang, Y., & Barrett, L. (2015). The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. *Building and Environment,* 89, 118-133.

Brooks, D. C. (2012). Space and consequences: The impact of different formal learning spaces on instructor and student behavior. *Journal of Learning Spaces, 1*(2), 1–10.

Brooks, D. C. (2011). Space matters: The impact of formal learning environments on student learning. *British Journal of Educational Technology*, *42*(5), 719–726. https://doi.org/10.1111/j.1467-8535.2010.01098.x

Buehler, K., Sánchez, B., Vaclavik, D., Rodriguez, E., & Gray, T. (2020). Rules of disengagement: Negative relationships and interactions between adults and youth. *Youth & Society*, *52*(6), 1033–1056. https://doi.org/10.1177/0044118X18793157

Bybee, R. (2010). Advancing STEM Education: A 2020 Vision. *Technology and Engineering Teacher*, 70(1), 30.

Byers, T., Hartnell-Young, E., & Imms, W. (2018). Empirical evaluation of different classroom spaces on students' perceptions of the use and effectiveness of 1-to-1 technology. *British Journal of Educational Technology*, *49*(1), 153–164. https://doi.org/10.1111/bjet.12518

Byers, T., & Imms, W. (2016). Evaluating the change in space in a technology-enables primary years setting. In K. Fisher (Ed.), *The translational design of schools: An evidence-based approach to aligning pedagogy and learning environments* (pp. 199–220). Sense Publishers.

Cappella, E., Hwang, S. H. J., Kieffer, M. J., & Yates, M. (2018). Classroom practices and academic outcomes in urban afterschool programs: Alleviating social-behavioral risk. *Journal of Emotional and Behavioral Disorders*, *26*(1), 42–51. https://doi.org/10.1177/1063426617739254

Capps, D. K., & Crawford, B. A. (2013). Inquiry-based instruction and teaching about nature of science: Are they happening? *Journal of Science Teacher Education*, 24(3), 497–526. https://doi.org/10.1007/s10972-012-9314-z

Carver, P. R., Iruka, I. U., & Chapman, C. (2005). *National Household Education Surveys Program of 2005: Afterschool Programs and Activities:2005*. National Center for Education Statistics. https://nces.ed.gov/pubs2006/2006076.pdf

Chan, H. Y., Choi, H., Hailu, M. F., Whitford, M., & Duplechain DeRouen, S. (2020). Participation in structured STEM-focused out-of-school time programs in secondary school: Linkage to postsecondary STEM aspiration and major. *Journal of Research in Science Teaching*, *57*(8), 1250–1280. https://doi.org/10.1002/tea.21629

Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: Linking cognitive engagement to active learning outcomes. *Educational Psychologist*, *49*(4), 219–243. https://doi.org/10.1080/00461520.2014.965823

Chittum, J. R., Jones, B. D., Akalin, S., & Schram, Á. B. (2017). The effects of an afterschool STEM program on students' motivation and engagement. *International Journal of STEM Education*, *4*(1). https://doi.org/10.1186/s40594-017-0065-4

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Routledge Academic.

Cohen, M. D., Therriault, S., Scala, J., Lavinson, R., & Brand, B. (2019). *Afterschool programming as a lever to enhance and provide career readiness opportunities*. College and Career Readiness and Success Center at American Institutes for Research. https://ccrscenter.org/products-resources/afterschool-programming-lever-enhance-and-provide-career-readiness-opportunities

Cutucache, C., Boham, T., Luhr, J., Sommers, A., Stevenson, N., Sointu, E., Mäkitalo-Siegl, K., Kärkkäinen, S., Valtonen, T., Grandgenett, N., & Tapprich, W. (2018). NE STEM 4U afterschool intervention leads to gains in STEM content knowledge for middle school youth. *Cogent Education*, *5*(1), 1–12. https://doi.org/10.1080/2331186X.2018.1558915

Dabney, K. P., Tai, R. H., Almarode, J. T., Miller-Friedmann, J. L., Sonnert, G., Sadler, P. M., & Hazari, Z. (2012). Out-of-school time science activities and their association with career interest in STEM. *International Journal of Science Education, Part B: Communication and Public Engagement*, *2*(1), 63–79. https://doi.org/10.1080/21548455.2011.629455

