2019

Science Occupational Images and Aspirations of African American/ Black Elementary Students

Saron LaMothe
University of Central Florida

SCIENCE OCCUPATIONAL IMAGES AND ASPIRATIONS OF AFRICAN AMERICAN/BLACK ELEMENTARY STUDENTS

by

SARON LAMOTHE
B.S. Xavier University of Louisiana, 1998
M.A. University of Central Florida, 2007

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Counselor Education and School Psychology
in the College of Community Innovation and Education
at the University of Central Florida
Orlando, Florida

Summer Term
2019

Major Professor: W. Bryce Hagedorn

ABSTRACT

Within the United States, more than a million jobs in science and engineering (S&E) are projected over the next few years; yet, the Nation lacks the workforce to meet these demands. Despite the need for a more diverse, qualified workforce, African Americans/Blacks remain disproportionately underrepresented in science occupations, science degree attainment, and in science postsecondary majors. The lack of science participation is reflective of how minority secondary students view science and science occupations as many consider the pursuit of a science career as unfavorable. Moreover, minority secondary students, who do choose to pursue science occupations, seem to possess inaccurate (or a lack of) occupational knowledge necessary to do so successfully. Therefore, an understanding of antecedents to career choice will assist educational professionals in addressing the underrepresentation of diverse populations, such as African Americans/Blacks, within the science workforce. The purpose of this study is to garner insight into the science occupational images, occupational and educational aspirations of African American/Black fourth and five grade students. Gottfredson's Theory of Circumscription and Compromise, in conjunction with extant empirical literature, serves as the foundation for the study's conceptual framework. A qualitative case study design was used. The qualitative data provided a contextual understanding of science occupational images, occupational and educational aspirations. Participant-produced drawings, questionnaires, and semi-structured interviews served as sources for data collection. Overall, participants lacked some occupational knowledge. Participants viewed scientists as mostly male and Black. Additionally, the occupation of scientist was perceived as a dangerous and of high status. Lastly, half of the

participants expressed aspirations to be a scientist, while a majority expressed college educational aspirations.

This dissertation is dedicated to my supportive spouse and best friend, Michael LaMothe, and to my lovely daughter, Siena LaMothe. I love you all dearly, and I hope that you all are proud. This is also dedicated to my mother, Bernadine Victor, and to my brother, Chad Victor. Thank you for your guidance, support, and laughter. Lastly, this is dedicated to the loving memory of my father, Melvin Victor. I finally did it, Dad!

ACKNOWLEDGMENTS

Thank you to all of my loved ones, who provided support and even a good laugh to help me through this process. I would especially like to thank my spouse, Michael LaMothe, who was with me every step of this journey. I would like to acknowledge and thank my dissertation chair, Dr. Bryce Hagedorn, and committee members, Dr. Stacy Van Horn, Dr. Carolyn Hopp, and Dr. Bill Blank. You all were the best committee ever. Dr. Hagedorn, your leadership helped make that possible. Thank you all for your valuable feedback, encouragement, support, and mentorship.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

Today, we enjoy the benefits of scientific innovation spearheaded by individuals employed in science occupations. Several types of scientists, across various disciplines, contribute to our society in numerous ways by solving problems and enhancing our daily living experiences (Babco, 2004; Langdon, McKittrick, Beede, Khan, & Doms, 2011). The science workforce can be observed in private, education, research, and government sectors (Bureau of Labor Statistics, 2015; National Science Board, 2016); hence, the fruits of their labor are evident in products, such as smartphones, and in services, such as labor market trend analyses.

As an example of science's contributions to modern life, the ubiquitous use of smartphones and smart wearable technologies can be contributed to the work of computer and information scientists, as well as software developers. These technologies have changed the way members of society learn and live, especially given recent advances. Students can use voice-activated software, such as Google Assistant®, to help define a word or perform a mathematical calculation while studying for an upcoming examination. Software applications can assist individuals in monitoring their heart rate after a long workout or track daily health habits overtime.

Life scientists, such as biological and medical scientists, contribute to the health of our society as members of this profession conduct research in the hopes of curing diseases. For example, various scientists across the United States have collaborated to fight the spread of Zika (e.g., Xu et al., 2016), a mosquito transmitted virus linked to fever, pain, and birth defects in the infected (Centers for Disease Control and Prevention, 2017). Undoubtedly, the ongoing contributions of such scientists will continue to make a positive impact on increasing the health of our society.

Life scientists, such as biological and medical scientists, are not the only individuals who positively influence human health. Physical scientists, such as environmental scientists, contribute to our health and that of the world around us. Environmental scientists address concerns regarding pollution and other environmental conditions related to the (a) water that we drink, (b) air that we breathe, and (c) soil used to grow the food that we eat on a daily basis (Bureau of Labor Statistics, 2015).

Lastly, social scientists, such as economists, contribute to our knowledge of business, financial, employment and labor trends (Bureau of Labor Statistics, 2015). An economist, employed by a private corporation, may collect and analyze data to determine consumer spending forecasts of products, or advise on how the corporation may remain globally competitive. Similarly, an economist who works within a government agency may collect and analyze data related to employment trends and the effects of laws on minimum wages within the United States.

Thus, the types of scientists are just as diverse as the settings in which they can be found. The work of a scientist has a widespread impact on our personal lives, our environment, and our society at-large. Given the importance of contributions made by scientists, employment demands for scientists continue to increase within the United States (National Science Board, 2016).

Background and Context

Science, technology, engineering, and math (STEM) jobs are prevalent in today's economy and are projected to increase over the next few years. For instance, 7.3 million STEM jobs were estimated within the United States in 2008. By 2018, STEM employment opportunities are projected to exceed 8 million, or 5.3% of, jobs in the nation's economy (Carnevale, Smith, & Strohl, 2010). These estimates and projections reflect STEM jobs irrespective of educational requirements, and include technical, sub-baccalaureate occupations.

Job estimates for science and engineering (S&E), a more restrictive classification of occupations, indicate comparable prevalence and growth. In 2012, nearly 6 million S&E jobs, regardless of education level, were estimated within the United States (National Science Board, 2015). Additionally, S&E jobs in 2014 were estimated to be 6.3 million (National Science Board, 2016). These estimates are expected to increase to over 6.5 million in 2020 and 6.8 million in 2022 (National Science Board, 2014, 2016). Among science occupations, life scientist employment opportunities are projected to increase by 9.2%, physical scientists by 10.3%, and social scientists by 11.1%. The greatest projected increase is related to computer and mathematical scientist employment opportunities, as these opportunities are projected to grow by approximately 19% (National Science Board, 2016).

Whereas computer and mathematical science jobs reflect the highest increase in employment opportunities among science occupations, the same occupational group reflects the one of the highest workforce shortages. Particularly, these shortages are observed within software development in both private and government sectors (Xue & Larson, 2015). Continuously, employers are in search for qualified individuals with skillsets associated with computer and mathematical science, as these skills are highly valued (Rothwell, 2014). However, many employers have difficulty filling computer and mathematical science job vacancies due to the specialized skillset needed to meet the demands of the job. Additionally, employers have similar difficulties filling other science job vacancies, especially those requiring at least a postsecondary degree (Rothwell, 2014).

Diversity within the Science Workforce

Given the projected growth of science occupations, concerns abound that the United States will lack the necessary workforce to fill the growing number of science jobs projected within the next decade, these concerns in turn have led to addressing the underrepresentation of minorities within science occupations (President's Council of Advisors on Science and Technology, 2012). Approximately 70% of the S&E workforce are of Caucasian American/White descent, whereas African American/Blacks comprise of just 5% of the S&E workforce (National Science Board, 2016). However, not all minorities are underrepresented in S&E occupations, as Asian Americans are overrepresented, particularly in the computer and mathematical sciences (National Science Board, 2016).

It is important to consider that African Americans/Blacks could serve as a viable source for science workforce recruitment, especially given the shortages noted earlier as well as the disproportionate representation of African American/Black individuals.

Diversity within the science workforce will lead to increased innovation stimulated through collaboration among individuals of various backgrounds, perspectives, and skills (Babco, 2004). Furthermore, this innovation, supported by a diverse workforce, is important for the United States to remain globally competitive (Ashcraft & Blithe, 2010; Babco, 2004; Page, 2008).

There are additional benefits to a more diverse science workforce beyond increased technological innovation and competitiveness. Some proponents suggest that expanding the science workforce to include traditionally underrepresented populations would assist in reducing social inequalities due to the financial benefits afforded to science workers (Barker & Aspray, 2008; Langdon et al., 2011). For instance, the availability of S&E jobs has increased at a faster rate in comparison to non-S&E jobs, and S&E workers report lower rates of unemployment in comparison to non-S&E workers (Langdon et al., 2011; National Science Board, 2016). Additionally, individuals employed in S&E fields enjoy higher than average wages (upwards of 55%) and those with S&E degrees earn higher wages even if employed in non-S&E fields (Langdon et al., 2011; National Science Board, 2016).

The Nation's Skills Gap and Educational Attainment in STEM

Given the many benefits of a diverse science workforce, it is not surprising that S&E-focused initiatives and reform efforts exist, which includes over $3 billion in allocations to diversify the S&E talent pool and extend educational opportunities to traditionally underrepresented populations (Committee on STEM Education & National Science and Technology Council, 2013). An illustration of this notion is reflected in the nation's goal of producing over 1 million STEM graduates within the next decade in order to meet STEM job projections (Committee on STEM Education & National Science and Technology Council, 2013; President's Council of Advisors on Science and Technology, 2012).

Efforts to produce over 1 million STEM college graduates is pivotal, because postsecondary degree attainment is vital for individuals with science career aspirations, as most science occupations require at least an associate's degree (Carnevale et al., 2010). For example, Carnevale and colleagues (2010) project that 8 million STEM job vacancies will be available by 2018, many of which will be in professional and information service industries. Of the projected 2.8 million STEM job vacancies in the professional and information service industries, the following jobs require at least some postsecondary educational experience and/or degree attainment. According to Carnevale and colleagues (2010) by 2018 it is projected that

- 274,000 STEM jobs will be available for those with at least some postsecondary experience, but without an associate's or bachelor's degree;
- 313,000 STEM jobs will be available for those with at least an associate's degree; and
- 1.2 million STEM jobs will be available for those with at least a bachelor's degree.

As suggested, a postsecondary degree is an important step towards gaining access to science jobs, while having a bachelor's degree qualifies an individual for over a million projected STEM vacancies. Therefore, to rectify the nation's science skills gap by creating a more diverse science talent pool, the rate of science degree attainment by minorities, such as African Americans/Blacks, should be addressed. Although the number of bachelor's degrees awarded to African Americans/Blacks have increased from 8.8% in 2002 to 9.9% in 2012, the number of S&E bachelor's degrees awarded to African Americans/Blacks have remained steady at 8.7% (National Science Board, 2015).

Just as there are a disproportionate number of African Americans/Blacks attaining science degrees and thus pursing science occupations, there are a disproportionate number of African Americans/Blacks college students who even intend on majoring in science (National Science Board, 2015). Among freshmen attending 4-year institutions, approximately 39% of freshmen expressed intentions of declaring S&E majors, with African Americans/Blacks being the least likely to express such intentions (National Science Board, 2015).

Aspiration Gaps of Secondary Students

The lack of African Americans/Blacks majoring in science, graduating with science and engineering degrees, and thereby forgoing science careers may be relevant to aspiration development. For example, some students aspire towards educational or occupational opportunities without the necessary academic preparation needed to succeed (Akos, Lambie, Milsom, & Gilbert, 2007). Many science occupations require that an individual take college courses, or more advantageously to obtain a science postsecondary degree. However, in order to pursue a science degree, a high school student will need to take particular science and mathematics courses in order to gain entry into a science major in college. If a student lacks the prerequisite courses, the college student might have to add one to three years of additional coursework before she/he can enroll in a science major (Nicholson et al., 2013).

Unfortunately, aspiration gaps in science are exacerbated due to the lack of science occupational knowledge. For example, in a study regarding STEM career pathways of high school students, one African Americans/Blacks female student expresses this very issue. When asked for what initiated the exploration of STEM occupations, the student stated:

> They talked to us about careers in math, engineering and all of this stuff…Um, they just like showed it to us in case we wanted to go into it. They didn't go into all the science fields so I'm not really sure. (Zhang & Barnett, 2015; p. 644)

If this student decided to aspire towards a science occupation, she will be faced with challenges related to the academic preparation necessary for a science major declaration. Yet, these challenges can reveal themselves as early as middle school when math course trajectories are set and thus become difficult to change. Middle school is a crucial time for students academically, which is especially true for African American/Black students of low socioeconomic status who are disproportionally placed in lower level courses (Dauber, Alexander, & Entwisle, 1996; Hallinan, 1994; Plata, Masten, & Trusty, 1999). If a student is placed into a lower level mathematics course in middle school, she/he is less likely to switch to higher level courses without parental intervention and thus are less likely to take the high school courses necessary to pursue college (Akos et al., 2007; Dauber et al., 1996; Hallinan, 1994; McGrath & Kuriloff, 1999; Oakes, Gamoran, & Page, 1992). Therefore, intermediate elementary school years and the transition to middle school are important times to address issues such as aspiration gaps. These gaps can contribute to minorities forgoing those middle and high school courses which are most relevant to the pursuit of science college degrees (Akos et al., 2007; Zarrett, Malanchuk, Davis-Kean, & Eccles, 2006).

To summarize, we are living during a time in which technological innovation provides sustenance for our growing economy. In order to compete on a global scale, the United States will need to produce a qualified and skilled science workforce, which necessarily leads to an increase in the representation of African Americans/Blacks in science occupations. A more diverse (and qualified) science talent pool will not only encourage increased innovation, but will provide sources of recruitment for the growing number of science job vacancies. Additionally, a more diverse science workforce will address social inequities related to socioeconomic status (Ashcraft & Blithe, 2010; Babco, 2004; Barker & Aspray, 2008; Page, 2008). While African Americans/Blacks are the third largest group in the United States, they are disproportionately awarded science bachelor's degrees and as such are disproportionally represented in science occupations (National Science Board, 2015). In order to meet the goal of producing over 1 million STEM graduates within the next decade, researchers and educators must address the low attraction of science occupations among African American/Black K-12 students (Committee on STEM Education & National Science and Technology Council, 2013; President's Council of Advisors on Science and Technology, 2012)..

However, there are possible explanations for the disproportionate number of African Americans/Blacks in science, which can be illuminated by an understanding of aspiration development. Practical implications of exploring aspiration development in elementary school can address issues experienced by middle and high school students, such as discrepancies between the student's pursuit of a science occupation and the lack of academic preparation needed to flourish in science. Moreover, a middle school student's academic trajectory in mathematics, for example, is related to whether she/he enrolls in higher-level mathematic courses needed for college (ACT, 2008). Consequently, if the middle school years are important to a student's academic trajectory given the sequential nature of STEM courses, then having an understanding of aspiration development during the elementary school years is paramount.

Conceptual Framework

The following conceptual framework is based on Gottfredson's (1981, 2005) Theory of Circumscription and Compromise, which is a theory that addresses the content and development of occupational aspirations and image formation of children and adolescents (Gottfredson, 1996). Gottfredson's theory is similar to person-environment fit theories (Patton & McMahon, 1999), which address congruency between individuals and their work environment. As Gottfredson (1996) states, "Forming occupational aspirations is a process of comparing one's self-image with images of occupations and judging degree of match between the two" (p. 189).

Gottfredson's (1981, 2005) Theory of Circumscription and Compromise posits that career development begins before one reaches kindergarten; and that the circumscription process primarily involves the "rejection" of occupations rather than their "selection". The complexity of career development is compounded by the compromising of aspirations if and when an individual considers occupations once deemed incompatible in place of more desirable alternatives. Thus, one's career development is an expression of their self-concept; and an individual's aspiration is the product of comparing one's self-image with the images of occupations, which includes incumbents (i.e., those employed in respective occupations). The stages of circumscription and compromise, which form the basis of Gottfredson's theory, are presented.

Circumscription of aspirations

The process of circumscription, the development of self-concept (i.e., one's image of self), occupational images and aspirations, has four developmental stages which posits how an individual may eliminate viable occupational options beginning in early childhood (Gottfredson, 1981, 2005). In addition to the stages, there are five principles related to the circumscription process as whole (Gottfredson, 1981, 1996, 2002). The first principle states that children move from concrete thinking in elementary school to more abstract reasoning as they age. However, children develop cognitively at different rates, which is related in the rate in which they process through the four stages. Second, the development of one's self-concept and occupational preferences are interconnected. An occupational aspiration is a sampling of one's social space (i.e., zone of acceptable alternatives), which in essence is an outward expression of one's self-concept to society at large. In other words, the zone of acceptable alternatives (or social space) are the occupations, bounded by levels of sex type (i.e., female and/or male domination of occupations) and prestige. Third, children incorporate information of increasing complexity as they progress through the each of the stages.

As a result, the self-concept progressively becomes delineated, which is the fourth principle. Additionally, an individual eliminates occupations deemed as unacceptable (e.g., the occupation is perceived as too difficult). This narrowing of options is essentially irreversible. Lastly, the fifth principle suggests that self-concept development is a gradual process in which individuals may maintain certain occupational preferences, and yet have difficultly articulating the reasons for holding these preferences. Due to individuals largely being unaware of the process, an external event or stimulus is needed to bring the process to the forefront of one's awareness. Each of the principles are illustrated through the four stage of circumscription, which are summarized below.

Stage 1: Orientation to size and power

The first stage in the process of circumscription of aspirations occurs during three to five years of age (Gottfredson, 1981). The occupational task at this stage is to develop an awareness that adults participate in the world of work (Gottfredson, 1981). Additional developments typical of this age group includes labeling others based on outwardly observable characteristics of gender, race, and occupations.

Stage 2: Orientation to sex roles

The second stage occurs during grades one through three, which are typically ages six to eight years of age (Gottfredson, 1981). During this stage, children are becoming increasingly aware of gender roles; that is, what is and is not appropriate for their own gender. Additionally, children at this stage have begun to realize the permanence of race, and that racial status is not limited to observable characteristics (Quintana & Smith, 2012).

The conceptions of children in this stage are concrete and dichotomous (Gottfredson, 1981). Typically, they consider occupations that are more apparent to them due to highly distinguishable characteristics (e.g., police officer’s uniform) or through close interactions with parents, teachers, and other significant adults. However, children will begin to discard occupations typically held by the opposite gender (Gottfredson, 1981). Thus, females may foreclose careers typically held by males.

Stage 3: Orientation to social valuation

The transition to high school marks the development of the integrated abstract self, and self-direction becomes more prominent in the pursuit of personal goals (Gottfredson, 1981). Previous stages of development are marked by the rejection of unacceptable occupations based on gender and prestige; although the child and adolescent are largely unaware of this process. In contrast, the stage of orientation to internal, unique self encompasses the exploration of occupations within their social space, which are acceptable alternatives worthy of consideration.

By the age of 14 years, adolescents have begun to acknowledge the connections between education, occupations, and social class. In addition, they begin to notice distinctions among occupations and the personalities of those who participate in varying occupational groups (i.e., occupational images). During this stage, adolescents are able to express idealistic aspirations, occupations most desired, and realistic aspirations, least desirable but otherwise acceptable occupations (Gottfredson, 1981). However, these expressed aspirations are mostly likely tentative, and change as the adolescent continues to refine their interests and abilities.