Dawes, N. P., & Larson, R. (2011). How youth get engaged: Grounded-theory research on motivational development in organized youth programs. *Developmental Psychology*, 47(1), 259–269. https://doi.org/10.1037/a0020729

Deed, C., Lesko, T. M., & Lovejoy, V. (2014). Teacher adaptation to personalized learning spaces. *Teacher Development*, *18*(3), 369–383. https://doi.org/10.1080/13664530.2014.919345

Deschenes, S., Arbreton, A., Little, P. M., Carla, H., Grossman, J. B., Weiss, H. B., & Lee, D. (2010). *Engaging older youth: Program and city-level strategies to support sustained participation in out-of-school time* (Issue April). The Wallace Foundation.

Deutsch, N. L., & Jones, J. N. (2008). "Show me an ounce of respect": Respect and authority in adult-youth relationships in after-school programs. *Journal of Adolescent Research*, *23*(6), 667–688. https://doi.org/10.1177/0743558408322250

Dillman, D. A., Smyth, J. D. & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (3rd edition). Wiley.

Diversi, M., & Mecham, C. (2005). Latino(A) students and caucasian mentors in a rural after-school program: Towards empowering adult-youth relationships. In *Journal of Community Psychology* (Vol. 33, Issue 1, pp. 31–40). Wiley-Liss Inc. https://doi.org/10.1002/jcop.20034

Donmez, I. (2021). Impact of out-of-school STEM activities on stem career choices of female students. *Eurasian Journal of Educational Research*, *91*, 173–204. https://doi.org/10.14689/ejer.2021.91.9

Dornian, K., Moshirpour, M., & Behjat, L. (2021). Understanding mentor needs in online engineering outreach. *Canadian Engineering Education Association (CEEA-ACEG21) Conference*.

Dreyer, K. (2010). *An examination of academic outcomes for students who attend a school-based afterschool program*. University of Pittsburgh.

Durlak, J.A., Mahoney, J.L., Bohnert, A.M., & Parente, M.E. (2010). Developing and improving after-school programs to enhance youth's personal growth and adjustment: A special issue of AJCP. *Society for Community Research and Action*, 45, 285-293. DOI 10.1007/s10464-010-9298-9

Durlak, J. A., & Weissberg, R. P. (2007). *The impact of after-school programs that promote personal and social skills*. www.casel.org

DuBois, D. L., Portillo, N., Rhodes, J.E., Siverthorn, N., Valentine, J.C. (2011). How effective are mentoring programs for youth? A systematic assessment of the evidence. *Psychological Science in the Public Interest*, 12(2), 57-91. https://doi.org/10.1177/1529100611414806

Dworkin, J., & Larson, R. W. (2007). Adolescents' negative experiences in organized youth activities. *Journal of Youth Development*, *1*(3), 44–62. https://doi.org/10.5195/jyd.2007.373

Eccles, J., Midgley, C., Wigfield, A., Buchanan, C., Reuman, D., Flanagan, C., & Iver, D. Mac. (1993). The impact of stage-environment fit on young adolescents' experiences in schools and in families. *American Psychologist*, *48*(2), 90–101. https://doi.org/10.1016/B978-0-12-373951-3.00036-3

Faust, L., & Kuperminc, G. P. (2020). Psychological needs fulfillment and engagement in afterschool: "I pay attention because I am really enjoying this." *Journal of Adolescent Research*, 35(2), 201–224. https://doi.org/10.1177/0743558419852058

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). Sage Publications, Inc.

Finn, J. D., Pannozzo, G. M., & Achilles, C. M. (2003). The " why's" of class size: Student behavior in small classes. *Review of Educational Research*, *73*(3), 321–368.

Firestone, W. A. (1987). Mearing in method: The rhetoric of quantitative and qualitative research. *Educational Researcher, 16, 16-21.*

Fisher, K. (2016). The translational design of learning environments. In K. Fisher (Ed.), *The translational design of schools: An evidence-based approach to aligning pedagogy and learning environments* (7th ed., pp. 3–26). Sense Publishers.

Fredricks, J. A., Bohnert, A. M., & Burdette, K. (2014). Moving beyond attendance: lessons learned from assessing engagement in afterschool contexts. *New Drections for Youth Development*, *144*, 45–58. https://doi.org/10.1002/yd.20112

Granovskiy, B. (2018). Science, technology, engineering, and mathematics (STEM) education: An overview. *Congressional Research Service*, 7-5700, 1-33

Greene, K. M., Lee, B., Constance, N., & Hynes, K. (2013). Examining youth and program predictors of engagement in out-of-school time programs. *Journal of Youth and Adolescence*, *42*, 1557–1572. https://doi.org/10.1007/s10964-012-9814-3

Grossman, J. B., & Rhodes, J. E. (2002). The test of time: Predictors and effects of duration in youth mentoring relationships. *American Journal of Community Psychology*, *30*(2), 199–219. https://doi.org/10.1023/A:1014680827552

Hanlon, T. E., Simon, B. D., O'Grady, K. E., Carswell, S. B., & Callaman, J. M. (2009). The effectiveness of an after-school program targeting urban African American youth. *Education and Urban Society*, *42*(1), 96–118. https://doi.org/10.1177/0013124509343144

Hardiman, M. M. (2012). *The brain-targeted teaching model for 21st-century schools*. Sage Publications, Inc.

Herrera, C., DuBois, D. L., & Grossman, J. B. (2012). The role of risk: Mentoring experiences and outcomes for youth with varying risk profiles. In *MDRC*. http://eric.ed.gov/?id=ED544233

Hirsch, B. J., Roffman, J. G., Deutsch, N. L., Flynn, C. A., Loder, T. L., & Pagano, M. E. (2000). Inner-city youth development organizations: Strengthening programs for adolescent girls. *Journal of Early Adolescence*, *20*(2), 210–230. https://doi.org/10.1177/0272431600020002005

Hirsch, B.J., & Wong, V. (2005). After-School Programs. In *Handbook of Youth Mentoring* (First edition, pp. 364-375). Sage Publications, Inc.

Hopkins, W.G. (2006). *New view of statistics: Effect magnitudes*. Retrieved from http://www.sportsci.org/resource/stats/effectmag.html.

Huang, D., Cho, J., Mostafavi, S., Nam, H., H., Oh, C., Harven, A., & Leon, S. (2010*). What works? Common practices in high functioning afterschool programs across the nation in math, reading, science, arts, technology, and homework—A study by the National Partnership.* The afterschool program assessment guide (CRESST Report 768). Los Angeles: University of California, National Center for Research on Evaluation, Standards, and Student Testing (CRESST).

Huang, D., La Torre Matrundola, D., & Leon, S. (2014). Identification of key indicators for quality in afterschool programs. *International Journal for Research on Extended Education*, 2(1), 20-44.

Huang, D., Leon, S., & La Torre, D. (2017). Using entropy balancing to reduce the effects of selection bias in afterschool studies: An example in studying the relationship between intensity of afterschool program participation and academic achievement. *International Journal for Research on Extended Education*, *5*(1), 5–25. https://doi.org/10.3224/ijree.v5i1.01

Humphrey, C. (2013). A paradigmatic map of professional education research. *Social Work Education*, *32*(1), 3–16. https://doi.org/10.1080/02615479.2011.643863

Indiana GEAR UP. (n.d.). *Our mission*. https://indianagearup.org/about/our-mission.php

Jent, J. F., & Niec, L. N. (2009). Cognitive behavioral principles within group mentoring: A randomized pilot study. *Child and Family Behavior Therapy*, *31*(3), 203–219. https://doi.org/10.1080/07317100903099258

Jones, J. N., & Deutsch, N. L. (2011). Relational strategies in after-school settings: How staff – youth relationships support positive development. *Youth & Society*, *43*(4), 1381–1406. https://doi.org/10.1177/0044118X10386077

Kafai, Y., Desai, S., Peppler, K., Chiu, G., & Moya, J. (2009). The multiple roles of mentors. In Y. Kafai, K. Peppler, & R. Chapman (Eds.), *The computer clubhouse: Constructionism and creativity in youth communities* (pp. 90–99). Teachers College Press.