Compromise of aspirations

The process of circumscription described the stages in which children and adolescents eliminate occupations deemed as unacceptable. Compromise, on the other hand, is the process in which individuals "relinquish their most preferred alternatives for less compatible but more accessible ones" (Gottfredson, 2005 pg. 82). However, compromise is differentiated from the process of vocational choice.

Vocational choice takes place when an individual, such as a high school student, evaluates more acceptable or attractive occupational alternatives. Once the high school student begins to consider less acceptable or attractive occupational alternatives – he or she begins to engage in the process of compromise (Gottfredson, 2005). Aspects that are the most central to one's self-concept are prioritized first when compromising aspirations. Therefore, individuals will choose occupations that are reflections of their gender self-concept first, followed by prestige and occupational field last.

In summary, Gottfredson's (1981, 2005) Theory of Circumscription and Compromise posits that career development begins before one reaches kindergarten; and that the circumscription process primarily involves the "rejection" of occupations rather than their "selection". The complexity of career development is compounded by the compromising of aspirations if and when an individual considers occupations once deemed incompatible in place of more desirable alternatives. Thus, one's career development is an expression of their self-concept; and an individual's aspiration is the product of comparing one's self-image with the images of occupations.

Problem Statement

An explanation for the lack of African Americans/Blacks (a) majoring in science; (b) graduating with science degrees; and thereby (c) forgoing careers in science can be illuminated by exploring the antecedents to career choice (e.g., knowledge and perceptions) in African American/Black children. Research supports Gottfredson's (1981, 2005) theory suggesting that occupational aspirations begin to form at an early age (e.g., Auger, Blackhurst, & Wahl, 2005). Occupational aspirations, jobs considered as the "best alternative" (Gottfredson, 1981; p. 548), reflect how the individual views the self and her/his compatibility with the perceived image of the occupation (Gottfredson, 1981, 2005). A process of progressively narrowing occupational alternatives (i.e., circumscription) can lead to the child prematurely foreclosing options based on erroneous information, such as *all scientists are geniuses* (Gardner, 1980; Gottfredson, 1981, 2005). Additionally, as suggested by Gottfredson's (1981, 2005) theory, the perceived occupational images of science workers play a role in whether a child, ultimately, aspires to and/or is adequately prepared to pursue a career in science.

Statement of Purpose and Research Questions

The purpose of the current study was to explore the occupational images of science workers and aspirations expressed by African American/ Black elementary students. A qualitative case study method was used. Therefore, the primary research questions are as follows:

1. What do African American/Black 4th and 5th grade students know of science occupations?

2. How do African American/ Black 4^{th} and 5^{th} grade students perceive science occupations and incumbents?
3. To what extent do the aspirations of African American/Black 4^{th} and 5^{th} grade students align with the pursuit of science occupational paths?
4. What differences exist, if any, between female and male African American/Black 4^{th} and 5^{th} grade students in regard to science occupational knowledge, perceptions, and aspirations?

Research Design Overview

Upon the approval of the Institutional Review Board (IRB) at the University of Central Florida (UCF), the researcher explored the occupational images of science workers, occupational and educational aspirations held by African American/Black elementary school students. Descriptive statistics were used to present results regarding the presence of (a) stereotype indicators of science workers, (b) occupational aspirations, and (c) educational aspirations. Additionally, scores data from an occupational status questionnaire were averaged to determine composite scores. Qualitative results included data from individual drawings, transcripts from semi-structured interviews, and contextual factor sources. Additionally, the primary types of data were collected in sequential phases bounded by location (e.g., local elementary school) and time (i.e., start of 2017-2018 school year). Lastly, throughout the study, the researcher addressed issues of trustworthiness, and maintained field notes during data collection.

Rationale and Significance

The acquisition of vocational knowledge and the development of aspirations is a dynamic process involving elements of race, gender, and socioeconomic status. Due to this dynamic process, diverse populations, such as African Americans/Blacks and those from low socioeconomic backgrounds, particularly, would benefit from childhood (i.e., pre-adolescence) career development research (Porfeli, Hartung, & Vondracek, 2008). However, limited research exists regarding occupational images and the connection to aspiration development of African American/Black children (Bigler, Averhart, & Liben, 2003), as much of the extant career development literature is focused on the high school years and beyond (Palladino Schultheiss, 2008). As a result, researchers call for the inclusion of diverse groups in career development research (Watson & McMahon, 2005).

Extant literature presents challenges to understanding childhood career development in general (Watson & McMahon, 2005). Limitations of extant career development research include the absence of conceptual frameworks used to organize studies, as well as the inconsistent use of operational definitions (Hartung, Porfeli, & Vondracek, 2005; Palladino Schultheiss, 2008; Porfeli et al., 2008; Watson & McMahon, 2005). Relatedly, there are a number of STEM-based interest and attitude studies published in science and technology journals. However, science and technology education researchers (see Potvin & Hasni, 2014) suggest that career development is a psychological complex process, and that career development research produced by the science education community falls short of gleaning insight into such complex issues. Therefore, the current study is designed with these limitations in mind, and seeks to glean understanding regarding the underrepresentation of African Americans/ Blacks in science and the precursors to career choice. This understanding will assist educational professionals, particularly school counselors, in developing K-12 career programs consistent with the nation's goals of expanding the STEM workforce.

Summary

African American/Black individuals are disproportionately underrepresented as science majors, science degree holders, and as scientists within the workforce. Possible explanations for the disproportionate number of African American/Black individuals in science can be extrapolated from exploring the antecedents to career choice. However, limited research exists in which the aspiration development of African American/Black children are addressed. Extant literature related to the constructs of interest in the current study focuses on secondary and post-secondary samples, or lack conceptual frameworks.

Therefore, the researcher sought to explore the science occupational images, occupational and educational aspirations of African American/Black 4^{th} and 5^{th} grade students. A qualitative case study design was used in this study. Trustworthiness was addressed throughout the stages of data collection.

Definition of Terms

The following terms, which are used throughout the study, are defined here for the sake of consistency and clarity:

Aspirations: An expressed goal, whether occupational or educational, bounded by time (Gottfredson, 1981; Rojewski, 2007).

Circumscription: The process in which an individual forgoes occupations, that are incongruent with one's self-concept (Gottfredson, 2005).

Compromise: The process in which an individual considers constraints upon vocational choice. The individual may consider occupations, that are accessible, yet less compatible (Gottfredson, 2005).

Occupational Images: Generalizations an individual conceives about various occupations, such as the lifestyle and personalities of those working in that occupation, job duties, rewards, status, and general knowledge of the occupation (Gottfredson, 1981).

Occupational Knowledge: Familiarity with the earning potential, tasks, essential skills, work environment, and paths of attainment for any given occupation (Ferrari et al., 2015; Gottfredson, 1981; Walls, 2000). Occupational knowledge may be perceived, that is 'how familiar an individual thinks she/he is with an occupation?'. Or, occupational knowledge can be deemed actual knowledge, that is 'to what extent does an individual's knowledge corresponds with objective sources of information?'(Ferrari et al., 2015).

Occupational Status: The perceived difficulty, importance, and earning potential of an occupation (Liben, Bigler, & Krogh, 2001).

S&E Occupations: Science and engineering occupational groups based on similar work tasks as determined by the Standard Occupational Classification (SOC) system, and requiring at least a bachelor's degree in most instances (see Appendix A and B; National Science Board, 2015; Oleson, Hora, & Benbow, 2014)**.**

S&E-Related Occupations: Occupations in which S&E knowledge and training is used, but may not require a bachelor's degree. Such occupations include architects, actuaries, S&E managers, S&E precollege teachers, S&E technicians, and occupations in health (see Appendix C; National Science Board, 2015).

Science Occupations: An occupational group comprising of (a) computer and mathematical scientists, (b) life scientists, (c) physical scientists, (d) social scientists, and I science postsecondary teachers and researchers (see Appendix A; National Science Board, 2015).

STEM Occupations: In comparison to S&E, this is a more general term used to reference occupations in science, technology, engineering, and math. The occupations are based on similar work tasks, skills, and/or knowledge that encompasses those across S&E and S&E-related occupational groupings (Oleson et al., 2014).

Zone of Acceptable Alternatives: Zone of acceptable alternatives (also referred to as social space) are the occupations, bounded by levels of sex type (i.e., female and/or male domination of occupations) and prestige. It contains a sampling of occupations deemed acceptable by an individual (Gottfredson, 1981).

Organization of the Study

This current study contains a total of five chapters. The present chapter contained (a) an introduction to the study including a statement of the problem explored; (b) primary research questions, (c) an overview of the research approach, and (d) significance of the study. Chapter Two contains a review of relevant research pertaining to aspirations and images of scientists. In Chapter Three the research approach and methods used in the study will be explored, which includes (a) procedures, (b) descriptions of data collection tools, (c) an overview of data analysis procedures, and (d) limitations of the study. Chapter Four will include the themes and results that emerge, followed by a discussion of the findings and implications presented in Chapter Five.

CHAPTER TWO: REVIEW OF LITERATURE

The purpose of this current qualitative case study was to explore the science occupational images, occupational and educational aspirations of African American/Black elementary school students. The researcher sought to explore the following.

1. What do African American/Black 4^{th} and 5^{th} grade students know of science occupations?
2. How do African American/ Black 4^{th} and 5^{th} grade students perceive science occupations and incumbents?
3. To what extent, do the aspirations of African American/Black 4^{th} and 5^{th} grade students align with the pursuit of science occupational paths?
4. What differences exist, if any, between female and male African American/Blac^{k} 4th an^{d} 5th grade students in regard to science occupational knowledge, perceptions, and aspirations?

Therefore, this chapter contains an on-going, evolving review of seminal and contemporary research related to the questions of this current study. First, a brief description of the literature review process is provided. Second, a critique of relevant literature for each main construct is presented.

This review of representative literature explores the aspiration development of children and adolescents; which, includes the connection to occupational images. A review of occupational aspirations provides an understanding of science aspirations. Furthermore, a review of educational aspirations is provided, as the pursuit of a postsecondary degree is fundamental to the attainment of science employment. Lastly, the influences of occupational images are explored, which includes topics regarding occupational knowledge, perceptions of occupational status, and the perceptions of science occupational incumbents.

In conducting the review of literature, the researcher used an array of sources, including professional peer-reviewed journals and books. Primarily, these sources were accessed through digital research databases, such as EBSCOhost®, ProQuest®, and Google Scholar®. Additionally, Web of Science ™ was used to find published articles in which seminal publications were cited. The researcher used several keywords associated with the primary constructs of aspirations (i.e., both occupational and educational), occupational images, occupational knowledge, and occupational status. The search of empirical literature was an interdisciplinary endeavor due to topics of career development, education, and STEM. Therefore, this review is reflective of its interdisciplinary nature, for each discipline conceptualizes the constructs, essential to this current study, in distinctive manners. However, the researcher has analyzed the literature from a career development perspective; and primarily, presents the results of the analysis through the lens of Gottfredson's (1981, 2005) Theory of Circumscription and Compromise.

Given the social psychological approach of the current study, the researcher recognizes and honors the complex interaction between the individual and various aspects of society (e.g., geographic location, historical occurrences; Weber, 1998), particularly when generalizing results to African Americans/Blacks. Therefore, this review of literature will focus on investigations within the United States, except for studies that enhance the understanding of a construct or data collection methods. Relatedly, a review of seminal and contemporary studies with mostly European American/White samples are included, albeit cautiously, as a result of either limited investigations with African Americans/Blacks and/or the absence of demographic descriptions delineating ethnicity/race.

Aspiration Development in Childhood and Adolescence

Oftentimes children are asked by parents, teachers, and other adults, *What do you want to be when you grow up*?; and *Do you want to go to college?* Seemingly, these questions appear quite simple, yet reveal the complex nature of aspiration development, and eventual occupational and educational attainment. So, what are aspirations, and how is the construct presented in extant literature? Why are aspirations important to understand, especially within the context of science occupations?

The construct of aspirations is presented in numerous ways by researchers within career development and education disciplines. Researchers have presented aspirations as hopes and dreams for the future; while, others use the term aspirations and interests, interchangeably. The researcher of the current study conceptualizes aspirations as an individual's expressed choice or goal, whether occupational or educational, that is bounded by time (Gottfredson, 1981; Rojewski, 2007).

Ambiguous presentations of the aspiration construct were noted in science-related extant literature, as well. For example, aspirations were encapsulated within broader attitude investigations (see meta-review, Potvin & Hasni, 2014). Thus, the construct of aspirations was difficult to decipher without reviewing the way in which it was measured, especially when interests and aspirations were used interchangeably by researchers (e.g., Ing, Aschbacher, & Tsai, 2014). The somewhat elusiveness of the aspiration construct reflects a common limitation of extant childhood career development research; that is, the absence of (or at least the presentation of) an organizing framework (Palladino Schultheiss, 2008) to aid in our understanding of aspiration development.

Lastly, this researcher conceptualizes occupational images as generalizations an individual conceives about various occupations (Gottfredson, 1981). However, the construct of occupational images was not presented, usually, in a holistic manner within extant literature. Instead, aspects of occupational images, such as occupational knowledge and status were presented as separate constructs, mostly. Therefore, occupational images, and the sub-constructs of occupational knowledge and occupational status are included within this literature review.

Selected Theoretical Perspectives

Few career theories exist that focus on the aspirations of children (Palladino Schultheiss, 2008). Of those that exist, there are fewer in which contextual influences, such as gender, ethnicity/race, and socioeconomic status are acknowledged (Patton & McMahon, 2014). Common theoretical perspectives used to frame childhood aspiration development in literature include the (a) psychological perspective of Super's (1990) Life-Span Life-Space Theory, (b) the sociological perspective of Status Attainment Theory (Blau & Duncan, 1967; Sewell, Haller, & Ohlendorf, 1970), and (c) social psychological perspectives of Social Cognitive Career Theory (Lent, Brown, & Hackett, 1994, 1996) and Gottfredson's (1981) Theory of Circumscription and Compromise (Rojewski, 2005).

The researcher of this current study values the contextual nature of aspiration development. This sentiment is echoed throughout contemporary career development literature; and, is pertinent to understanding the career development of diverse populations (Palladino Schultheiss, 2008; Patton & McMahon, 2014). In comparison to psychological career development perspectives, sociological and social psychological perspectives are more equipped to account for contexts of gender, ethnicity/race, and socioeconomic status. Of the remaining perspectives, social psychological-based theories, such as Gottfredson's (1981) Theory of Circumscription and Compromise, effectively addresses the central constructs of the current study, while providing a broad theoretical framework in which to conceptualize aspects of career development for diverse populations (Patton & McMahon, 2014).

In general, Gottfredson's (2005) theory frames the construct of aspirations as a process of cognitive development (i.e., self-knowledge and occupational images) over the course of childhood and adolescence periods (see Appendix D). Transition to each stage represents the capacity to integrate information of increasing cognitive complexity, as the individual seeks compatibility between her/his self-concept and occupational images. This process accounts for the dismissal of least compatible occupations (i.e., circumscription) and the acceptance of occupational alternatives perceived as more accessible, yet less compatible. The latter contrasts with occupational choice, which is the consideration of preferred occupations.

Empirical Investigations

Overall, this literature review includes constructs of aspirations and occupational images; which, are general constructs of aspiration development as presented within Gottfredson's (1981) Theory of Circumscription and Compromise. The first presentation of literature includes investigations related to aspirations (i.e., occupational and educational), followed by occupational images. The constructs are presented in this order; as, resulting aspirations are influenced by occupational images. Therefore, the presentation of literature related to aspiration development unfolds throughout this review.

Moreover, this presentation is representative of extant literature regarding the aspiration development of children and adolescents. Some investigations are considered seminal works, while others are contemporary studies. Most, presented within this portion of the chapter, are studies conducted within the context of career development, education, psychology, and/or science disciplines.

Overall, most studies focus on middle or high school populations, regardless of findings supporting the need to understand antecedents of aspiration development taking place in elementary (Hartung et al., 2005). Other limitations are related to the (a) focus on Caucasian American/White samples, especially of moderate socioeconomic status; (b) lack of contextual, delineated sample descriptions by ethnicity/race; and (c) the confounding of ethnicity/race and socioeconomic status, especially in seminal studies (Hartung et al., 2005; Patton & McMahon, 2014). Lastly, some investigations include qualitative methods of data collection (e.g., interview) that would support contextual descriptions of aspiration development; yet, the data is transformed and presented quantitatively (e.g., descriptive statistics) only. Therefore, most aspiration-related investigations relevant to the current study appear to be quantitative in nature.

Occupational aspirations.

Aspirations are an individual's expressed occupational goal, that is bounded by time (Gottfredson, 1981). In the case of occupational aspirations, the resulting expressions are a reflection of an individual's perception of job compatibility and accessibility (Gottfredson, 1981). When the preferences for an occupation are tempered by the likelihood of attainment, realistic circumstances, and/or constraints, the resulting expression is referred to as a realistic aspiration (Gottfredson, 1981). Gottfredson (2005) suggests that expressed aspirations, idealistic and realistic, reveals several desirable occupations in which the child or adolescent is willing to pursue, and to some extent a reflection of the individual's perceived place in society.

The distinctions between idealistic and realistic aspirations can be illustrated through the way in which they have been measured by career development researchers. Commonly, researchers measure idealistic occupational aspirations by asking variations of the following open-ended, free-response question, "What do you want to be when you grow up?" (p. 324, Auger et al., 2005). In contrast, realistic aspirations are measured by asking an individual a variation of, "Now, what do you think you really will do when you grow up?", or "What do you think you *really* will be when you are an adult?" (emphasis in original; Looft, 1971, p. 366). The latter question denotes a sense of realism and consideration for one's circumstances. Discrepancies between the idealistic and realistic aspiration may offer some insight into what the individual perceives as a barrier to attainment, such as a lack of occupational knowledge or perceived incompatibility with an occupation and/or occupational incumbents.

Occupational aspirations can be categorized many ways during analysis. One common way is to categorize occupational aspirations by various levels of occupational groups (e.g., life scientists or biological scientists) or by the actual occupation itself (e.g., microbiologists). Other common categorizations include the educational requirements of the occupation expressed as an aspiration.

Science aspirations.

Currently, there is a lack of science-specific aspiration research with African American/Black students, particularly at the elementary school level. Of the studies that exist, most are conducted with secondary students, and/or feature the distinct, yet related, construct of interest. However, there are promising aspiration research studies with elementary samples (including Black students), conducted within the United Kingdom.

One such study was conducted by Dewitt and colleagues (2011, 2015). The larger, mixed-methods study was entitled the ASPIRES project, which was funded by UK Economic and Social Research Council, Targeted Initiative on Science and Mathematics Education. The longitudinal study consisted of 3 phases in which students completed online surveys and were interviewed. The phases correspond to Y6 (–0 - 11-year-old students, 5^{th} grade US equivalent), Y8 (–2 - 13-year-old students, 7^{th} grade US equivalent), and Y9 (13 – 14-year-old students, 8^{th} grade US equivalent).

The initial sample of students, who completed the online survey, consisted of 9319 students (49.3% female and 50.6% male) representing 279 primary schools throughout England. Of the 9319 primary students, 7.5% identified themselves as Black African or Black Caribbean and 74.9% as White. The second phase, Y8 (7^{th} grade US equivalent), consisted of 5634 students (59.6% female and 40% male) representing 69 secondary schools. 6.2% self-identified as Black African or Black Caribbean and 75.3% as White. Y9 (8^{th} grade US equivalent), the last phase of the longitudinal study, consisted of 4600 students (55.4% female and 44.4% male) representing 147 schools. 6.2% identified as Black African or Black Caribbean, and 71.2% as White. Of students, who completed the Y8 survey, 711 completed the Y6 (5^{th} grade US equivalent) survey. Of students who completed surveys in Y9, 1043 students completed surveys from Y6 (5^{th} grade US equivalent). The participants represented a range of free school meal (FSM) eligibility.

Aspirations were measured by determining a composite score to questions contained within the online survey. In comparison to Whites, Black students held significantly stronger science aspirations (F, 5, 9313=41.98, $p<.001$) in Y6. The mean score for Blacks was 14.4, whereas for Whites the mean score was 13.3. However, the mean score for Asian students was the highest at 15.8. In Y8 and Y9, the same pattern continued, and is indicative of group differences through Y6, Y8, and Y9. Black students held stronger science aspirations than White students, but the science aspirations of Asian students were the strongest.

A subsample of students were interviewed in order to add depth and breadth to the survey responses. Of the 279 schools in which students completed Y6 online surveys, 11 schools, 9 state and 2 independent, were purposively sampled for various contexts (i.e., urban, suburban, rural). All students in year 6 at the 11 sampled schools were invited to participate. During Y9, 83 interviews were conducted with students.

One portion of the study consisted of interviews conducted with all students (*n*=10), who self-identified as Black (mostly Black African, Black Caribbean) and/or Mixed (at least one Black parent). This sample consisted of 5 females and 4 males of mostly low (*n*=8) or mid to low (*n*=2) SES backgrounds. The gender of one participant was not provided.

The survey findings regarding science aspirations are somewhat reflected in the interview data. Black students expressed science or science-related aspirations more so than White students. Although, the authors caution that all students (regardless of race/ethnicity), who aspired to STEM occupations, disproportionally volunteered to participate in the interview data collection.

In Y9, half of the Black students, who make up the qualitative sample, either expressed having science aspirations, science-related aspirations, or once held science aspirations. Notably, the authors state that Black students (5/9, 55%) were more likely to have "never held science" or STEM-related aspirations in comparison to their White (36%) and South Asian (9%) peers.

Another international study was conducted by Sikora and colleague (2012), who explored the STEM and STEM-related, realistic aspirations of adolescents across 50 counties. Approximately 400,000 15-year-old students were sampled (United States, *n*=5,611); and responded to an open-ended, free-response questionnaire item, "What kind of job do you expect to have when you are 30 years old?" (p. 239). The aspirations were coded using the International Standard Classification of Occupations 88 (ISCO-88; International Labour Organization, 1988). Subsequently, the aspirations were coded as dichotomous variables representing biology, agriculture, or health (BAH) occupations and computing, engineering, or mathematics (CEM) occupations.

Consistently, females were more likely to express aspirations for BAH occupations; while, males expressed realistic aspirations for CEM occupations (Sikora & Pokropek, 2012). The findings from the study correspond to gender distributions found in the science workforce. For example, physical scientist and computer/information scientist occupational incumbents are mostly male (69% and 76%, respectively); and occupations in mathematics is slightly skewed as masculine (i.e., 60%). In contrast, biological sciences have similar female and male proportions of 48% and 52%, respectively (National Science Board, 2014).

There is a slight minority representation within the samples of the previously reviewed studies. However, scarcity applies to contemporary career development research with minority children in the United States, as most have predominately Caucasian/White samples of moderate SES. Nonetheless, some insight into occupational aspirations and development can be gleaned from empirical studies, such as the following conducted by Helwig (1998, 2004, 2008).

Helwig (1998, 2004, 2008) conducted a seminal, longitudinal study regarding occupational aspiration development. The sample was described as Caucasian American/White individuals of moderate SES backgrounds, followed by a sample of Hispanic American/Latin American students and other minorities (14%). The author does not further delineate the minority sample by describing the ethnicity/race of other participants, except for the reference to one Asian American student, who participated in each of the six data collection phases (Helwig, 2004). Relatedly, the author does not include descriptions referencing the intersection of race and gender (e.g., % of Hispanic American/ Latin American females versus males).

The first phase of data collection began while participants were in the 2^{nd} grade, and continued every two years thereafter until their senior year in high school. The mean age of the participants in 2^{nd} grade (N=208) was 7.7 years, 9.7 years in 4^{th} (N=160), 11.7 years in 6^{th} (N=130), 14 years in 8^{th} (N=123), 16 years in 10^{th} (N=115), and 18 years of age in 12^{th} grade (N=103; female, 49%, male, 54%). The attrition rate is approximately 50% over the course of the study. Those, who did not participate in subsequent data collection phases, relocated to other areas (Helwig, 1998).

Individual interviews were conducted in which research participants were asked the open-ended, free-response question, “When you become an adult, if you could have any job you wanted, what job would that be?” among other questions related to idealistic and realistic occupational aspirations (p.50, Helwig, 2004). Overall, elementary school males aspired to male-dominated occupations (e.g., engineer or pilot), while females aspired to mostly female-dominated occupations (e.g., teacher or nurse). In middle school, males continued to aspire to male-dominated occupations; while, females began to increasingly choose male-dominated occupations. Some of the idealistic occupational aspirations expressed by females and males during the 6th grade data collection phase, included scientist, astronaut, engineer, and science-related occupations, such as doctor.

Helwig's findings partially supports Gottfredson's theory that occupational aspirations reflect the typical gender proportions of the child's reported sex (e.g., aspirations of males tend to reflect male-dominated occupations). The aspirations of male participants increasingly reflected male-dominated occupations as the participants aged. For example, 83% of 2nd grade males expressed male-dominated occupational aspirations (i.e., occupations of same-gender prevalence), while 90% of 4th grade males and 93% of 6th grade males reported male-dominated occupations as aspirations.

In regards to the female participants, the expressed occupational aspirations became less reflective of female-dominated occupations over time. In other words, the females increasingly expressed aspirations reflecting occupations that were typically occupied by males, or at least were gender neutral. 56% of 2nd grade females reported aspirations reflecting female-dominated careers, while 45% of 4th grade and 30% of 6th grade females reported aspirations reflecting female-dominated careers. Similar results to those found in Helwig's (1998,2004, 2008) investigation, were found in other longitudinal (e.g., Blackhurst & Auger, 2008; Sandberg, Ehrhardt, Ince, & Meyer-Bahlburg, 1991) and cross-sectional (e.g., Auger et al., 2005; Bobo, Hildreth, & Durodoye, 1998) studies.

Occupational aspirations as measured by occupational group.

Helwig (1998, 2001) estimated associations between occupational group categories and occupational preparation indicators assigned to most occupations within any given category. The professional, technical, and managerial category required more extensive educational requirements in comparison to other categories (e.g., machine trades). The percentage of research participants, who expressed aspirations representative of professional, technical, and managerial categories, increased significantly from the 2nd (62%) to 8th (93%) grade, and slightly decreased in 10th (87%) and 12th grade (81%). Examples of these aspirations included variations of science occupations, science-related occupations (e.g., doctor or veterinarian), and general professional occupations, such as lawyer. Notably, the exact stability and change patterns reported by Helwig (1998, 2001) were not found in other longitudinal aspiration studies (e.g., Mau & Bikos, 2000; Mello, 2008, 2009) with more representative minority samples.

For example, in a seminal, longitudinal investigation by Mau & Bikos (2000), the aspiration development of adolescents was examined. The sample consisted of participants from a national dataset, the National Educational Longitudinal Study:88-94 (NELS:88-94; National Center for Education Statistics, 1996) in which data was collected from participants every two years beginning with the eighth grade and concluding two years post high school graduation. Overall, the research participants (n>25,000) represented in the NELS:88-94 database were randomly sampled from a stratified sample of schools (N=1052) throughout the United States. The sample, used in the analysis of occupational aspirations, consisted of approximately 5,670 participants.

The researchers coded idealistic occupational aspirations by occupational group (e.g., unskilled-semiskilled, technical-semiprofessional, professional); although, the authors did not provide a source for their categorizations. In general, the levels of aspirations, as measured by occupational group, increased overtime, and this increase was significant (i.e., $p<.001$) from 10^{th} to 12^{th} grade. Other notable findings include gender as a predictor for aspirations, as females (n=3,030) were reported to have higher occupational aspirations, as determined by occupational groups, in comparison to their male counterparts (n=2,640). Gender differences, reported by Mau and colleague (2000) are consistent with other investigations (e.g., Davis, 2013), as well.

A different, yet related, criterion was used to categorize realistic aspirations in Mello's (2009) analysis of the NELS dataset. The researcher categorized realistic aspirations by using a dichotomous variable of professional and non-professional groupings. Overall, the realistic occupational aspirations were stable from high school into adulthood. In addition, students of low socioeconomic status were less likely ($p<.001$) to report realistic aspirations for professional occupations. Lastly, African-American/Black and Asian American students were more likely to report ($p<.001$) higher occupational realistic aspirations, which exceeded those of Caucasian American/White and Native American participants.

Occupational aspirations as measured by occupational group & preparation requirements.

The implicit assumption of professional occupations is the requirement for extensive occupational preparation, as was the case in Helwig's (1998, 2001) analysis.

Relatedly, researchers have analyzed data by determining the educational requirements of an expressed aspiration, explicitly, while categorizing by occupational group (e.g., Davis, 2013) and salary (e.g., Howard et al., 2011).

Davis (2013) conducted one such contemporary study in which occupational groups and educational requirements of expressed idealistic aspirations were explored. The sample of the quantitative study included 662 ninth-grade students. The sample was described as mostly minority (i.e., 26% African American/Black, 55% Hispanic American/ Latin American) from low socioeconomic backgrounds (i.e., 64%) with a somewhat equal distribution of females (49%) and males (51%).

Each participant was asked to list three occupational aspirations to the open-ended, free-response question, “What job would you like to have when you are finished going to school?” (p. 145, Davis, 2013). The educational requirements of each of the three occupational aspirations were summarized, and coded using the Dictionary of Occupational Titles (DOT; National Academy of Sciences, 1971). Additionally, the occupational aspirations were coded by occupational groups derived from the Standard Occupational Classification (SOC; Standard Occupational Classification Policy Committe, 2009) system, such as professional, service, sales and office, natural resources, construction, and maintenance, production, transportation and material moving occupations (Davis, 2013). Finally, either the occupation best representative of the three were used for analysis, and if a representative occupational group could not be determined; the occupational group for the first aspiration was used for analysis.

Overall, significant differences were reported for gender, and in some cases ethnicity/race. Females, especially African American/Black and Hispanic American/Latin American, were more likely to express professional and/or management level aspirations ($x^2_{1, 534}$=69.028, *p*<.001). Consequently, females, of all ethnicities/races, were more likely to express occupational aspirations, that required higher levels of education (i.e., college education, t_{533}=6.74, *p*<.001; *d*=.583) than those aspirations reported by males. Notably, science-related occupations in healthcare (e.g., pediatrician, doctor, nurse) and veterinary medicine were predominantly expressed by females, regardless of ethnicity.

In contrast to females, males were more likely to express the occupational aspiration of professional athlete ($x^2_{1,537}$=70.125, *p*<.001). Similar results were reported in other studies (e.g., Bobo et al., 1998; Cook et al., 1996; Helwig, 1998; Perry, Przybysz, & Al-Sheikh, 2009) across all grade levels. Especially, the aspiration of professional athlete was common among African Americans/Blacks ($x^2_{2,534}$=6.943, *p*=.031; Davis, 2013), and related results were reported in prior seminal studies (e.g., Miller & Stanford, 1987, 1986). Other than aspirations of athlete, males were more likely to express occupational aspirations related to natural resources, construction, and maintenance occupational groups ($x^2_{1,532}$=35.611, p<.001). Consequently, males were more likely to express occupational aspirations in which lower levels of education (i.e., post-high school training) are required for entry (Davis, 2013).

Occupational aspirations as measured by preparation requirements & salary.

Similar gender differences, reported by Davis (2013), were found in other studies (i.e., Howard et al., 2011). Howard and colleagues (2011) analyzed the occupational aspirations of a dataset sample (*N*=22,136) consisting of 8th and 10th grade students. The sample was described as mostly Caucasian American/White (88%) from moderate and/or high socioeconomic backgrounds (76%) with somewhat equal distributions of females (49%) and males (51%). African American/Black students represented 5.1% (n=1,131) of the sample, followed by Asian/Pacific Islander (2.2%) and Hispanic/Latino/a (1.4%).

As a part of a statewide career guidance system, students chose “dream occupations” (p. 102, Howard et al., 2011) from a list of 661 occupations, populated within an online career guidance system. The dream occupations were considered as occupational aspirations by the authors. The educational requirements and salaries of the occupational aspirations were coded using the same career guidance system, which was derived from the U.S. Bureau of Labor Statistics (2010). Similar to the finding reported by Davis (2013), a significant difference was report in terms of gender ($p<.001$, $d=.45$). Overall, the occupational aspirations of females required higher levels of education, but with comparable median salaries of occupations aspired to by males. Notably, African American males aspired to occupations with higher educational requirements in comparison to White males.

In summary, occupational aspirations are an individual’s expressed goal bounded by time. Data collection may consist of individual interviews (e.g., Helwig, 1998, 2004), in which participants are asked, variations of “What do you want to be when you grow up?”. Or, participants are encouraged to complete a questionnaire containing similar open-ended, free-response items related to occupational idealistic and realistic aspirations. Occupational aspirations, as presented in this review, is sometimes represented by occupational title, occupational grouping, preparation requirements, and/or median salary earned by occupational incumbents. However, aspiration research with children is scarce; and of those that exist, few have African American/Black samples or the minority samples are not delineated. Consequently, there are even fewer science-related aspiration research studies conducted with minority children.

Overall, there is some support for Gottfredson's assertion that children aspire to occupations that are more representative of their gender overtime. However, researchers suggest that this occurrence is related more so to the aspiration development of males. Females are more likely to aspire to the attainment of gender neutral or masculine sex-typed occupations.

Females tend not aspire to male-dominated S&E occupations, such as those related to physical sciences, computer/information sciences, engineering, and mathematics. When considering S&E occupations, females were more likely to express aspirations related to more gender-neutral occupations (e.g., biological sciences), and males were more likely to express aspirations related to male-dominated occupations (e.g., computer/information sciences).

In general, occupational aspirations, as categorized by occupational group, preparation requirements, and salary, tend to increase as children consider the social value of occupations; thereby, offering some support for Gottfredson's theory. Additionally, realistic occupational aspirations become more stable overtime; and therefore, are predictors of eventual attainment. Overall, students from low socioeconomic backgrounds are more likely to express lower realistic occupational aspirations. However, African American/Black students, in general, are likely to express higher realistic occupational aspirations in comparison to their Caucasian American/ White peers. Lastly, females are likely to express aspirations for occupations with higher preparation requirements, yet with comparable earning potential to males.

Educational aspirations.

Much like occupational aspirations, educational aspirations are an individual's expressed ideal goal or choice (Rojewski, 2007, regarding her/his educational attainment), bounded by time. When educational aspirations are tempered by the likelihood of attainment, realistic circumstances, and/or constraints, the resulting expression is referred to as a realistic aspiration (Gottfredson, 1981). These differences in idealistic and realistic educational aspirations are reflected in how each is measured. Commonly, idealistic educational aspirations are measured by asking a variation of the following closed-ended question indicating a specific level of education, "Do you want to go to college?" (p. 153, Blackhurst & Auger, 2008); or by asking a variation of a more general question, "Eventually, how much schooling do you want to get?" (p.143, Lee, Hill, & Hawkins, 2012). Similarly, realistic educational aspirations are measured by asking a variation of a closed-ended question indicating a specific level of education, "Do you think you really will go to college?" (p. 153, Blackhurst & Auger, 2008); or by asking a variation of a more general closed-ended question, "Eventually, how much schooling do you expect to get?" (p. 143, Lee, Hill, & Hawkins, 2012). Typically, responses are recorded using a Likert-scale, whether interview or survey methods are used.

Most S&E occupations require at least some post-secondary education or a post-secondary degree. Therefore, an understanding of idealistic and realistic educational aspirations provides some insight into (a) future occupational aspirations (Rojewski & Yang, 1997), (b) eventual degree attainment necessary for occupations (Mello, 2009), and (c) future salary (Lee et al., 2012). This is especially important, given that African American/Black individuals are less likely to pursue a STEM major and/or degree. Unlike research regarding occupational aspirations, there are a greater number of studies with African American/Black elementary samples. However, like occupational aspiration research, the numbers of educational aspiration research studies conducted within a science and/or S&E context are low, regardless of ethnicity/race or grade level. Nevertheless, a greater number of studies from which to choose offers an opportunity to untangle select influences, such as gender, ethnicity/race, and SES of idealistic and realistic educational aspirations; as some aspiration researchers of seminal studies confound ethnicity/race and socioeconomic status (e.g., Cook et al., 1996, discussion follows; Hartung et al., 2005).

For example, Cook and colleagues conducted a cross-sectional, seminal study in which the realistic educational aspirations of males (*N*=220) were examined in the hopes of understanding the differences between low and moderate/high socioeconomic groups. The researchers sampled students from elementary and middle schools located within the South. The first group of students (*n*=101) attend a set of schools (2 elementary and 1 middle) described as 99% African American/Black in which 74% to 96% of the students receive free and/or reduced lunch. In contrast, the second group of students (*n*=119) attended schools (1 elementary, and 1 elementary/middle) described as 70% Caucasian American/White in which 12% to 17% of the students receive free and/or reduced lunch; therefore, majority of the students were from at least moderate socioeconomic backgrounds. The mean age for participants in the 2nd grade was 8.3 years of age, for 4th grade 10.41, for 6th 12.53, and for 8th grade 14.51.

The male participants were interviewed individually, and asked of their certainty that they will "go to high school", "finish high school", "go to college", and "finish college" (p. 3373). Responses were recorded using a Likert-scale, and the results were quantified for analysis. Overall, the elementary African American/Black males from low socioeconomic backgrounds held higher realistic educational aspirations in comparison to their peers. Additionally, there was a decline in realistic educational aspirations for the middle school African American/Black males. This decline, in comparison to the Caucasian American/White students from moderate/high socioeconomic backgrounds, was significant ($p<.01$). Notably, the low realistic occupational aspirations of the African American/Black participants corresponded to their low realistic educational aspirations.

Next, the following idealistic and realistic educational aspirations investigations are discussed through the presentation of representative literature. As with occupational aspirations, most studies are longitudinal to illustrate the development of educational aspirations. However, the discussions are organized by selected influences of gender, ethnicity/race, and socioeconomic status, given the availability of educational aspiration research with minority samples. Additionally, the descriptions of investigations will illustrate the way educational idealistic and realistic aspirations are measured.

Gender context.