Kariuki, L. W., Njoka, J. N., & Mbugua, Z. K. (2019). Influence of teachers preparedness on performance of pupils in mathematics in lower primary schools in Aberdares Region of Kenya. *European Journal of STEM Education*, 4(1), 1–6. https://doi.org/10.20897/ejsteme/3931

Kataoka, S., & Vandell, D. L. (2013). Quality of afterschool activities and relative change in adolescent functioning over two years. *Applied Developmental Science*, *17*(3), 123–134. https://doi.org/10.1080/10888691.2013.804375

Klassen, R. M., & Chiu, M. M. (2010). Effects on teachers ' self-efficacy and job satisfaction: Teacher gender, years of experience, and job stress. *Journal of Educational Psychology*, *102*(3), 741–756. https://doi.org/10.1037/a0019237

Knoblauch, D., & Chase, M. A. (2015). Rural , suburban , and urban schools: The impact of school setting on the efficacy beliefs and attributions of student teachers. *Teaching and Teacher Education*, *45*, 104–114. https://doi.org/10.1016/j.tate.2014.10.001

Künsting, J., Neuber, V., & Lipowsky, F. (2016). Teacher self-efficacy as a long-term predictor of instructional quality in the classroom. *European Journal of Psychology of Education*, *31*(3), 299–322. https://doi.org/10.1007/s10212-015-0272-7

Kunter, M., Klusmann, U., Baumert, J., Richter, D., Voss, T., & Hachfeld, A. (2013). Professional competence of teachers: Effects on instructional quality and student development. *Journal of Educational Psychology*, 105(3), 805–820. https://doi.org/10.1037/a0032583

Kuuskorpi, M., & Cabellos Gonzalez, N. (2011). The future of the physical learning environment: School facilities that support the user. *CELE Exchange*, *11*. https://doi.org/10.1787/5kg0lkz2d9f2-en

Lauer, P. A., Akiba, M., Wilkerson, S. B., Apthorp, H. S., Snow, D., & Martin-Glenn, M. (2006). Out-of-school-time programs : A meta-analysis of effects for at-risk students. *Review of Educational Research*, *76*(2), 275–313.

Lee, D. S., Dang, T. G., Ulibas-Pascual, J., Gordon Biddle, K. A., Heller de Leon, B., Elliott, D., & Gorter, J. (2017). Exploring the influence of efficacy beliefs and homework help in predicting reading achievement among underserved children in an afterschool program. *Urban Review*, *49*(5), 707–728. https://doi.org/10.1007/s11256-017-0418-9

Lerner, R. M., Alberts, A., Jelicic, H., & Smith, L. M. (2006). Young people are resources to be developed: Promoting positive youth development through adult-youth relations and community assets. In *Mobilizing Adults for Positive Youth Development: Stategies for Closing the Gap between Beliefs and Behaviors* (pp. 19–39). Springer.

Lerner, R. M., Lerner, J. V., Almerigi, J. B., Theokas, C., Phelps, E., Gestsdottir, S., Naudeau, S., Jelicic, H., Alberts, A., Ma, L., Smith, L. M., Bobek, D. L., Richman-Raphael, D., Simpson, I., Christiansen, E. D. D., & Von Eye, A. (2005). Positive youth development, participation in community youth development programs, and community contributions of fifth-grade adolescents: Findings from the first wave of the 4-H study of positive youth development. *Journal of Early Adolescence*, 25(1), 17–71. https://doi.org/10.1177/0272431604272461

Li, P. P., Locke, J., Nair, P., & Bunting, A. (2005). Creating 21st century learning environments. *PEB Exchange, Programme on Educational Building 2005/10*, *10*, 15–26.

Lin, K., Lu, S., Hsiao, H., Kao, C., & Williams, P. J. (2021). Developing student imagination and career interest through a STEM project using 3D printing with repetitive modeling. *Interactive Learning Environments*, 1–15. https://doi.org/10.1080/10494820.2021.1913607

Lowell, B. L., Salzman, H., Bernstein, H., & Henderson, E. (2009, Nov. 7). *Steady as she goes? Three generations of students through the science and engineering pipeline* [Paper presentation]. Annual Meeting of the Association for Public Policy Analysis and Management, Washington, D.C.