There is some evidence to suggest that gender differences exist in terms of educational aspirations; although, there is a lack of uniformed consensus on this matter. For those studies in which differences are reported, females were more likely to express higher idealistic and realistic educational aspirations in comparison to males (Akos et al., 2007; Mau & Bikos, 2000; Perry, Link, Boelter, & Leukefeld, 2012; Rojewski & Yang, 1997). In contrast, some researchers have found no significant differences in expressed idealistic and realistic educational aspirations by gender (e.g., Blackhurst & Auger, 2008; Kirk et al., 2012).

One study in which gender differences were found was conducted by Perry and colleagues (2012). A qualitative study was conducted with 6th grade students enrolled in a program, which addressed the use of technology within the biomedical sciences. Of the 182 students used for analysis, 58% were reported as female and 42% were reported as male, while 32% were reported as African American/Black, 41% as Caucasian American/White, 7% Hispanic American/Latin American, 14% as Asian American, and 7% as other and/or multiracial. The authors reported that approximately 40% of the sample were from low socioeconomic backgrounds.

Each participant completed a questionnaire, and were asked if she/he "would like to complete at least" middle school, high school, trade school, 2-year and 4-year postsecondary levels (p.730). Overall, the students held high idealistic educational aspirations, as indicated by 97% expressing aspirations to attend postsecondary institutions. While controlling for socioeconomic status and race/ethnicity, females expressed higher idealistic educational aspirations for themselves ($p<.05$) in comparison to males. These results are aligned with findings from previous studies (e.g., Akos, et al., 2007; Mau & Bikos, 2000; Rojewski & Yang, 1997).

Ethnicity/race context.

The minority participants in the study of Perry and colleagues (2012) reported lower idealistic educational aspirations in comparison to White participants when gender and socioeconomic status were controlled. Significant differences were reported for Latino participants ($p<.001$), and nonsignificant differences were reported for African Americans.

Although, Perry and colleagues (2012) reported lower idealistic educational aspirations for African Americans, some researchers reported higher idealistic educational aspirations (e.g., Wilson & Wilson, 1992) and realistic educational aspirations (e.g., Mau & Bikos, 2000; Mello, 2009) for minority students in comparison to their peers. In an analysis of the NELS:88 database, Mello (2009) found significant differences among the ethnic/racial groups (x^2 (df=12)=43.46, $p<.001$). Specifically, African American/Black middle school students held the highest realistic educational aspirations ($p<.01$) in comparison to other students after controlling for socioeconomic status and academic achievement.

Lastly, some researchers did not find significant differences among ethnic/racial groups. Akos and colleagues (2007) conducted an investigation by analyzing the study plans of eighth graders (N=522) attending schools in the Southern United States. Course study plans from African American/Black students represented 20% of the sample, while

7% represented other minorities such as Hispanic American/Latin American and Asian American students. Notably, the authors report a lower representation of course study plans for African American/Black students (20%) in the sample in comparison to the school population (30%), suggesting that some plans for African American/Black students were not submitted to the researcher, or that a portion of African American/Black students did not submit a plan to the school at all.

Course of study plans included (a) occupational (for students with exceptionalities), (b) career (high school diploma and/or admission to community colleges), (c) college tech (admission to community college for technical field, may lack requirements for university admissions), and (d) college/university (meets requirements for university admissions). Significant differences were not found by race/ethnicity [$x^2(12, 520)=15.14$, $p=.322$]; although, significant differences were reported for gender [$x^2(3, 522)=11.87$, $p=.008$] and socioeconomic status [$x^2(3, 521)=38.86$, $p=.000$], albeit with small effect sizes of .01 and .04, respectively. That is, females and students of mid/high socioeconomic status were more likely to hold higher educational aspirations, as indicated by their choice of course of study plan.

Socioeconomic status context.

Similar findings to those reported by Akos and colleagues (2007) regarding socioeconomic status were also reported by other researchers (e.g., Boxer, Goldstein, DeLorenzo, Savoy, & Mercado, 2011; Mau & Bikos, 2000). Although, students of low socioeconomic backgrounds are reported to express idealistic educational aspirations to attend college at times (Berzin, 2010; Lee et al., 2012); overall, students of low socioeconomic status are more likely to report lower idealistic and/or realistic educational aspirations in comparison to their peers.

Lee and colleagues (2012) took a closer look at the idealistic and realistic educational aspirations of students with low socioeconomic backgrounds by analyzing a dataset, Seattle Social Developmental Project (SSDP). In this longitudinal study, students (*N*=808) were interviewed in their 5th grade year in elementary school and followed until 30 years of age. 26% were reported as African American/Black, 47% as Caucasian American/White, 22% Asian American, and 5% as Native American or other. 52% of the student sample were reported to have low socioeconomic status backgrounds.

The idealistic and realistic educational aspirations were measured by responses to Likert-scaled questions, in which the possible responses indicated their aspirations to attend high school, graduate from high school, attend college, or graduate from college. Students were asked, “Eventually, how much schooling do you want to get?”; and “Eventually, how much schooling do you expect to get?” (p.143, Lee et al., 2012). Additionally, the authors analyzed information regarding the participants’ household income at the age of 30.

Overall, those students, who continued to hold high idealistic and realistic educational aspirations throughout their development (93%), or increased their levels of idealistic and realistic aspirations overtime (82%), were more likely to graduate from high school. The trajectories for students of low socioeconomic status were similar at 89% and 81%, respectively. Additionally, students who continued to hold high idealistic and realistic educational aspirations throughout development or increased their levels overtime, were more likely to report higher household incomes (*M*=$30,980, *M*=$24,300) than their peers. Students of low socioeconomic backgrounds reported average household incomes of $28,230 and $19,520 for those who consistently held high aspirations and for those who increased their levels of idealistic and realistic aspirations overtime, respectively. Therefore, high levels of educational aspirations, whether consistently high or increased overtime, can have a positive impact on adult socioeconomic status.

So far, this review of educational aspirations has been compartmentalized into context influences of gender, ethnicity/race, and socioeconomic status to capture the role of each. Yet, much of the research points to a more complex dynamic, such as the interaction of gender, ethnicity/race, and socioeconomic status. It has been a challenge for researchers of aspiration investigations to capture this complexity, especially between ethnicity/race and socioeconomic status (Rojewski, 2007). Nonetheless, findings from educational aspiration (and even occupational aspiration) investigations seem to suggest that socioeconomic status is in the forefront (e.g., Rojewski & Yang, 1997).

For example, Valadez (1988) analyzed the NELS:88 database (*N*=24,599) to explore the influences of gender, ethnicity/race and socioeconomic status on whether students applied to a college/university, given their expressed aspirations to attain a four-year college degree (*n*=10,080). Overall, socioeconomic status was a central influence on whether students followed through on their aspirations for college, as determined by their submission of an application to at least one college/university. However, the exact influence of socioeconomic status is unclear, due to the overrepresentation of minority students with low socioeconomic backgrounds.

In other NELS:88 investigations, socioeconomic status (as measured by parent occupation, education, and income) distinguished the levels of idealistic educational aspirations of African American/Black males (*n*=173,519; 53% from low SES, urban backgrounds). The level of idealistic educational aspirations were determined by the following responses: 1= "less than high school graduation", 2= "high school graduation only", 3= "less than two years, vocational, trade, or business school", 4= "two years or more, vocational, trade, or business school", 5= "less than two years of college", 6= "two or more years of college (including two-year degree)", 7= "finish college (four- or five-year degree", 8= "Master's degree or equivalent", 9=Ph.D. degree or equivalent, 10=M.D. degree or equivalent (p. 35, National Center for Education Statistics, 1996; Strayhorn, 2009). Overall, African American males held low idealistic educational aspirations, relative to the aspirations of African American females in other investigations (e.g., Mau & Bikos, 2000; Wood, Kaplan, & McLoyd, 2007). Additionally, African Americans of low socioeconomic status were more likely to express lower idealistic educational aspirations (i.e., urban, *M*=4.42, SD=2.92; rural, *M*=3.88, SD=2.94); while, African Americans of mid/high socioeconomic status backgrounds (i.e., suburban, *M*=4.77, SD=3.15) were more likely to express higher idealistic educational aspirations (Strayhorn, 2009).

In summary, educational aspirations are an individual's expressed goal regarding educational attainment, that is bounded by time. Typically, researchers may interview participants or administer a questionnaire; and ask participants variations of closed-ended questions to garner participants' aspirations for completing a particular level of education. Usually, the responses are recorded using a Likert-scale irrespective of data collection method (i.e., interview or survey). Measuring idealistic and realistic educational aspirations are useful due to their relatively stable and predictive nature, as they are representative of future realistic occupational aspirations, eventual attainment, and earning potential. These connections are relevant to science, due to the need for a post-secondary education for occupational attainment.

Overall, there are a greater number of educational aspiration investigations with young minority samples. Although, some researchers, especially those of seminal studies, confound ethnicity/race and socioeconomic status. Nonetheless, there is difficulty in untangling the context of gender, ethnicity/race, and socioeconomic status; though, socioeconomic status seems to be the most influential within the complex interaction. For example, socioeconomic status was central to students following through with their aspirations for a college degree. Even still, the consensus on socioeconomic status's influences is lacking. Some researchers have suggested that individuals of low socioeconomic backgrounds tend to have lower idealistic educational aspirations; while other times, this population is reported as having high idealistic aspirations. Differences as determined by gender cannot be disregarded, due to the common finding of females expressing higher idealistic educational aspirations in comparison to males. For example, African American/Black females held higher idealistic educational aspirations than their African American/Black counterparts. When only considering ethnicity/race, some researchers suggest that African American/Black students hold higher realistic educational aspirations, while others report low idealistic and realistic educational aspirations.

Interim Interpretative Summary

So far, this review presents a number of research implications for the current study. Overall, there are limited investigations regarding the aspirations of elementary school children. However, some researchers suggest that aspiration development begins during elementary; thus, supporting the need for further exploration (Hartung et al., 2005). Most of this research includes Caucasian American/White, middle class samples; thereby, limiting the generalizability to minority children and/or those of low socioeconomic backgrounds. The researcher of this current study sought to fill the empirical gap, and explore the aspirations of African American/Black students.

Commonly, the aspirations of children are explored through the use of interview methods of data collection. Free-response, open-ended question variations are used to measure idealistic occupational and educational aspirations. For example, such questions include, "What do you want to be when you grow up?, and "Do you want to go to college?". However, many studies lack the contextual aspects supported through the use of qualitative methods. The researcher of this current study sought to implement common analytical strategies presented in extant literature (e.g., quantifying data), while maintaining the strengths that qualitative methods afford (i.e., descriptions of context).

Lastly, some career development investigations lack an organizing framework; therefore, it is difficult to interpret findings related to the aspiration construct. Relatedly, the construct of aspirations is sometimes loosely defined and/or used interchangeably with interests; thereby, limiting the validity and interpretation of findings. Thus, the researcher of this current study has used a conceptual framework to organize the study and to analyze findings.

Occupational images.

So far, we reviewed literature concerning occupational and educational aspirations, as well as, possible differences and select contextual influences of gender, ethnicity/race, and socioeconomic status. The second portion of this chapter will cover the topic of occupational images, which are the conceptions an individual has in regards to occupations and their incumbents (Gottfredson, 1981). In the context of aspiration development, occupational images are the barometer for which the self is compared; that is, individuals compare themselves to their conceptions of a particular occupation, whether accurate or inaccurate (Gottfredson, 1981). It is during this ongoing, comparison that individuals determine their compatibility with an occupation.

Many individuals tend to purse occupations that are representative of their social group. In other words, if the child perceives compatibility between images of the self and of her/his conception of an occupation, the occupation is maintained as a preference (one of the many alternatives from which aspirations are derived). However, if the child perceives incompatibility, the occupation is overlooked as viable option (Gottfredson, 1981).

This dynamic process continues through childhood and adolescence, as the individual develops realistic and hopefully accurate conceptions of themselves and the world of work. However, this is where the process of aspiration development may go astray. If an individual has inaccurate conceptions of occupations and/or incumbents, she/he may dismiss, whether consciously or unconsciously, male-dominated, professional occupations, such as those in science. Therefore, the following discussion will focus on investigations in which researchers addressed various components of occupational images, including occupational knowledge, perceived occupational status, and will conclude with a discussion surrounding the occupational images of scientists, specifically. The presentation of extant literature is representative of seminal and contemporary studies with children and adolescents. The occupational knowledge and occupational status investigations were conducted within the context of career development, primarily. However, most occupational image of scientists investigations were conducted within a science and/or science education context, primarily.

As with aspiration research, there are few contemporary studies conducted with elementary-aged minorities and/or children of low socioeconomic status, that explored occupational knowledge, perceived occupational status, and occupational images of scientists. Additionally, there are few occupational knowledge and occupational status investigations with children that are conducted within a S&E context, specifically. For example, Schmitt-Wilson and colleague (2012) presented a total of 25 diverse occupations, which only included two S&E occupational titles of "scientist/chemist" and "civil engineer" (pg. 2). Lastly, there are a lack of studies in which occupational images are explored holistically, as the construct of occupational images is presented as either occupational knowledge, occupational status, and/or traits of incumbents (Gottfredson, 1981).

Occupational knowledge.

Occupational knowledge refers to the notion of, what is known of occupations, preparation requirements, and paths of attainment. Investigations concerning occupational knowledge may focus on perceived knowledge, that is, the extent to which an individual believes she/he are familiar with an occupation. Or, occupational knowledge investigations focus on actual knowledge, that is, the extent to which an individual's occupational knowledge corresponds with objective sources (Ferrari et al., 2015). For the purposes of this review, the following discussion will address actual knowledge, primarily, as this is the most relevant to the current study. Though, very few studies exist that explores occupational knowledge, whether perceived or actual, in children (Ferrari et al, 2015).

Typically, occupational knowledge investigations are quantitative in nature. The level of occupational knowledge is determined by requesting participants to rate aspects of various occupations presented from a list (i.e., fixed-response); or, participants are asked to judge the necessity of education for their own aspirations. In some cases, a simple yes or no response is compared to an objective source (e.g., Blackhurst & Auger, 2008, discussed later), such as the Occupational Outlook Handbook (US Bureau of Labor Statistics, 2015). In other cases, a mean score is computed for each individual participant to be used for analysis; and/or the mean score is determined for a group of participants to use during analysis.

For example, Walls (2000) conducted a seminal study to examine the actual occupational knowledge of students. The accuracy of occupational knowledge was determined by asking elementary (n=57), middle (n=43), and high school students (9th grade, n=44; 12th grade, n=45) to rate 20 occupations, such as teacher, police officer, and science-related occupations of computer programmer and physician. A matrix of 20 occupational titles and dimensions was administered to participants within a group setting. The participants, described as mostly Caucasian American/White (90%), rated each occupation based on training/preparation, availability of positions, earnings, physical requirements, mental requirements, status, and a fixed-response aspiration. Accuracy was determined by consulting the Dictionary of Occupational Titles (US Employment Service, 1991).

Values were assigned to each dimension by occupation. A participant's mean accuracy score were computed by first, comparing the participant's converted standard rating score for each dimension with the actual value standard score, resulting in a discrepancy score. Next, the participant's discrepancy scores for the same dimension across each occupation was averaged, resulting in the participant's mean accuracy score. Those scores were then used for quantitative analysis.

Overall, the accuracy of occupational knowledge increased with age ($p<.01$). Third grade participants were significantly less accurate in judging each dimension in comparison to other grades. Additionally, the middle and high school students were more accurate in terms of salary and earnings, which was significant for ninth and twelfth grade students ($p<.05$). However, there were no significant differences between sixth, ninth, and twelfth grades in terms of time needed for preparation and training. Notably, each grade level was inaccurate in judging the occupation of physician, and third and sixth graders were moderately inaccurate in judgments of the computer programmer occupation.

Schmitt-Wilson and colleague (2012) replicated Walls' (2000) study with the addition of examining influences of idealistic aspirations, realistic aspirations, and academic achievement on occupational knowledge. Second, the researchers assessed 25 occupations in which civil engineer, scientist/chemist, and other occupations were added to the original list presented by Walls (2000). Notably, the inclusion of the "scientist/chemist" occupational title limits the validity of responses for this item (p. 2). Most chemists are scientists, but not all scientists are chemists. Given that the purpose is to judge accuracy of occupational knowledge, this was one limitation of the measure (i.e, Vocational Knowledge Questionnaire, Schmitt-Wilson & Welsh, 2012).

Third, the fixed-response format was extended to include exposure ratings for whether the participants were familiar with the occupation due to knowing an incumbent, or hearing about it from parents, peers, teachers, and/or media. Lastly, exposure of expressed occupational idealistic and realistic aspirations were measured by an item asking if participants knew occupational incumbents.

Elementary and middle school students were sampled (n=132) from rural communities in the Midwest. As with Walls (2000), the occupational knowledge matrix was group administered, and mean ratings were calculated to determine the accuracy of occupational knowledge. Unlike Walls (2000), significant differences by grade level were not found for the accuracy of occupational knowledge. Notably, idealistic and realistic occupational aspirations were not influenced by exposure. Finally, academic achievement (as determined by grade point average, GPA) was reported as a predictor of occupational knowledge. Therefore, high achieving students were more likely to rate occupations accurately. Similarly, findings were reported in a seminal study (i.e., Phipps, 1995, discussed next) in which reading ability was related to the accuracy of occupational knowledge of their respective occupational aspirations.

In this seminal study, Phipps (1995) used interview methods of data collection to explore occupational knowledge. Phipps (1995) asked elementary students (n=80, 51% African American, 36% White, 12% Hispanic) from low to middle socioeconomic backgrounds, "What will you have to do to be able to get a job like that?"; and "Are there any reasons why you might not be able to get the job you want?" (p. 29-30). Less than a third of students expressed that they could attain their occupational goals by working hard or by exhibiting personality characteristics (e.g., being honest). A greater proportion of students in the third (38%), fourth (45%), and fifth (45%) expressed a general school-to-work connection by stating reasons such as "staying in school" and enrolling in college (p. 30). However, fewer students (3rd 20%; 4th and 5th 20%) demonstrated specific knowledge of how to attain their occupational goals. For example, a fifth grader, who aspired to a science-related occupation of architect, expressed the need for science and math courses, a high school diploma, and a college degree. Overall, students did not demonstrate knowledge of preparation requirements for expressed occupational aspirations, especially students of low socioeconomic status. The tendency for students, especially those of low socioeconomic status, to demonstrate inaccurate knowledge was reported in other studies (e.g., Ludwig, 1999).

Interview methods were also used in a contemporary study by Blackhurst and Auger (2008). The researchers examined the accuracy of preparation requirements for expressed idealistic and realistic aspirations, specifically. In this qualitative, longitudinal study, two schools were purposively sampled due to their representativeness of the school district's demographic composition, which was described as consisting of Caucasian American/ White, working class and professional families. The authors do not explicitly state whether one school is an elementary and the other middle; or whether the schools were K-8.

The interviews were conducted in two phases. The first phase, conducted in 2001, consisted of students in 1^{st} grade (*n*=41), 3^{rd} grade (*n*=38), and 5^{th} grade (*n*=44). Two years later in 2003, the same participants were interviewed as 3^{rd} grade (*n*=39), 5^{th} grade (*n*=37), and 7^{th} grade (*n*=39) students. The authors reported that one student, who participated in phase one interviews, voluntarily withdrew from the study before phase two commenced. Other students were not interviewed during phase two, due to relocation out of the school district. Thus, phase two data collection consisted of a total of 115 (female, *n*=45; male, *n*=70) students.

The participants were identified as mostly Caucasian American/White (93%; *n*=107), while the others were identified as African American/Black (*n*=2), Native American (*n*=1), Hispanic American/Latin American (*n*=1), and biracial or multiracial (*n*=4). The authors do not state the combination of ethnicities/races for the biracial/multiracial category. Additionally, majority of the participants were from two-parent households consisting of both biological parents (77%; *n*=89), and household incomes above $41,000 a year (71%; *n*=81). 80% of the participants identified at least one parent with some postsecondary education, and 20% of the participants identified at least one parent with some post-baccalaureate education. The authors caution that the parents' postsecondary and post-baccalaureate educational attainment was higher than the national average of 50% and 9%, respectively.

The interview data was coded, transformed, and analyzed quantitatively (i.e., descriptive statistics). Reponses to the following interview questions were coded as "yes", "no", or "unsure". The interview questions included, "Do you think you will need to go to college in order to be a ____?" (p. 154). Responses to the interview question, "Can you tell me what you think college is?" were coded for accuracy (p.154). Lastly, categories and codes were identified for the interview question, "Why do you want to go to college". The resulting codes were "to learn or get smarter", "to get or prepare for a job", and "other". Chi-square analyses were used to examine differences (significance alpha level = .05) by gender, grade level, and within-grade gender.

Overall, students were knowledgeable about college. In terms of knowledge accuracy (measured by the interview question "Can you tell me what you think college is?"), majority of the participants provided an accurate response during phase one (88% females, 88% males) and phase two (100% females, 93% males) of data collection. The authors did not provide the results by grade for college knowledge accuracy.

Most of the participants aspired (96% females, 88% males in phase one; 100% females, 91% males in phase two) and expected (84% females, 88% males in phase two) to attend college. However, there were significant gender and grade level differences in the reasons for attending college. Student responses were coded as “to learn” or “to get smarter”. Reflected in the phase one data analysis, 1st graders were more likely than 3rd or 5th grade students to attribute their educational aspirations to learning ($x^2 = 11.99$; $p < .01$; $V = .31$). In addition, motivations to attend college for preparation or occupational attainment increased significantly by grade level ($x^2 = 34.38$; $p < .001$; $V = .53$).

In phase two, there were small (effect size variance of 7% - 16%) significant differences by gender regarding motivations for attending college. Majority of the female (91%) and male (72%) students in phase two indicated their reasons to attend college as a desire for college preparation and/or occupational attainment. Similar percentages were reported by gender in phase one and phase two for “to learn or get smarter” motivations. Other notable findings related to knowledge were the tendency for most students, females and males, to over approximate the postsecondary requirements for respective occupational aspirations. Although, the author did not provide statistical evidence for this finding.

Similar findings were reported by Blackhurst and colleagues (2003) in a qualitative, cross-sectional study in which elementary students’ perceptions of preparation requirements were explored using a fixed-response format (i.e., preselected list of occupations). The sample (n=119) was described as consisting of mostly, Caucasian American/White (i.e., approximately 90%) middle class (approximately 67%) first, third, and fifth grade students from the Midwest. Additionally, most of the participants had at least a parent (80%) or sibling (20%) with a college education.

Structured interviews were conducted, and questions were very similar to the ones presented in the study by Blackhurst and colleague (2008, previously discussed). Occupational knowledge interview questions were the following: “Do you think you will need to go to college in order to be a ______?” “Why or why not”, and “Do you think the person who holds this job would need to go to college?” “Why or why not?” (p. 60, Blackhurst et al, 2003). The latter question was asked when pictures of work settings were presented. Various occupations were presented including science-related occupations of doctor, dentist, and pharmacist. Finally, the audio-recorded interviews were analyzed qualitatively, and transformed for quantitative analysis, when applicable.

Overall, the sample (i.e., approximately 90%) aspired to and expected to attend college. The reasons for college enrollment varied by grade level. First grade students expressed reasons related to increasing knowledge, for example, “to learn”; however, fifth graders seemed to make a connection between school and work by citing reasons such as “preparing for a job” (p. 61, Blackhurst, et al., 2003). Notably, students from every grade level overemphasized the need to attend college for their respective occupational aspirations. For example, fifth grade students aspired to occupations in which 47.6% required a college education, yet 76.2% suggested the need to attend college for their respective aspiration.

Errors in the perception for advanced training were made when presented with familiar occupations, such as dentist and secretaries. A little over 80% of first and third grade participants overestimated the need for a college education to be a secretary. Fifth grade students were less accurate, in that nearly 90% overestimated. The authors state that participants seemed to associate computer usage with the need to attend college, for example occupations of secretary and bank teller. Interestingly, few fifth graders differentiated between technical schools and 4-year institutions. Of those who did differentiate, some suggested that technical schools provided a higher level of education required for science (including computer science) and engineering occupations. Lastly, the participants were more apt to have knowledge of occupations in which they were exposed; although, inaccuracies were still apparent.

In summary, occupational knowledge refers to an individual’s conceptions involving occupational tasks, preparation requirements, and potential salary. The focus of occupational knowledge investigations may include perceived knowledge; that is, an individual’s own perceptions of their familiarity with an occupation. Or, an investigation may focus on actual occupational knowledge, which is the accuracy of knowledge when compared to objective sources. However, there are some investigations in which the researcher has examined both.

The method of data collection varies from using a fixed-response matrix of occupations to the use of semi-structured interviews. However, there are few occupational knowledge investigations conducted with children. Consequently, the representation of minority samples is scant. Nonetheless, there is some evidence to support that actual (i.e., accuracy of) occupational knowledge increases with age. Though, some researchers suggest that children and adolescents, in general, seem to lack occupational knowledge regarding to S&E and S&E-related occupations and preparation requirements. Lastly, minorities of low socioeconomic backgrounds seem to lack occupational knowledge related to their own aspirations.

Perceived occupational status.

This portion of the review will focus on perceived occupational status; that is, how do the participants, themselves, perceive the status of their own occupational aspirations or specific occupations (e.g., fixed-response format). Similarly to occupational knowledge, few studies exist in which children's own perceptions of occupational status are explored. Of the studies that do exist, a wide range of occupations are presented, and do not focus on S&E, specifically. For example, Stockard and McGee (1990) explored fourth grade students' (*N*=496) perceptions of 21 occupations including the occupation of scientist. The participants were described belonging to mostly Caucasian American/White, working class families located within the Northwest.

Drawings of incumbents performing tasks were presented during individual interviews, and participants were asked their perceptions of earnings, importance, difficulty, and supervision for each occupation. Perceptions of each dimension were rated using a 5-point Likert scale, in which five indicates perceptions of high earnings, importance, difficulty, and/or supervision. Overall, the occupation of scientist was preferred by males ($p<.001$), and males were more likely to prefer occupations, such as scientist, if perceived as important or earning more. However, perceptions of importance and earnings were not influences for females.

Occupational Status Dependent Measure.

Liben and colleagues (2001) conducted a similar study in which perceived occupational status of 25 occupations (including the occupation of scientist) were explored among mostly Caucasian American/White primary (*n*=64) and intermediate (*n*=65) elementary school students of moderate socioeconomic status in the South. Primary elementary school students (ages 6-8, *M*=6 years, 10 months) were interviewed individually, while upper elementary school students (ages 11-12, *M*=11 years, 10 months) completed a group-administered questionnaire. Descriptions of occupations were prepared, none of the upper elementary school students requested the descriptions; although, primary elementary students requested descriptions for bank teller, dental assistant, and business executive.

Perceived occupational status was determined using a measure containing the following four questions: (1) "How hard do you think it is to learn to be a(n)________?"; (2) How hard do you think it is to do the job of being a(n) ________ everyday?"; (3) "How much money do you think a(n) ________ gets paid?"; and (4) "How important is the job of being a(n) ________?" Each response was recorded using a 5-point Likert scale. Lastly, primary elementary school students were asked "Who do you think should do each of these jobs?"; and responses included "only men", "only women", and "both men and women" (p. 352; Liben et al., 2001). The latter question was omitted for upper elementary school participants due to time constraints. During preliminary analysis, the occupational status questions were found to correlate ($p<.001$); and average composite scores were computed resulting in Cronbach's alpha of .80. Overall, students rated male –

dominated occupations as having higher status; and participants aspired to occupations typically associated with their own gender.

Teig and Sussking (2008)adapted the measures used by Liben and colleagues (2001) to explore the perceived occupational status expressed by mostly Caucasian American/White elementary (*n*=49; mean age 7 years, 9 months) and middle school (*n*=58; mean age 11 years, 6 months) students of moderate socioeconomic status in the Midwest. Teig and colleague (2008) added the question of "How cool do you think this job is?" (p. 850). Next, the students were asked, "Who usually is a ______?" (p. 851). Available responses were "only men", "usually men", "equal number of men and women", "usually women", and "only women" (p. 851). Each student, regardless of age, was interviewed individually, and asked to assess a more extensive list of 54 occupations (including occupations of engineer and computer programmer).

Overall, students (*n*=51) perceived the occupation of engineer as masculine, as at least 22% of respondents associated the occupation with only men (22.2%) or usually men (43.1%). Notably, this perception corresponds with the actualities of engineering occupations; for, 85% of the engineering workforce is male (National Science Board, 2014). Interestingly, participants (n=55), who were asked to rate the occupation of computer programmer, perceived the occupation as neutral (58.1%). Lastly, participants perceived engineering (*M*=20.69, *SD*=3.10) and computer programming (*M*=19.35, *SD*=3.48) occupations as high status.

As suggested, the aforementioned studies were conducted with mostly Caucasian American/White students of moderate socioeconomic backgrounds. However, Bigler and colleagues (2003) conducted a related study with African American/Black elementary and middle school students (*N*=92) from socioeconomic backgrounds ranging from low (approximately 50%) to upper middle. Low socioeconomic status was determined by eligibility for free or reduced lunch.

Similarly, participants were asked, "How hard do you think it is to learn to be a(n)________?"; How hard do you think it is to do the job of being a(n) ________ everyday?"; "How much money do you think a(n) ________ gets paid?"; and "How important is the job of being a(n) ________?" (p. 574). The authors adapted measures used by Liben and colleagues (2001), and asked participants the following question in lieu of gender, "Who usually does the job of being a(n) _________?". Available responses included "only Black people", "only White people", and "both Black and White people" (p. 574). Additionally, participants were asked to rate each of the 27 occupations, including scientist. Participants responded to the question, "How much would you like to be a(n) _________?" (p.574). All responses with exception to those associated with racial stereotypes were recorded using a 5-point Likert scale. Lastly, preliminary analysis was conducted for the occupational status measure. The occupational status questions were correlated ($p<.01$), and composite scores resulted in a Cronbach's alpha of .82.

Overall, occupations perceived as high status (followed by medium, and then low) were favored among participants, especially for students with high socioeconomic backgrounds (F [1.45, 117.73] =11.58, $p<.01$). Second, most participants expressed that African Americans were unlikely to have occupations perceived as high status (F [1.29, 105.01] =137.47, $p<.01$). Lastly, students of low socioeconomic status in comparison to those of high socioeconomic status were more likely to perceive African Americans in occupations of medium and low status (F [1.79, 146.86] =4.62, $p<.05$).

In summary, there are few studies in which perceived occupational status is explored with children, and even fewer with minority samples. Of those that exist, some researchers have asked participants to rate occupations in terms of difficulty, salary, and relative importance. Overall, there is some evidence to suggest that occupations in which children perceive as male dominated are also perceived as having a higher status, for example, the occupation of engineer.

Although limited due to sample size, there is some evidence to suggest that African Americans/Blacks, especially those of moderate socioeconomic status, prefer occupations that they perceive as high status. Notably, participants perceived African Americans as occupying positions of low or moderate status. This perception was pronounced for participants from a low socioeconomic background.

Traits of scientists.

Researchers suggest that children and adolescents compare images of themselves with those of occupations; and, will dismiss occupations deemed as incompatible (Gottfredson, 1981). However, many have inaccurate knowledge of occupations; thereby, decreasing the chances of considering otherwise compatible occupations (Gottfredson, 2005). Further, the impact is compounded by the stereotypical views of occupational incumbents, such as scientists. That is, students are less likely to pursue science occupations if they hold negative occupational images of incumbents in the science profession (Finson, 2002).

Several researchers have studied the image of scientists; yet, one constant is the view of scientist as masculine, White, and nerdy. This pervasive image of scientists has remained a constant throughout the years, regardless of age and culture. Due to concerns with the STEM workforce, researchers have found ways to tap into the consciousness of society to explore these images further.

One of the first seminal studies was conducted by Mead and Me'traux (1957), who explored the image of scientists for the American Association for the Advancement of Science. A sample of high school students (*N*=35,000, approximate) were sampled from over 145 schools throughout the United States. Participants were asked to respond to one of three open-ended prompts; such as, "When I think about a scientist, I think of" (p.385). The other two prompts were dependent upon the gender of the participant, which reflects the sociohistorical nature of the research given the assumption that females are not scientists. Males were asked to complete one of the two, which was predetermined by the researchers, "If I were going to be a scientist, I should like to be the kind of scientist who", or "If I were going to be a scientist, I would not like to be the kind of scientist who". In contrast, females were asked one of the following, "If I were going to marry a scientist, I should like to marry the kind of scientist who", or "If I were going to marry a scientist, I would not like to marry the kind of scientist who" (p. 385).

Qualitative analysis of the written prompts revealed a scientist, who was complex and idiosyncratic. The following passage represents a description of a scientist derived from themes; and is worth displaying, as this description is still prevalent today.

> "The scientist is a man who wears a white coat and works in a laboratory. He is elderly or middle aged and wears glasses. He is small, sometimes small and stout, or tall and thin. He may be bald. He may wear a beard, may be unshaven and unkempt. He may be stooped and tired.
>
> He is surrounded by equipment: test tubes, Bunsen burners, flasks and bottles, a jungle gym of blown glass tubes and weird machines with dials (p. 387, Mead & Me'traux, 1957)."

The scientist described within the study seemed to be a chemist, with other minor clues presented by the authors indicating an astronomer, epidemiologist, or even an entomologist. In addition, the scientist is described as someone, who is "intelligent" (or the negative equivalent of "a brain"), and works in a "dingy" laboratory laboring over "uninteresting" matters in isolation (p. 387, Mead & Me'traux, 1957). Additionally, the scientist seems to lack a social life, and has no hobbies. If he decides to have a family, the family will be burdened by his ever-consuming fixation on work, if he returns home at all. For, his work is a labor of love, in which case money and public recognition is of no consequence.

In some ways, this narrow conception may be reflective of the state of scientific discovery at the time, especially with the world's fascination with space activities (e.g., Sputnik). However, similar occupational images of scientists have persevered since the

50's. In some cases, this conception is shared among adults, adolescents, and children, today (e.g., DeWitt, Archer, & Osborne, 2013; Finson, 2002) despite a gradual shift towards a more positive occupational image of a scientist (e.g., Losh, Wilke, & Pop, 2008).

Draw-a-Scientist Test

Since Mead and Me'traux's (1957) seminal study, researchers have designed various instruments to capture the occupational image of scientists (e.g., Image of Science and Scientist Scale, Krajkovich & Smith, 1982). Such instruments rely on written and/or verbal abilities of participants. However, one instrument, Draw-a-Scientist Test (DAST, Chambers, 1983) was developed to elicit children's visual images of a scientist in order to not rely on verbal and/or written capabilities.

Chambers (1983) conducted a study to explore the pictorial representations of a scientist with national and international samples. The DAST was administered to approximately 4800 elementary school students, ranging from kindergarten to the fifth grade (i.e., ages five to 11 years of age). The sample size varied by grade level (e.g., kindergarten, n=45; 1st grade, n=842; 2nd grade, n=1,222; 3rd grade, n=1,284; 4th grade, n=946; 5th grade, n=468); and had a mostly equal distribution of females (49%) and males (51%). The author did not present descriptive statistics for ethnicity/race.

Classroom teachers were asked to administer the instrument, in which participants were asked to "Draw a picture of a scientist" (p. 257). Predetermined indicators found in literature (e.g., Mead & Me'traux, 1957, previously discussed) were used in analyzing the drawings. The indicators referenced the presence of a lab coat, eyeglasses, facial hair, laboratory instruments, books, and captions (e.g., “eureka”, p. 258).

Overall, the drawings of kindergarten and first grade students contained few indicators represented in the shared occupational image of scientists presented in studies (e.g., Mead & Me’traux, 1957). However, the presence of indicators began to increase by the second grade. For example, the drawings of second grade students contained two indicators, on average. The drawings of fifth grade students contained at least three to four, and in some cases all seven, on average. A notable finding was that female scientists were only drawn by female students; although, the female scientist was scare (i.e., 28 drawn) overall. Therefore, the mostly male occupational images held by children, as measured by the DAST, increasingly replicated the images held by adult populations (Chambers, 1983).

Since Chambers’ (1983) original study, the DAST has been administered to various national and international (e.g., Australia, Schibeci & Sorensen, 1983) populations resulting in similar findings. Overtime, methodological critiques of the DAST, as originally presented by Chambers (1983), began to emerge. For example, children were found to draw different variations of a scientist based on the directions (Symington & Spurling, 1990). Fifth grade students were asked to first, “Draw a picture of a scientist”, and then were asked second, “Do a drawing which tells me what you know about scientists and their work” (p. 75, Symington & Spurling, 1990). At times, the drawings did not differ; however, the author states that most of the subsequent drawings presented a different image from the first. The author suggests that the initial drawings were of the “public” occupational image of a scientists rather than their own conceptions of a scientist (Symington & Spurling, 1990).

Other researchers have suggested that students possess alternative and/or multiple images of a scientist. Chambers (1983) noticed these alternative images in which he refers to as mythic stereotypes, such as Jekyll/Hyde and Frankenstein. These images seemed to occur in drawings of students beginning at the second grade. Also, they were more likely to occur in subsequent drawings; that is, the students were more likely to draw a mythic stereotype when asked to draw a second image of a scientist. Similar observations were made by other researchers (e.g., Maoldomhnaigh & Hunt, 1988; Monhardt, 2003).

Losh and colleagues (2008) contributed to the professional discourse by examining some the methodological concerns with DAST administration. The researchers requested that elementary school participants (*N*=206; African American/ Black *n*=43; Caucasian American/White *n*=124; Hispanic American/Latin American *n*=25; Asian American *n*=6; other *n*=8), located within the Southeast, to draw a scientist, veterinarian, and a teacher to determine if and how images of scientists were distinct from other professions. Overall, the researchers found that scientists were portrayed as more serious (i.e., absence of a smile) in comparison to teacher images; and scientists were more likely to be portrayed as a mythical figure or monster. However, these alternative images of scientists were interpreted as positive; for, the males, who were more likely to draw these images, seemed to portray the scientists as representations of powerful characters in media (e.g., X-Men). Lastly, the researchers observed the unintended priming effect of administrators' ethnicity, as students in one experimental group drew approximately 20% more minority figures than in other groups. This was observed more so in the scientist (F_1, 196=5.03, p<.05) and veterinarian (F_1, 197=18.05, p<.001) drawings of female participants in the veterinarian experimental group, which had two African American/Black administrators.