Lumpe, A., Czerniak, C., Haney, J., & Beltyukova, S. (2012). Beliefs about teaching Science: The relationship between elementary teachers' participation in professional development and student achievement. *International Journal of Science Education*, 34(2), 153–166. https://doi.org/10.1080/09500693.2010.551222

Mahoney, J. L., Lord, H., & Carryl, E. (2005*a*). Afterschool program participation and the development of child obesity and peer acceptance. *Applied Developmental Science*, *9*(4), 202–215. https://doi.org/10.1207/s1532480xads0904_3

Mahoney, J. L., Lord, H., & Carryl, E. (2005*b*). An ecological analysis of after-school program participation and the development of academic performance and motivational attributes for disadvantaged children. *Child Development*, *76*(4), 811–825. https://doi.org/10.1111/j.1467-8624.2005.00879.x

Marchand, G.C., Nardi, N.M.., Reynolds, D., & Pamoukov, S. (2014). The impact of the classroom build environment on student perceptions and learning. *Journal of Environmental Psychology*, 40, 187-197. http://doi.org/10.1016/j.jenvp.2014.06.009

Matthews, K. E., Andrews, V., & Adams, P. (2011). Social learning spaces and student engagement. *Higher Education Research and Development*, *30*(2), 105–120. https://doi.org/10.1080/07294360.2010.512629

Mekinda, M. A., & Hirsch, B. J. (2013). After-school programs. In *Handbook of youth mentoring* (Second edition, pp. 221–232). Sage Publications, Inc.

Messias, D. K., Fore, E. M., Mcloughlin, K., & Parra-Medina, D. (2005). Adult roles in community-based youth empowerment programs. *Community Health*, *28*(4), 320–337.

Mizell, H. (2010). *Why professional development matters*. Learning Forward.

Moore, K.S., & Yulianti, K. (2014). Preparedness to deliver integrated STEM curricula: Establishing a baseline in four Indonesian high schools. *Journal of Education and Technology*, 1(1), 49-67.

Mulcahy, D., Cleveland, B., & Aberton, H. (2015). Learning spaces and pedagogic change: Envisioned, enacted and experienced. *Pedagogy, Culture & Society*, *23*(4), 575–595. https://doi.org/10.1080/14681366.2015.1055128

Murray, J., & Cousens, D. (2020). Primary school children's beliefs associating extra-curricular provision with non-cognitive skills and academic achievement. *Education 3-13*, *48*(1), 37–53. https://doi.org/10.1080/03004279.2019.1572769

National Research Council. (2009). *Learning science in informal environments*. The National Academies Press. https://www.nap.edu/catalog/12190/learning-science-in-informal-environments-people-places-and-pursuits

Nugent, G., Barker, B., Welch, G., Grandgenett, N., Wu, C., & Nelson, C. (2015). A model of factors contributing to STEM learning and career orientation. *International Journal of Science Education*, *37*(7), 1067–1088. https://doi.org/10.1080/09500693.2015.1017863

Nunnally, J.C. (1978). *Psychometric theory (2nd ed.)*. McGraw-Hill.

Oliver, J.D, & Hinkle, D.E. (1981). *Selecting procedures for agricultural education research*. Paper presented at the 8th Annual National Agricultural Education Research Meeting, Atlanta, GA.

Park, Y. S., Konge, L., & Artino, A. R. (2020). The positivism paradigm of research. *Academic Medicine*, 95(5), 690–694. https://doi.org/10.1097/ACM.0000000000003093

Parra, G. R., Dubois, D. L., Neville, H. A., Pugh-lilly, A. O., & Povinelli, N. (2002). Mentoring relationships for youth: Investigation of a process-oriented model. *Journal of Community Psychology*, *30*(4), 367–388. https://doi.org/10.1002/jcop.10016

Payton, J., Weissberg, R. P., Durlak, J. A., Dymnicki, A. B., Taylor, R. D., Schellinger, K. B., & Pacham, M. (2008). The positive impact of social and emotional learning for kindergarten to eighth-grade students: Findings from three scientific reviews. In *Collaborative for Academic, Social, Emotional Learning (CASEL)*. https://doi.org/10.1142/9789814289078_0016

Polman, J. L. (2003). The perils and promise of afterschool programs on school territory. *Afterschool Matters*, *3*, 3–12.

President's Council of Advisors on Science and Technology. (2010). *Prepare and inspire: K-12 education in science, technology, engineering, and math (STEM) for America's future.* https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast-stem-ed-final.pdf

Price, C. A., Kares, F., Segovia, G., & Loyd, A. B. (2019). Staff matter: Gender differences in science, technology, engineering or math (STEM) career interest development in adolescent youth. *Applied Developmental Science*, *23*(3), 239–254. https://doi.org/10.1080/10888691.2017.1398090

Princiotta, D., & Fortune, A. (2009). *The quality imperative: A state guide to achieving the promise of extended learning opportunities*. National Governors Association. https://doi.org/10.4324/9780203361566-11

Rhodes, J. E. (2002). *Stand by me: The risks and rewards of mentoring today's youth*. Harvard University Press.

Rhodes, J. E. (2004). The critical ingredient: Caring youth-staff relationships in after-school settings. *New Directions for Youth Development*, *2004*(101), 145–161.

Rhodes, J. E., & Dubois, D. L. (2006). Understanding and facilitating the youth mentoring movement. *Social Poilicy Report*, *20*(3), 3–19. https://doi.org/10.1002/j.2379-3988.2006.tb00048.x

Rogers, A. (2014). The iceberg: Exploring the relationship between formal, non-formal and informal learning. In *The base of the iceberg: Informal learning and its impact on formal and non-formal learning* (pp. 15-32). Verlag Barbara Budrich. Doi:10.2307/j.ctvbkk3bb.5

Rosenbaum, P.R. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55.

Roth, J. L., & Brooks-Gunn, J. (2016). Evaluating youth development programs: Progress and promise. In *Applied Developmental Science* (Vol. 20, Issue 3, pp. 188–202). Psychology Press. https://doi.org/10.1080/10888691.2015.1113879

Roth, J. L., Malone, L. M., & Brooks-Gunn, J. (2010). Does the amount of participation in afterschool programs relate to developmental outcomes? A review of the literature. In *American Journal of Community Psychology*, 45(3–4), 310–324. https://doi.org/10.1007/s10464-010-9303-3

Sahin, A., Ayar, M. C., & Adiguzel, T. (2014). STEM related after-school program activities and associated outcomes on student learning. *Educational Sciences: Theory & Practice*, *14*(1), 309–322. https://doi.org/10.12738/estp.2014.1.1876

Saltmarsh, S., Chapman, A., Campbell, M., & Drew, C. (2015). Putting "structure within the space": Spatially un/responsive pedagogic practices in open-plan learning environments. *Educational Review*, 67(3), 314–326. https://doi.org/10.1080/00131911.2014.924482

Sanchez, J. E., Lowman, J. L., & Hill, K. A. (2018). Performance and persistence outcomes of GEAR UP students : Leveling the playing field in higher education. *Journal of College Student Retention: Research, Theory & Practice*, *20*(3), 328–349. https://doi.org/10.1177/1521025116669954

Sanderson, R. C., & Richards, M. H. (2010). The after-school needs and resources of a low-income urban community: Surveying youth and parents for community change. *American Journal of Community Psychology*, *45*(3–4), 430–440. https://doi.org/10.1007/s10464-010-9309-x

Schunk, D.H., & DiBenedetto, M.K. (2016). Self-efficacy theory in education. In K.R. Wentzel & D.B. Miele (Eds.), *Handbook of motivation at school* (2nd ed., pp. 34-52). Taylor & Francis.

Schutt, R. (2015). *Investigating the social world (8th ed.)*. Sage Publications, Inc.

Shields, N.C. (2010). *Elementary students' knowledge and interests related to active learning in a summer camp at a zoo* (Publication No. 1490696). [Master's Thesis, Purdue University]. ProQuest Publishing.