When using participant-produced drawings, such as the DAST, validity can be addressed by assessing the conception of scientists with supplementary measures, such as interviews and questionnaires (Finson, 2002). One researcher demonstrates the importance of considering the students' context when interpreting drawings. Monhardt (2003) explored the occupational images of scientists among 94 elementary and middle school-aged Navajo students located within the Southwest. Fourth, fifth, and sixth grade students were asked to draw to "Draw a picture of a scientist at work" (p. 28). The Draw-a-Scientist Test Checklist (DAST-C, Finson, Beaver, & Cramond, 1995), a scoring measure comprised of indicators found in literature, was used to analyze each drawing. Overall, the students drew less stereotypical images in comparison to other studies. For example, 47% of the drawings were male in comparison to 73% in a national study by Barman (1999). However, the preliminary findings of Monhardt's (2003) study were deceiving, inadvertently.

Monhardt (2003) interviewed the participants after administering the DAST. She discovered a few concerns. First, the researcher noted the introduction by the school principal. The principal introduced the female researcher as a "scientist" (p. 31), which may have had a priming effect similar to the one in the Losh and colleagues' study

(2008). This assertion was supported by at least four students drawing the researcher, which was confirmed during the interviews. Second, few (18%) drawings were representative of scientists working indoors, which may indicate a broader perception of scientists by the participants in the study. For comparison, 88% of the drawings in Barman's (1999) national study were of scientists working indoors. Monhardt (2003) discovered that the many volcanos presented in the DAST drawings were due to the participants watching a science video of volcanos the week prior to administration. Third, the researcher cautioned her readers when interpreting DAST results presented in insolation. Initially, a low indicator score may suggest the absence of stereotype indicators. However, a low indicator score might suggest the absence of occupational knowledge, as discovered while interviewing a participant. The participant, a fourth grade female, did not have knowledge of the scientist occupation or of incumbents. Therefore, the participant drew an image of a teddy bear instead. Due to the contextual nature of Monhardt's (2003) study, the researcher could address possible validity concerns after administering the DAST. Nonetheless, the DAST, in conjunction with supplementary methods of data collection, has been useful in exploring the conceptions of elementary school children.

Researchers of prior DAST studies, have requested captions, written responses to questions, and have interviewed participants to discern a more complex, richer description of scientists as conceived by children and adolescents. Specifically, Monhardt (2003) asked participants to clarify the scientist's age, by asking whether the scientist was "as old as they were", "as old as their parents were", or "as old as their grandparents or other elders" (p. 29). Hillman and colleagues (2014) requested participants to name the scientist in their drawings. Also, Farland-Smith (2012) requested written clarification of the scientist's gender, work setting (i.e., indoors or outdoors), and a written description of what the scientist is doing in the image.

Sumrall (1995) administered the DAST and a questionnaire to students (*N*=358) located in the Southeast. The elementary and middle school students were asked to provide a description of their scientist, and a rationale for the gender and ethnicity/race of their scientist. Various reasons for the gender and ethnicity/race were provided. Reasons included self-portraits, portrayal of images in media or someone in their personal life, as well as generalizations or stereotypes.

Related studies have included questions regarding sources of scientist images. For example, Turkmen (2008) administered a questionnaire along with the DAST to determine possible sources. Overall, Turkish elementary school students reported sources ranging from individuals (e.g., friends, parents, teachers), media (e.g., TV, radio, newspaper, magazines, movies), and school (e.g., teacher, project, textbooks, fieldtrips). In a study with Korean adolescents, film was reported as the primary source for scientist conceptions (Song & Kim, 1999), which is similar to findings within the US.

Other researchers have probed for richer descriptions by asking participants to tell a story or write a short narrative regarding their scientist, as was the case in a qualitative study conducted by Walls (2011). The researcher explored the occupational images of scientists within a broader framework of science attitudes and education. Twenty-three (females *n*=12, males *n*=11) African American/Black 3rd grade participants from the

Midwest completed a modified version of the DAST. Modifications were made to address methodological concerns within prior studies. As mentioned the participants were asked to write a short narrative about their scientist for the purposes of discerning a broader conceptualization of each scientist. Second, the participants were asked to provide a name for their scientist for the purposes of aiding in gender interpretation without introducing bias. Third, the participants were asked the ethnicity/race of their scientist; particularly, when the ethnicity/race was difficult to interpret. Additional methods of data collection included interviews, a questionnaire, and a photo-elicitation activity. During the photo-elicitation activity participants were asked to select the photograph, that most accurately matched their conception of a scientist in terms of gender, ethnicity/race, and attire. The findings were derived from a qualitative content analysis of the DAST, transcription of the interviews, and scoring of the photo-elicitation activity.

Overall, the descriptions of scientists' occupational tasks seem to suggest that some of the participants understood scientists' work, at least in part. Students described scientists as those who engage in experimentation (35%) and teaching (30%). However, most of the participants suggested that scientists engage in the act of inventing (57%) and problem solving (70%). Although, this active form of problem solving and inventing is akin to the related work of engineers, given the direct real-world applications of their work. At least, this is what's suggested by a description presented below.

"…try to make new inventions to see if it will work out right and if it does work out right it is a new product that is made, and no one ever heard of until then." (p.18)

In some ways, the descriptions of incumbents were like those of other studies, in that conceptions of scientists are dissimilar to participants' self-perceptions. The general occupational image of a scientist included one, who wore glasses and a lab coat. Although, the prominence of the professional attire (e.g., tie, "jacket", p.16) theme differed from prior studies. In addition, the scientist was identified as a male with grey hair, indicating a mature age.

Notably, the ethnicity/race of the participants' conceptions of scientists was Caucasian American/White (35%), with some reporting African American/Black (23%), and the most were conceived as Indian/Indian American (40%). Another noteworthy finding suggests that in some ways, perhaps the participants can envision themselves as scientists, as a sizeable proportion (41%) drew their scientists as children; and some confirmed that they drew themselves as scientists. However, the implications of this finding are unclear, as the author reports that many images in the students' science textbooks were of children. Again, the importance of contextual factors, such as potential sources of knowledge and reasoning, is supported.

In summary, the perceptions of scientists' traits have remained unchanged, virtually, for at least six decades. The image of scientists as Caucasian American/White, male, intelligent (or the negative perception of brainy), and more likely a chemist has been shared among adults, children, and adolescents. However, this occupational image, in some ways accurate and in other ways inaccurate, has implications for whether minority students and/or individuals of low socioeconomic status choose to pursue science occupations.

Nonetheless, there are few occupational image studies conducted with minority, elementary school children. For those that exist, the traits of scientists are explored through child-friendly methods, such as the DAST (Chambers, 1983). The DAST has been used over the past 30 years, but with modifications to increase validity and reliability. Modifications to the DAST include asking clarification questions regarding the scientist's gender, age, work setting, and tasks performed in the drawing. In others, the modifications addressed the context of the drawing, which aided in interpretation. Most notably, researchers, who used the DAST, have done so along with supplementary methods, such as interviews. The use of interviews has been helpful in garnering further contextual information regarding participants' drawings.

Conclusion

This review of extant literature included studies from career development, education, psychology, and science-related disciplines. Several themes were identified as potential implications for the current study. First, there is a lack of career development investigations with elementary school children; especially with diverse populations, such as African Americans/Blacks and/or students of low socioeconomic status. The lack of contemporary research with children is juxtaposed to the findings supporting the need to understand antecedents of occupational choice. For example, researchers suggest that educational and occupational aspirations become increasingly stable; and, are predictive of future aspirations, eventual attainment and earnings. Additionally, researchers suggest that this process begins in elementary school; for, children display some knowledge of occupations (although mostly inaccurate) and reasoning regarding their aspirations.

Second, career development researchers call for the inclusion of diverse populations, as many studies with mostly Caucasian American/White students of moderate socioeconomic status. Perhaps, this call reflects the partial evidence supporting contextual differences of gender, ethnicity/race, and socioeconomic status. For example, some researchers suggest that although African American/Black students may hold high aspirations, they may possess inaccurate occupational knowledge for their own aspirations and of STEM occupations. In addition, students of low socioeconomic backgrounds tend to hold lower aspirations, have lower attainment, and lower earnings. Therefore, exploring the aspirations and STEM occupational images held by African American/Black elementary students will aid in our understanding (and help to eventually address) the low participation of this population within the STEM workforce.

Third, many of the studies lacked contextual features necessary to explore children's aspirations and occupational images in depth. For example, child-friendly interview methods were used during data collection, but the qualitative data was presented quantitatively, devoid of the participant's context. As was demonstrated in one DAST study, the context could aid in the researcher's interpretation of the findings, as well as, that of the readers' when considering generalizability. Therefore, the researcher of this current study sought to implement common analytical strategies presented in extant literature (e.g., quantifying data), while maintaining the strengths that qualitative methods afford (i.e., descriptions of context).

Lastly, some of the investigations lacked the presentation an organizing framework. An organizing framework would aid in clarifying the constructs of aspirations and occupational images. For example, the use of a framework could assist researchers in exploring a construct holistically, which is helpful when limited findings exist. For example, a greater understanding of STEM occupational images could be accomplished when STEM occupational knowledge, perceived occupational status, and traits of incumbents are explored. Therefore, the researcher of this current study has used a conceptual framework to organize the study, analyze findings, and seek greater breadth and depth of knowledge concerning the constructs of interest.

CHAPTER THREE: METHODOLOGY

The purpose of this qualitative case study was to explore the science occupational images, occupational and educational aspirations of Black/African American elementary school students. An understanding of these constructs will assist educational professionals in addressing the nation's concern regarding the underrepresentation of African American/Black individuals in science careers. To better understand the phenomena, the current study addressed four research questions:

1. What do African American/Black 4^{th} and 5^{th} grade students know of science occupations?
2. How do African American/ Black 4^{th} and 5^{th} grade students perceive science occupations and incumbents?
3. To what extent, do the aspirations of African American/Black 4^{th} and 5^{th} grade students align with the pursuit of science occupational paths?
4. What differences exist, if any, between female and male African American/Blac^{k} 4th an^{d} 5th grade students in regard to science occupational knowledge, perceptions, and aspirations?

This chapter describes the methodology of the current study. The areas discussed include (a) a rationale for a case study design, (b) a description of the research sample, (c) data collection methods and procedures; (f) data analysis descriptions, (g) ethical considerations, and (h) trustworthiness issues. Finally, the chapter concludes with a summary of the aforementioned areas.

Case Study Method

A qualitative case study design was employed for the current study. Case study methodology is best suited for research in which the distinction between the current context of the phenomenon and the phenomenon itself are less apparent (Yin, 2014). Case study methodology involves the collection of multiple sources of data within a contemporary context, that is bounded by time and setting (Yin, 2014). Therefore, the use of case study methods maintained the strengths of qualitative research, such as enabling phenomena exploration in which contextual knowledge was generated (McLeod, 2010; Yin, 2014).

Due to the subjective nature of participants' aspirations and perceptions, the significance of such cannot be understood, fully, separate from its context (Osborne, Simon, & Collins, 2003). Therefore, qualitative data collection methods and analysis allow for researchers to explore phenomena within a participant's context, such as a school setting (Johnson & Onwuegbuzie, 2004; Palladino Schultheiss, 2008). Additionally, qualitative methods are preferred in garnering the voices, experiences, and perceptions of children, especially those belonging to traditionally marginalized groups (Mertens, 2009; Palladino Schultheiss, 2008).

Additionally, case study methods allowed for the use of qualitative data, as the major method, and quantitative data as supplementary means of data collection. This design consists of the collection of both qualitative (e.g., drawings, written responses, interviews) and quantitative data (e.g., questionnaire responses) provides a more comprehensive view of the phenomenon (Bryman, 2006; Creswell & Plano Clark, 2011;

Johnson, Onwuegbuzie, & Turner, 2007). While qualitative methods are synonymous with the provision of thick, rich descriptions within context, quantitative data are useful in enhancing these descriptions. It is common for researchers of the constructivist paradigm to use descriptors such as ‘most’ and ‘frequently’ (Sechrest & Sidana, 1995, p79), which denotes quantification. Descriptive statistics (e.g., frequencies, means), and even inferential statistics, can be used in a similar fashion to enhance qualitative descriptions with numerical data. For example, Walls (2012) presented frequencies of emerging themes, such as the presence of characteristics attributed to scientists. Relatedly, Parsons (1997) presented descriptive statistics in several tables to provide a comprehensive description of the participants’ context (i.e., school system, community, course completion, graduation rates, etc.). However, the differences in the use of descriptive statistics in studies, situated within a constructivist paradigm, is to enhance the narrative and provide internal (as opposed to external) statistical generalizations; as well as, symbolize only one of many phenomenon descriptions (Onwuegbuzie, Johnson, & Collins, 2009).

Research Participants

As suggested by the embedded design in which qualitative methods are dominant, internal (as opposed to external) generalizability is more appropriate in studies conducted within a constructivist paradigm (Onwuegbuzie et al., 2009). Therefore, random purposeful sampling was used to seek a representation of average individuals, who have the potential of providing insight into the constructs of interest (Merriam, 1998; Merriam

& Tisdell, 2016; Patton, 2015). Additionally, a random purposeful sampling strategy was used for the purposes of addressing interview selection bias (Krueger & Casey, 2009).

Due to its status as a large urban school district (as well as due to the researcher's familiarity with the district as a former Professional School Counselor) the Orange County Public Schools (OCPS) district was selected as the site for this study. Among the schools located within Orange County, Oak Lake Charter School was selected based on two criteria: (a) the high representation of elementary students identified as African American/Black; and (b) the provision of educational services within a STEM context. African American/Black students within the 4^{th} and 5^{th} grades (*N*=80) from Oak Lake Charter School were invited to participate in this study. The 4^{th} and 5^{th} grade students (*n*=17), who returned consent and assent forms, where included in the random sample selection. Numbers were assigned to each student, and a random number generator was used to select the final sample of participants. The sample derived from random purposeful sampling included an even representation of females and males from each grade level (*n*=5). The number of participants chosen is suggested for case study research and other qualitative studies, as well (Creswell & Plano Clark, 2011; Mertens, 2009). Additionally, the sought-after sample size allowed for the researcher to collect the desired level of detail from each participant (Creswell & Plano Clark, 2011), and thus allowed the researcher to conduct an in-depth qualitative data analyses when appropriate (e.g., cross-case analysis of units by gender).

Data Collection Methods and Instrumentation

The researcher used several child-centered data collection methods to explore the scientist occupational images, occupational and educational aspirations of African American/Black 4th and 5th grade students (see Appendix E). Participant-produced drawings were used to explore the scientist occupational images held by research participants. Specifically, the drawing-based instrument was a modified version of the Draw-a-Scientist Test (DAST, Chambers, 1983; see Appendix F). Next, a brief questionnaire (i.e., the Occupational Status Dependent Measure; Liben et al., 2001; see Appendix G;) was used to explore the participants' perceptions of scientist occupational status, a component of occupational images. Lastly, two individual, semi-structured interviews (i.e., Interview I and II, see Appendices H and J, respectively) and a group, semi-structured interview (i.e., Interview III, see Appendix I) were conducted. The interviews were conducted to further explore occupational images, occupational and educational aspirations. A brief overview and description of each instrument is presented.

Participant-Produced Drawings

The popularity of creative methods, such as participant-produced drawings, show promise in exploring the views of children across a variety of research topics (Ganesh, 2011; Soffer & Ben-Arieh, 2014; Tatlow-Golden & Guerin, 2010). For example, participant-produced drawings have been used with children to explore perceptions of scientists (e.g., Losh, Wilke, & Pop, 2008). Additionally, participant-produced drawings provide researchers with an opportunity to see the world through the eyes of the child (Greene & Hill, 2005; Veale, 2005; Weller, Hobbs, & Goodman, 2014). Child-centered methods, such as drawings, offer participants alternative modes of communication and deemphasizes the reliance on written and verbal expression alone, thereby empowering participants to express themselves in a comfortable manner (Blerk, 2006; Prosser & Burke, 2008; Soffer & Ben-Arieh, 2014). Furthermore, children have expressed the desire for more pleasurable research methods, which suggests that drawing may be appropriate for increasing participant engagement (Hill, 2006; Tatlow-Golden & Guerin, 2010).

Drawing as a means of data collection is considered a child-friendly technique that allows the researcher to access a child's world (Soffer & Ben-Arieh, 2014; Weller et al., 2014). As with all research methods, there are inherent limitations. First, some participants may not feel comfortable with drawing (Groundwater-Smith, Dockett, & Bottrell, 2015), in which case participants will be reminded of their right to withdraw from the study without penalty. Second, drawings are context dependent, which is simultaneously a strength and limitation of this method. Given the underpinning epistemology of the study, constructing knowledge within context is advantageous. However, children may produce drawings that reflect the ethnicity/race of the researcher or any adult present during administration (Losh et al., 2008), or may produce drawings that reflect stereotypes rather than their own perceptions of incumbents (Groundwater-Smith et al., 2015). To address this limitation, the researcher (a) asked school personnel to refrain from introducing the primary researcher as a scientist (see Monhardt, 2003); and (b) modified instructions of the Draw-a-Scientist Test (Chambers, 1983) based on suggestions in literature (e.g., Walls, 2012). Lastly, drawings may be misinterpreted by the researcher during analysis (Groundwater-Smith et al., 2015), which was minimized by (a) requesting written captions, (b) asking participants to clarify any misinterpretations; and (c) requesting additional explanations of the drawings from participants during the semi-structured interviews, if needed (Ganesh, 2011).

Draw-a-Scientist Test (DAST).

The Draw-a-Scientist Test (DAST, Chambers, 1983) and similar variations have been used for decades to explore perceptions of scientists and other professionals (Barba, 1990; Martin, 2004), as children's drawings are considered an effective way of capturing internal mental images (Dennis, 1966). Modifications to the DAST instrument reflect (a) revised instructions, (b) a request for written descriptions, and (c) the inclusion of questions, which assisted the researcher in interpretation of the images (Blerk, 2006; Groundwater-Smith et al., 2015; also see Walls, 2012).

For example, the original instructions for the DAST (i.e., "Draw a picture of a scientist", Chambers, 1983, p. 257) were revised in order to elicit the participants' own perceptions of scientists, and not ones that are reflections of a public image. Therefore, the instructions of the modified DAST stated, "Draw a picture of a scientist at work" (Monhardt, 2003), and that the picture should "tell me what you know about scientists" (Symington & Spurling, 1990, p. 75) and the work that they do. Next, participants were asked to assign a name to their scientist. This modification was included in order for the researcher to decipher the gender of the scientist (Hillman et al., 2014; Walls, 2012) without priming. Additionally, participants were asked (a) if the scientist is working indoors or outdoors (Farland-Smith, 2012) and (b) to write a short description of what the scientist is doing in the picture (Walls, 2012).

Questionnaires

Questionnaires are commonly used in research with school-aged children (Gallagher, 2009; Groundwater-Smith et al., 2015; Soffer & Ben-Arieh, 2014) and have been used to explore perceptions of occupations, such as scientists (e.g., Hillman et al., 2014). The administration of questionnaires offers advantages such as increased anonymity and the opportunity for participants, who may be uncomfortable in an interview setting, to communicate in a written format (Gallagher, 2009; Groundwater-Smith et al., 2015; Hill, 2006). Additionally, school-aged children are familiar with the common task of answering questions provided in a questionnaire format.

As previously mentioned, the use of questionnaires is common, and can be effective data collection tools. However, the familiarity of responding to questions in written form can be a shortcoming, especially in school settings due to students perceiving questionnaires as "school work" (Gallagher, 2009, pg. 15). To increase engagement, graphic images of thermometers were used to indicate Likert-scale responses (Prosser & Burke, 2008); and survey questions were combined with drawing activities. Additionally, participants were reminded that they can withdraw from the study at any time without penalty. Second, questionnaires may be difficult to complete for children with limited literary skills (Losh et al., 2008). This was addressed by reading the question stems during group administration. Lastly, survey methods in general present challenges, such as response bias based on social desirability (i.e., choosing answers perceived as favorable by others). Therefore, prompts were included in the questionnaire protocol to remind participants that (a) there are no right or wrong answers, (b) the answers will not be graded, and to (c) do their best in answering the questions.

Occupational Status Dependent Measure.

The Occupational Status Dependent Measure, used in occupational image related studies (e.g., Bigler et al., 2003; Liben et al., 2001; Teig & Susskind, 2008) were administered to explore participants' perceived occupational status of scientists. To assess participant's occupational status ratings, responses to four questions indicate perceived (a) difficulty of learning to be a scientist, (b) difficulty to work as a scientist, (c) earnings, and (d) importance. The original Occupational Status Dependent Measure was adapted for use in the current study, and more specifically, references scientists as opposed to a range of occupations. As such, the following questions are: (1) "How hard do you think it is to learn to be a scientist?"; (2) "How hard do you think it is to do the job of being a scientist every day?"; (3) "How much money do you think a scientist gets paid?"; and (4) How important is the job of being a scientist?" Occupational status ratings were measured on a 5-point Likert scale from (1) none or not at all to (5) very or very much. Thermometers of varying mercury levels represent each scale point, and served as a strategy to engage research participants. In prior studies, the reported internal consistency reliability statistics of the occupational status items resulted in high Cronbach's alpha (.80) value (Liben et al., 2001).

Semi-Structured Interviews

Interview methods offer several advantages when employed in research with children and are preferred when an in-depth exploration of participants' perspectives provides insight into a phenomena (Gallagher, 2009; Groundwater-Smith et al., 2015; Soffer & Ben-Arieh, 2014). Children tend to be familiar with the concept of interviewing through media exposure (Groundwater-Smith et al., 2015) and thus the familiarity with interviewing may contribute to the participant's comfortability. Additionally, semi-structured interviews offer the advantage of using an interview guide, which assists in organizing the interview flow throughout a single interview and across multiple interviews (Groundwater-Smith et al., 2015).

Although interviews are useful in exploring the perspectives of children (Kvale, 2007), there are limitations in using the interview method with children. Participants may exhibit certain behaviors due to the power differentials between the researcher and participant. For example, children are prone to provide answers in an attempt to meet expectations of the interviewer (Groundwater-Smith et al., 2015; Weller et al., 2014). This tendency may lead to response bias due to a participant's attempt to appear socially desirable (Dillman, Smyth, & Christian, 2014). An additional limitation includes the acknowledgment that some participants may not feel comfortable expressing themselves verbally, especially in one-on-one formats, such as the individual interview, which may be perceived as threating (Blerk, 2006; Gallagher, 2009; Groundwater-Smith et al., 2015). Lastly, knowledge is produced through interviewer-interviewee interactions (Kvale, 2007). While this interaction is a strength, based on the epistemological assumptions that guides this research, interviewer-interviewee interactions pose limitations in the form of interviewer effects. Participants may respond to questions differently due to characteristics of the interviewer, such as gender and race (Dillman et al., 2014).

Individual & group semi-structured interview protocol.

The interview questions were adapted based on questions found in research literature (e.g., Archer, Dewitt, & Osborne, 2015; Blackhurst et al., 2003; Howard & Walsh, 2010; Mason, Butler, & Gardner, 1991), and serve as means to encourage further exploration of the constructs essential to the study. As such, the interview protocol (see Appendices I and J) consists of requests for more information referencing the participants' drawings (e.g., "Tell me more about your scientist") and questionnaire (e.g., "In what ways, is it easy/hard to learn to be a scientist"). Additionally, the interview protocol includes broader questions in hopes of gathering information regarding the participants' aspirations and occupational knowledge base. Examples of such questions include "Would you also like to be a scientist when you grow up?" and "What are some things that a person needs to know to be a scientist?".

Data Collection Procedures

Within a single phase, the data collection process occurred over three stages. The first stage refers the recruitment of research participants, such as obtaining parental consent and assent from research participants. In addition, data collection regarding the school's context began and continued throughout the entire data collection phase. The second stage consisted of conducting the aspiration individual, semi-structured interviews (i.e., Interview I), the modified DAST and the Dependent Occupational Status Measure. Finally, the researcher conducted the occupational images individual, semi-structured interviews (i.e., Interview II), group interviews (i.e., Interview III), and member checking during the third stage.

After each data collection stage, completed instruments were stored, and locked in a secure filing cabinet within the researcher's home office. Additionally, digital copies of scanned data collection instruments and audio-recordings were stored within an encrypted folder on the researcher's computer. Only the researcher had access to collected materials during and after data collection.

Stage I: Preliminary Data Collection Procedures

Upon approval of the University of Central Florida's (UCF) Institutional Review Board (IRB), the researcher met with school personnel to identity potential research participants and to discuss the data collection procedures. Next, the researcher sent the parental consent and child assent forms (refer to Appendices K and L, respectively) home with each identified student. A small incentive (e.g., pencil or eraser) was included in advance to increase the benefit of participation, as well as to establish trust with the research participants (Dillman et al., 2014). Each student was encouraged to keep the incentive regardless of their level of participation. Once the parental consent and child assent forms were received, data collection stages two and three began.

Stage II: Procedures for Semi-structured Interviews, Participant-Produced Drawings and Questionnaire

During the second stage of data collection, the researcher (a) conducted the first semi-structured interview (i.e., Interview I: aspirations interview); (b) administered the drawing instrument (modified DAST, Chambers, 1983); and (c) administered the questionnaire (Occupational Status Dependent Measure; Liben et al., 2001). The researcher conducted the aspiration semi-structured interviews first in order to minimize the priming effects of the scientist occupational image instruments. The individual, semi-structured interviews conducted in a private room provided by the school. Before the start of the first interview, participants were asked to choose a "code name" (i.e., pseudonym) to maintain confidentiality. Additionally, the researcher attempted to create a more comfortable experience for the participants by (a) reviewing the purpose of the interview, (b) emphasizing the researcher's role as learner and participant's role as expert, and (c) giving permission to the participant to ask for clarification when needed (Saywitz & Camparo, 2014; Weller et al., 2014). All interviews (i.e., Interview I) were audio-recorded, and each lasted approximately 30-45 minutes in length. Interview I, aspirations interview, was conducted over the course of four days.

Scientist occupational images.

Once the first round of interviews (i.e., Interview I: aspirations) were concluded. Data collection of the modified DAST (Chambers, 1983) and the Occupational Status Dependent Measure (Liben et al., 2001) occurred next. One school day separated the conclusion of Interview I and the administration of the DAST and Occupational Status Dependent Measure. The modified DAST was administered by a teacher (see Appendix N), as teacher administration is preferred in order to minimize effects of the researcher's presence (Barba, 1991; see Losh et al., 2008). Drawing utensils were made available throughout the administration and participants were encouraged to use their own materials if they wished. The estimated completion time for administration of the modified DAST instrument was approximately 25-35 minutes.

Once participants completed the modified DAST, the adapted Occupational Status Dependent Measure (Liben et al., 2001) was administered (see Appendix O). The researcher requested that the teacher/administrator read each question of the measure, if necessary, as an accommodation to those students with below level literacy skills. The estimated completion time for the Occupational Status Dependent Measure was 5-10 minutes. Therefore, the total time for completion of both the DAST and the Occupational Status Dependent Measure was approximately 30 to 45 minutes. The administration of the instruments occurred over the course of two school days.

Context

Throughout each stage of data collection, the researcher explored the participants' school context using qualitative methods, such as maintaining field notes and conducting unstructured observations (see Appendix O). Exploring the constructs of interest within the participants' context is preferred, due to the complex nature of aspiration development. Therefore, aspirations and perceptions are better understood within context, such as a school setting (Johnson & Onwuegbuzie, 2004; Osborne, et al., 2003; Palladino Schultheiss, 2008). The researcher conducted unstructured observations before and after data collection activities. The unstructured observations of general school operations were conducted in common areas, as the classes were engaged in assessment and other end-of-the year activities. Therefore, observations of the participants within their classroom environment were not conducted. In addition, at the researcher's discretion, informal interviews with staff regarding school curriculum and school activities were conducted. However, the informal interviews were not audio-recorded.

Lastly, aggregated assessment scores and documents relevant to the current study were collected. A point of contact for the school provided aggregated statewide assessment scores for language arts, mathematics, and science (for 5th grade students only). Additionally, the researcher reviewed the school's website, and posted documents, such as the School Improvement Plan (SIP) and Parental Involvement Plan (PIP).

Stage III: Procedures for Additional Semi-Structured Interviews

In stage three of data collection, each participant was interviewed by the researcher during the students' special area period in a room with minimal distractions. Interview II, occupational images interview, occurred immediately following the administration of the DAST and Occupational Status Dependent Measure. Before the start of the occupational images interview, participants were asked to choose a "code name" (i.e., pseudonym) to maintain confidentiality. The participants used the same pseudonym throughout all stages of data collection. Additionally, the researcher attempted to create a more comfortable experience for the participants by (a) reviewing the purpose of the interview, (b) emphasizing the researcher's role as learner and participant's role as expert, and (c) giving permission to the participant to ask for clarification when needed (Saywitz & Camparo, 2014; Weller et al., 2014). The respective scientist images, drawn during stage two of data collection, were provided and referenced at the start of each interview (i.e., Interview II; see Appendix J). All interviews were audio-recorded, and each lasted approximately 30-45 minutes in length. Interview II, occupational images interview, occurred of the course of four school days.

Following the completion of stage three, the researcher conducted group semi-structured interviews (i.e., Interview III) two days later, which occurred over the course of one week. Each individual participant was assigned to one group interview, based on the participant's gender. Therefore, the researcher conducted a total of two group interviews. Each group interview was conducted in a private room provided by the school. Before the start of each group interview, participants were asked to write their chosen "code name" on name tags provided by the researcher. The pseudonyms were used throughout the group interview to maintain confidentiality. Additionally, the researcher attempted to create a more comfortable experience for the participants by (a) reviewing the purpose of the group interview, (b) emphasizing the researcher's role as learner and participant's role as expert, and (c) giving permission to the participant to ask for clarification when needed (Saywitz & Camparo, 2014; Weller et al., 2014). Each group interview was audio-recorded, and each lasted approximately 40-45 minutes in length. Both of the gender-based group interviews, Interview III, occurred the same day.

Data Analysis

Data analysis occurred over four stages. The process included stages of data condensation, data display, data transformation, and merged data analysis (Creswell & Plano Clark, 2011; Miles, Huberman, & Saldana, 2014; Onwuegbuzie & Teddlie, 2003). These stages are commonly used in mixed methods studies; and, were employed for use in the current case study due to the use of qualitative and quantitative data collected. The first stage of the data analysis refers to the preliminary analysis of both qualitative and quantitative data. The quantitative data (i.e., Occupational Status Dependent Measure) was condensed through statistical analysis. The qualitative data (i.e. drawings, responses to open-ended questions, and interview transcripts) was condensed to codes and categories, respectively.

Each of the transcripts from the semi-structured interviews (see appendices S, R, and Q) and open-ended questions were read by the researcher to gain an overall understanding of the content. Next, the researcher used a structural coding method in which the transcribed text was coded, using predetermined codes based on literature (see appendix T), according to each research question. Structural coding can be useful in studies in which semi-structured protocols are used (Saldana, 2016). Once the codes were determined, they were clustered into categories for continued analysis.

Data display, the second stage, refers to the grouping of information for purposes of meaningful, visual representations (e.g., tables, matrices, graphs, etc.). The third stage of the data analysis process was data transformation, which is the quantification of qualitative data (e.g., assigning numerical values to codes) and the qualification of quantitative data (i.e., numerical values are represented as text). Data transformation aided in the next step, that is merged data analysis, in which the data was consolidated into a cohesive whole.

Merged Data Analysis

The final stage of the data analysis process refers to the merging of data or data integration (Creswell & Plano Clark, 2011; Onwuegbuzie & Teddlie, 2003). The purpose of this stage was to create a cohesive whole that eventually facilitated the process of drawing internal inferences (Onwuegbuzie & Teddlie, 2003). One common strategy used was to design a joint display, which is a visual representation (e.g., table) of both qualitative and quantitative data (Creswell & Plano Clark, 2011). This strategy was used for each research question in which both qualitative and quantitative data results are available. Finally, an additional merged data analysis strategy was used, which was to illustrate the qualitative and respective quantitative findings in the discussion (Creswell & Plano Clark, 2011).

Research Question One

Results from a modified DAST (Chambers, 1983) provided an understanding of what the research participants knew of the work-related tasks of scientists (e.g., symbols of knowledge, research, and technology). The first step towards analysis of the DAST included a review of written descriptions and responses provided by research participants. The written descriptions and responses were used to aide in the researcher's interpretation of the drawings. In doing so, the researcher conducted a qualitative, directed content analysis of the DAST drawings and written descriptions. Directed content analysis is employed when phenomena, previously studied, benefits from further analysis (Hsieh & Shannon, 2005). The use of codes, derived from extant literature, will assist in adding to the existing body of knowledge.

Subsequent analysis of the modified DAST (Chambers, 1983) included the identification of categories and themes, as they relate to the work tasks depictions. Matrices were used to display the qualitative data, in which some codes were transformed. Both qualitative and quantitative representations were considered for interpretation. All data analyses were conducted using computer assisted qualitative data analysis software and/or statistical programs.

Results from the semi-structured interviews (i.e., Interview II and III) provided an in-depth understanding of what research participants knew of scientists. Audio-recordings of each interview were transcribed by the researcher, after which initial codes were determined. The work-related tasks and preparation requirements of scientists were explored through the analysis of semi-structured interview data. Subsequent analysis included identification of categories and themes. The data was displayed using matrices. Given the purpose of the interviews to provide an in-depth perspective, majority of the qualitative data was maintained (i.e., not transformed). Lastly, a preliminary merged data analysis was conducted for this research question.

Research Question Two

Results from a modified DAST (Chambers, 1983) provided an understanding of how the research participants perceived scientists, specifically the appearance (e.g., presence of lab coat, eyeglasses, facial hair), gender, mood, and mythic stereotypes (e.g., Frankenstein). The first step towards analysis of the modified DAST included a review of written descriptions and responses provided by research participants. The written descriptions and responses (e.g., scientist's name) were used to aide in the researcher's interpretation of the drawings (e.g., gender). In doing so, the researcher conducted a qualitative, directed content analysis of the DAST drawings and written descriptions. The use of codes, derived from extant literature, will assist in adding to the existing body of knowledge.

Subsequent analysis of the modified DAST (Chambers, 1983) included the use of the Draw-a-Scientist Checklist (DAST-C, Finson et al.,1995) by noting the presence of appearance, gender, mood, and mythic stereotypes. Matrices were used to display the qualitative data, in which some codes (e.g., gender of scientist) were transformed. Both qualitative and quantitative representations were considered for interpretation.

Results from the Occupational Status Dependent Measure (Liben et al., 2001) provided an overview of how participants rate the occupational status of scientist occupations. Specifically, the (a) difficulty of learning to be a scientist, (b) difficulty of doing the job of a scientist, (c) perceptions of earnings, and (d) perception of importance were analyzed. Analysis included the computation of individual composite scores in SPSS, and achieved by averaging responses to the occupational status questions. The composite scores were displayed in tables, and transformed to represent occupational status categories (i.e., high, medium, and low).

Results from the semi-structured interviews (i.e., Interview II and III) provided an in-depth understanding of the research participants' perceptions of scientists. Audio-recordings of each interview was transcribed by the researcher, after which initial codes were determined. Subsequent analysis included identification of categories and themes. The data was displayed using matrices. Given the purpose of the interviews to provide an in-depth perspective, the majority of the qualitative data was maintained (i.e., not transformed). Lastly, a preliminary merged data analysis was conducted for this research question.

Research Question Three

Data collected from the aspiration, individual semi-structured interviews (i.e., Interview I) provided an understanding of the participants' occupational and educational aspirations. Results from the semi-structured interview provided an in-depth understanding of the research participants' occupational and educational aspirations. Audio-recordings of each interview were transcribed by the researcher, after which initial codes were determined. First, the researcher coded the free-response occupational aspirations by occupational title using the Standard Occupational Classification (SOC; Standard Occupational Classification Policy Committe, 2009). Next, the fixed-response scientist aspirations was coded. Lastly, the presence or absence of college educational aspirations was coded.

Subsequent analysis included categorizing each occupational title as science (see Appendix A), engineering (see Appendix B), science and engineering-related (see Appendix C), and non-science and engineering occupations. The predetermined categories were based on S&E occupations identified by the NSF (National Science Board, 2015). Codes and categories, derived from the free-response occupational and fixed-response educational aspiration questions, were transformed for the purposes of reporting descriptive statistics. Both qualitative and quantitative representations were considered during interpretation stages and displayed in matrices.

Research Question Four

Results derived from the analysis performed for prior research questions were used to determine if differences exist by gender. The researcher conducted a cross-case synthesis across the units. Cross-case patterns by gender were determined through the comparison of word tables (Yin, 2014). Both qualitative and quantitative representations were considered during interpretation stages, and displayed in matrices.

Context

Information contained within the researcher's notes taken in the field, during observations, and interviews contributed to the descriptions of the school context. Throughout the data collection stages, the raw field notes were typed and prepped for analysis. Initial codes were determined, which contributed to the descriptions of the school environment.

Ethical Considerations

Conducting research with any population, regardless of age, necessitates that the researcher considers the ethics of implementing their research agenda. However, conducting research with children have ethical implications that differ from designing studies with adult populations (Hillman et al., 2014). Ethical considerations, such as informed consent, assent, confidentiality and privacy as they relate to this current research study are discussed.

Gaining informed consent is fundamental to conducting ethical research with human subjects. However, the process in which consent is gained differs when conducting research with children, due to their legal status as dependents and decision making competencies (Hill, 2005; Soffer & Ben-Arieh, 2014). For example, researchers must secure consent from ‘adult gatekeepers’ (e.g., parents or guardians), and on-going, active permission from the child (i.e., in the form of assent; Blerk, 2006, p.11; Soffer & Ben-Arieh, 2014). Additionally, researchers should provide information pertinent to the study (e.g., research purpose, time commitments, confidentiality, etc.) to children as they would to adult populations (Hill, 2005). Therefore, the researcher sought informed consent from the parent/guardian of each potential research participant, and sought active assent (i.e., opt-in) from students in which parental consent was received. The assent form included child-friendly language, yet covered pertinent information to the research study. In addition, the assent process was on-going as each student’s willingness to participate was confirmed throughout the study. Research participants were informed of their right to withdraw from the study at any time without penalty.