Soobik, M. (2013). Physical learning environment and its suitability to the objectives of technology education. *Journal of Technology Education*, 25(1), 20-33.

Sullivan, P. J., & Larson, R. W. (2010). Connecting youth to high-resource adults: Lessons from effective youth programs. *Journal of Adolescent Research*, *25*(1), 99–123. https://doi.org/10.1177/0743558409350505

Switzer, G.E., Wisniewski, S.R., Belle, S.H., Dew., M.A., and Schultz, R. (1999). Selecting, developing, and evaluating research instruments. *Social Psychiatry and Psychiatric Epidemiology*, 34, 399-409.

Thi To Khuyen, N., Van Bien, N., Lin, P.L., Lin, J., & Chang, Chang, C.Y. (2020*a*). Measuring teachers' perceptions to sustain STEM education development. *Sustainability*, 12(4), 1531.

Thi To Khuyen, N., Van Bien, N., Lin, P.L., Lin, J., & Chang, Chang, C.Y. (2020*b*). *Teacher's perception of STEM education survey*. Graduate Institute of Science Education, National Taiwan Normal University.

Tichavakunda, A. A. (2019). Fostering college readiness: An ethnography of a Latina/o afterschool program. *Education and Urban Society*, *51*(7), 922–945. https://doi.org/10.1177/0013124517727055

Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, *68*(2), 202–248.

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). *Teachers' sense of efficacy scale (short form).* http://stelar.edc.org/instruments/teachers-sense-efficacy-scale

Tuckman, B., & Harper, B. (2012). *Conducting educational research (6th ed.)*. Rowman & Littlefield Publishers.

U.S. Department of Education (ED). (2021a). *Gaining early awareness and readiness for undergraduate programs: Frequently asked questions*. Office of Postsecondary Education. https://www2.ed.gov/programs/gearup/faq.html

U.S. Department of Education (ED). (2021b). *Gaining early awareness and readiness for undergraduate programs: Purpose*. Office of Postsecondary Education. https://www2.ed.gov/programs/gearup/index.html

Usher, E. L., & Pajares, F. (2008). Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research*, *78*(4), 751–796. https://doi.org/10.3102/0034654308321456

Vallett, D. B., Lamb, R., & Annetta, L. (2018). After-school and informal STEM projects: The effect of participant self-selection. *Journal of Science Education and Technology*, *27*, 248–255.

Vandell, D., Reisner, E., & Pierce, K. M. (2007). *Outcomes linked to high-quality afterschool programs: Longitudinal findings from the study of promising afterschool programs.* Policy Study Associates, Inc. https://eric.ed.gov/?id=ED499113%0Ahttp://dev.naesp.org/resources/1/A_New_Day_for_Learning_Resources/Making_the_Case/Outcomes_Linked_to_High-Quality_Afterschool_Programs.pdf

Walker, K. E., & Arbreton, A. J. A. (2004). *After-school pursuits: An examination of outcomes in the San Francisco Beacon Initiative*. Public/Private Ventures.

Wang, H.-H., Moore, T. J., & Roehrig, G. H. (2011). STEM integration: Teacher perceptions and practice. *Journal of Pre-College Engineering Education Research (J-PEER)*, 1(2). https://doi.org/10.5703/1288284314636

Wolters, C. A., & Daugherty, S. G. (2007). Goal structures and teachers' sense of efficacy: Their relation and association to teaching experience and academic level. *Journal of Educational Psychology*, *99*(1), 181–193. https://doi.org/10.1037/0022-0663.99.1.181

Woolner, P., Clark, J., Laing, K., Thomas, U., & Tiplady, L. (2014). A school tries to change: How leaders and teachers understand changes to space and practices in a UK secondary school. *Improving Schools*, *17*(2), 148–162. https://doi.org/10.1177/1365480214537931

Yampolskaya, S., Massey, O. T., & Greenbaum, P. E. (2006). At-risk high school students in the " Gaining Early Awareness and Readiness Program " (GEAR UP): Academic and behavioral outcomes. *The Journal of Primary Prevention*, *27*(5), 457–475. https://doi.org/10.1007/s10935-006-0050-z

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research*, *86*(4), 981–1015. https://doi.org/10.3102/0034654315626801