A part of the informed consent and assent process involves the review of issues surrounding confidentiality and privacy. As it relates to this current study, efforts were made so that personal identifying information, such as names, were not collected. For example, a random alphanumeric code was assigned to each participant in lieu of names. These codes were used on all instruments collected throughout the study. Additionally, at the start of each interview, participants were asked to choose their own “code name” (i.e., pseudonym) to (a) personalize the interview, (b) facilitate rapport building, and (c) protect her/his privacy. Finally, documents and information gathered to explore the school context were devoid of personal identifying information. For example, the researcher requested aggregated assessment scores as opposed to disaggregated scores, as aggregated scores were less likely to contain personal identifiers.

Issues of Trustworthiness

Validity and reliability are essential aspects of research design, as researchers must ensure what they propose to measure is measured in actuality, and can be consistently measured over time. Considering the predominately qualitative/constructivist nature of this current study, validity and reliability are discussed in terms of trustworthiness. Issues of trustworthiness surrounding (a) credibility, (b) dependability, (c) confirmability, and (d) transferability are presented.

Credibility

In qualitative research, credibility refers to the “authenticity” of the findings (Miles, Huberman & Saldana, 2014, p.312). That is, are the findings true and credible to the research participants, readers, and researcher? The conceptualization of credibility extends itself to internal validity as it is referenced in quantitative studies.

The researcher implemented strategies for enhancing credibility in the current study. The researcher employed member checking techniques to ensure accuracy of participants’ accounts (Creswell, 2013). Member checking occurred at a couple of points during data collection. The researcher asked participants to clarify, when needed, any drawings or written responses on the modified DAST and Occupational Status Dependent Measure. Additionally, the researcher summarized the main points after each interview, and asked each participant if the summarizations were accurate. Lastly, the researcher presented the preliminary findings of the study to the participants in a group setting, in which the participants formed a consensus.

Second, the researcher maintained an account of her biases and assumptions throughout data collection (Creswell, 2013). For example, the researcher presented a conceptual framework, which provides an indication of her orientation to the study and subsequent interpretation of the results. Additionally, the researcher maintained field notes with a section for reflections. Third, the researcher maintained a reflection journal as a method for recording all thoughts and impressions regarding the research process, overall. Lastly, the researcher has modified the DAST (Chambers, 1983) based on suggestions from researchers to increase the validity of the instrument.

Dependability

Dependability, in qualitative research, refers to the stability and consistency of the research process. Miles and colleagues (2014) refer to this as "auditability" of the research process (Miles et al, 2014, p. 312). As such, strategies employed consisted of developing operational procedures and protocols, while maintaining analytic memos (Yin, 2014). Additionally, the researcher described her role and the study's conceptual framework as an illustration of its connection to theory (Miles et al., 2014).

Confirmability

The strategies employed to address the "auditability" of the research process (Miles et al, 2014, p. 312), also extend to address confirmability. Confirmability refers to the minimizing, or at least addressing, of researcher's biases. Therefore, strategies to address confirmability include describing subjective states, such as beliefs and assumptions as it relates to the study. The researcher's beliefs and assumptions were documented within a positionality statement; and, the subjective states were collected through the use of field notes and a reflection journal. Second, the researcher provided descriptions of methods, procedures, data analysis and interpretation (Miles et al., 2014). Third, the researcher used random purposeful selection to select participants.

Transferability

The concept of transferability in qualitative research refers to the generalizability of findings to similar groups and contexts. Generalizability is sometimes referred to as internal generalizability and external generalizability (Maxwell, 2005; Onwuegbuzie & Johnson, 2006) in research studies. The distinctions between each are important in understanding the purpose of this current study's research design.

External generalizability refers to the extent to which research findings apply to populations and contexts beyond those of the study. For example, a researcher using quantitative methods may implement random sampling strategies that increase the probability of sampling individuals similar to those of the larger population. However, a researcher operating from a constructive framework would prioritize internal generalizability, or the generalizing of findings to the sample of interest. Therefore, the researcher used a random sampling strategy that is purposeful in order to enhance generalizability to the research sample - not to make external generalizations to a population (Patton, 2015). Another example includes the use of descriptive statistics during the data analysis stages of this study. The use of descriptive statistics enabled the researcher to make within-group inferences (e.g., inferences to the research sample; Onwuegbuzie et al., 2009) as opposed to statistical generalizations to a population.

As such, the researcher of this study employed strategies addressing transferability. The purposeful sample was drawn randomly; and was described (Miles et al., 2014). Relatedly, the researcher will provided descriptions of accounts and contexts, so that others may consider the appropriateness of transferability to similar contexts (Miles et al., 2014).

The Researcher

Currently, the researcher is a Doctoral Candidate pursing a degree in Education at the University of Central Florida. Prior to these doctoral studies, the researcher worked as Professional School Counselor in middle and elementary schools within the Central Florida area. In this role, the researcher provided personal/social, academic, and career services to students of varying ability, socioeconomic status, language, and ethnicity backgrounds. In addition, the researcher provided career services to young adults at postsecondary institutions. Therefore, the researcher has professional, practical, and even personal experiences that inform this study.

Chapter Summary

Contained within this chapter, is a description of the current study's methodology. A qualitative case study design, which included qualitative data (primary) and quantitative data (secondary) components, was used to explore the science occupational images, occupational and educational aspirations of African American/Black elementary students. Three data collection methods were employed, which included subject-produced drawings (i.e., a modified DAST based on Chambers, 1983), completion of a questionnaire (i.e., Occupational Status Dependent Measure; Liben et al., 2001), and semi-structured interviews. Techniques conducive to qualitative and quantitative analysis were employed, although; the use of descriptive statistics reflect internal, within-sample generalizations (as opposed to external generalizations to the population). Lastly, ethical considerations were discussed; and strategies for issues of trustworthiness were addressed.

CHAPTER FOUR

The purpose of this qualitative case study was to explore the science occupational images, occupational and educational aspirations of African American/ Black elementary school students. An understanding of these constructs will assist educational professionals in addressing the nation's concern regarding the underrepresentation of African American/Black individuals in science careers. To better understand the phenomena, the study addressed four research questions:

1. What do African American/Black 4^{th} and 5^{th} grade students know of science occupations?
2. How do African American/ Black 4^{th} and 5^{th} grade students perceive science occupations and incumbents?
3. To what extent, do the aspirations of African American/Black 4^{th} and 5^{th} grade students align with the pursuit of science occupational paths?
4. What differences exist, if any, between female and male African American/Blac^{k} 4th an^{d} 5th grade students in regard to science occupational knowledge, perceptions, and aspirations?

Findings from the current study are presented in this chapter. First, the participant demographics and school context are discussed. Second, findings from each research question are addressed. Lastly, the chapter concludes with a summary of the findings.

School Context

Oak Lake Charter School was assigned a pseudonym to maintain confidentiality and will be referred to as such throughout this chapter. Oak Lake Charter School is a Title I, public charter school located in Florida. Eighty-five percent of the total student population receive free or reduced lunch. At the time of data collection, Oak Lake Charter School had an enrollment of 348 students, which ranged from kindergarten to seventh grade. The majority of the students were African American/Black (*n*=319, 92%), followed by White Hispanic (7%) and multiracial students (1%). The student population had a fairly even distribution of females (*n*=178) and males (*n*=173). Additionally, approximately 9% of the student population is classified as English Language Learners (ELL), and 4% as gifted. Lastly, most of the students live in the surrounding communities, and either walk or commute as the school does not have buses for transportation.

Oak Lake Charter School is described as K-8 school with a STEM focus, and began operating during the 2014-2015 school year. The school is organized across two campuses – one campus housing grades K-4 and the other campus housing grades 5-7. At the time of data collection, there were no students enrolled in the eighth grade. Each campus appears to display a unique culture, with the STEM focus mainly exhibited on the K-4 campus and college paraphernalia displayed on the 5-8 campus. Additionally, the K-4 campus exhibits a culture reminiscent of a previous charter school ran by the Oak Lake Charter administration, as some of the employees from the previous charter school are now employees at Oak Lake.

In terms of the school's STEM focus, all students, living in the current district, are accepted regardless of STEM interest pending available accommodations. The school is in the process of further integrating STEM throughout their culture, as courses such as a STEM-based class is only available to lower grade levels (K-4). This course is offered once or twice a week depending on the special area routine consisting of art and PE. In addition, the school hosted science and/STEM activities to promote their STEM focus, although participation in such activities were described as limited. Such activities include the end-of-the-year science fair in which students were asked to showcase science projects. During Spirit Day, students were asked to make a dollar donation to “dress like a scientist”. Also, the school hosts a STEM club, consisting of approximately 20 students, which meets once a month. Topics of the STEM club consisted of scientific discussions surrounding candy and how to make ice cream. Notably, any of these activities, especially the ‘dress like a scientist’ could have impacted the perceptions of science occupations and incumbents.

In terms of technology, there are a number of resources available to the student population. A computer/laptop is available for nearly every student at the school; although, typing classes are not offered. There are resources available to infuse STEM into the curriculum (e.g., digital components of science textbook), but the school is still in the process of using these resources as they solidify their STEM focus. Additionally, there was a coding class offered during the previous school year but was not offered during the 2017-2018 school year. In the past, the school has not hosted a career event focused on science and/or STEM. Therefore, overall, the STEM focus at Oak Lake Charter is described as limited as the school administration continues to infuse STEM-based courses, activities, and services schoolwide.

The school does not have a school counselor, but has a social emotional specialist, who is responsible for the student culture. For example, students are asked to sit in reflective corners in lieu of discipline in certain instances; and, the school is described as a “community of kindness”. Other staff members have impacted the student culture by referring to each student as a scholar, which reflects that each student is responsibility for her/his learning, self-directed behavior, and excellence. These ideals including those of confidence and uniqueness and are highlighted in their morning pledge entitled, “I Am Somebody”.

Participants

The current study explored the science occupational images, occupational and educational aspirations of African American/Black at Oak Lake Charter School. African American/Black fourth (*n*=40) and fifth (*n*=40) grade students were invited to participant in the study. Seventeen students (approximately 20% response rate) returned parent consent and assent forms. From these 17 students, a sample of ten 4^{th} and 5^{th} grade student participants were randomly selected through the use of a random number generator. An even number of females (*n*=5) and males (*n*=5) were chosen in order to make cross-case comparisons. The participants’ grade, sex, and age are described in Table 1. The pseudonyms were assigned by the researcher to protect the participants’ confidentiality, and will be used throughout this chapter. Demographic information was self-reported during data collection.

Table 1 *Participant Demographics*

Pseudonym	Grade	Sex	Age
Mary	4	Female	11
Kevin	4	Male	10
Rose	4	Female	10
Eric	4	Male	9
Suzanne	4	Female	10
Jerome	5	Male	10
Chris	5	Male	10
Tracy	5	Female	10
Sarah	5	Female	11
William	5	Male	11

Research Question One

Data collected from the modified DAST (Chambers, 1983) and semi-structured interviews (i.e., Interview II and III) were used to explore what is known of the work-related tasks and preparation requirements of scientists. The work-related tasks and preparation requirements of scientists were compared to summaries provided by the Bureau of Labor Statistics (2010).

Overall, participants understood the core task of scientists, that is, that they engage in research. Although, half of the participants struggled to describe what an individual needed to learn or know in order to be a scientist. Additionally, only half of the participants thought that individuals needed to attend college in order to be a scientist.

Work Tasks

An overwhelmingly majority of the participants described tasks that were related to conducting research. For example, participants described tasks involving the manipulation of, or mixing of, “potions” in the hopes of assisting humanity:

> “They mix things and they get messy.
>
> It can, as I said before, it can make a mess. It can take a mess to create something that can save your whole world.”
>
> -Eric

In other instances, the scientists’ work tasks involved conducting investigations, observations, and discovery. A few of the participants described these tasks as it relates to animals and aquatic life:

> “If, well..’ They've like study some different kinds of stuff. Like on animals, or like sea life, or the trash that goes into the sea, with animals ... and they might talk about land, or land animals, or sea animals, or new animals that ’hey didn't discover yet.”
>
> -Rose
>
> “They look through their microscope on little things like sometimes they look in to see how much bacteria is in something.

They explore nature. Go look at different plants and animals out in the forest."

-Jerome

As suggested, many of the examples of research provided by the participants reflected scholarly activities of physical and life scientists.

Preparation Requirements

Half of the participants stated that they were unsure of what an individual needed to know in order to be a scientist. Other participants mentioned elements of science such as having knowledge of various animals, the periodic table, and how to conduct experiments. Additionally, participants mentioned the connection of reading and math to the job of being a scientist. For example:

> "They would need to know their math and their reading because being a scientist involves around numbers and reading different kinds of things."
>
> -Suzanne

When asked what an individual can do "at school that might help prepare them to be a scientist?", half of the participants mentioned various aspects of study skills, such as focusing in class, taking notes, and listening. Some participants emphasized exploration and conducting experiments, whereas others mentioned having exposure to scientists and their work as helpful:

> "…try to visit scientist and get little notes and observe what they do and how they do it."
>
> -Mary

Half of the participants stated that college is needed to be a scientist. Some participants viewed going to college as a pathway to learning concepts important to the occupation of being a scientist; and expressed that there were specialty schools and/or colleges for science.

> "And the science school teach them about chemicals, diseases, how to mix chemicals, and stuff. How to do little experiments…"
>
> -Mary

Most of the participants viewed learning and/or understanding science concepts as a determiner in whether an individual needed to go to college to become a scientist. This was highlighted as a reason whether participants expressed that college was needed or not. One participant expressed this sentiment in the following statement, as this participant determined that only some individuals needed to go to college in order to be a scientist:

> "Some people might not get the concept of it, but others might from high school, but some might not have taken a class on science but they want to be a scientist. But others might have took a class on science and they get it and they know what to do."
>
> -Rose

While a few mentioned the necessity of attending college in preparation to be a scientist, some of the participants lacked deeper knowledge of why college was necessary (e.g., labor demands). One participant compared a scientist to a musician in an anecdote of whether college is necessary in becoming a scientist. While the anecdote may be inspiring to some, the knowledge displayed doesn’t reflect the common labor demands of scientists:

> “This man, he did not get to go to college, and he wanted to be a musician. He did not have a lot of money. He started to work, played music at shows. He started doing music at five and people started hearing him and wanting him to come to a lot of concerts. He became famous without going to college’ So that's why I think that you don't have to go to college to become a scientist.”
>
> - Suzanne

As suggested, participants lacked some knowledge regarding the preparation requirements of scientists. Particularly, participants were unsure of what individuals needed to know to become a scientist; and underestimated the importance of attending college.

Research Question Two

Data collected from the DAST (Chambers, 1983), semi-structured interviews (i.e., Interview II and III), and Occupational Status Dependent Measure (Liben et al., 2001) were used to explore the perceptions regarding scientists. First, the DAST (Chambers, 1983) and written responses were analyzed to understand the perceptions of scientists as it relates to type of scientist, gender, and appearance. The type of scientist was determined by the work-related tasks suggested by indicators from the DAST, and descriptions provided during Interview II. These were coded using the Standard Occupational Classification (SOC) system (SOC Policy Committee, 2012). Next, the Interviews II and III were coded to understand general perceptions of scientists. Lastly, the semi-structured interviews were coded, and lastly, responses from the Occupational Status Dependent Measure (Liben et al., 2001) were analyzed in SPSS to determine the occupational status of scientists (i.e., difficulty of learning to be a scientist, difficulty to do the job of a scientist, money, and importance). The composite scores from the Occupational Status Dependent Measure (Liben et al., 2001) were transformed to qualitative categories of low, medium, and high.

Overall, the most common types of scientists drawn by participants were life and physical scientists. Most of the scientists were male and seemed happy while working. The most common work environment was indoors, most notably within a laboratory. Additionally, the participants perceived the job of a scientist as dangerous, albeit, with high occupational status.

Type of Scientists

Half of the participants drew life scientists, and 50% of the participants drew physical scientists on the DAST. The two most common types of life scientists referenced were food scientists (*n*=2) and medical scientists (*n*=2). Additionally, one participant referenced a plant scientist. The most common type of physical scientist referenced was a chemist (*n*=4), and one participant referenced a physicist. Typically, the chemists were conducting an experiment with various “potions” and liquids.

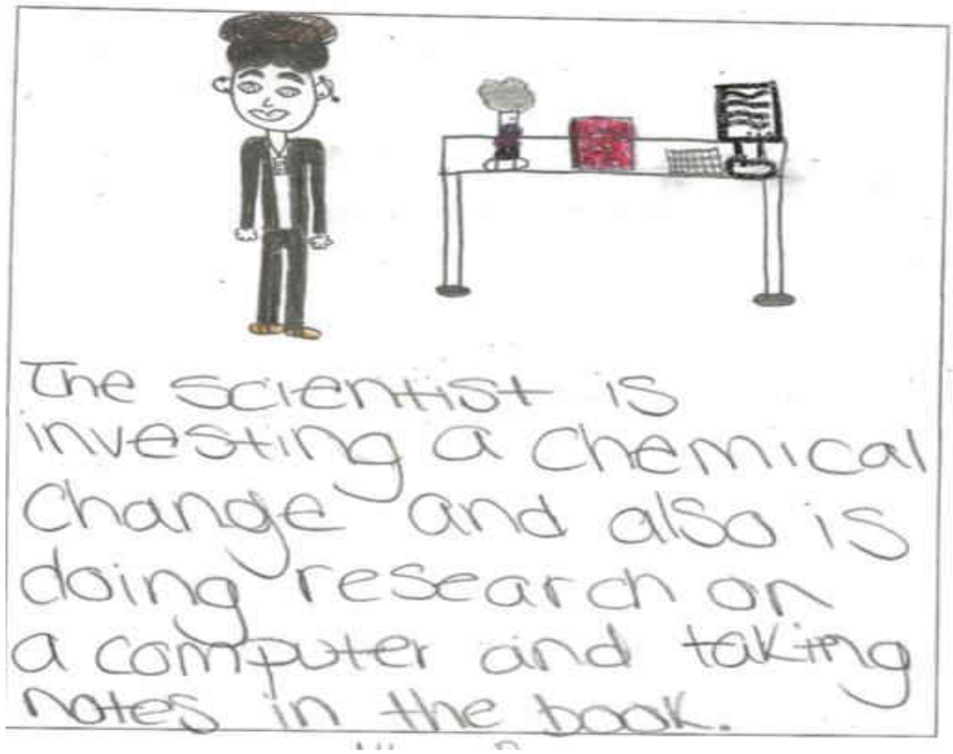


Figure 1: Sarah’s drawing of a scientist

Gender

When asked to draw a scientist at work, most of the participants (*n*=6) drew male figures as indicated by the names chosen for each scientist and the pronoun used to describe the drawings. Additionally, a couple of participants included the title of “Mr.” before the figure’s given name; while, other participants chose common male names, such as “Steve” or “Jack”. Lastly, some of the figures had distinguishing hairstyles common to either gender (e.g., longer hair for female)

Race

Most of the participants (*n*=7) drew scientists who were Black. The remainder were interpreted as White (*n*=3). Some of the drawings were self-portraits, as the participants described themselves as scientists in the future.

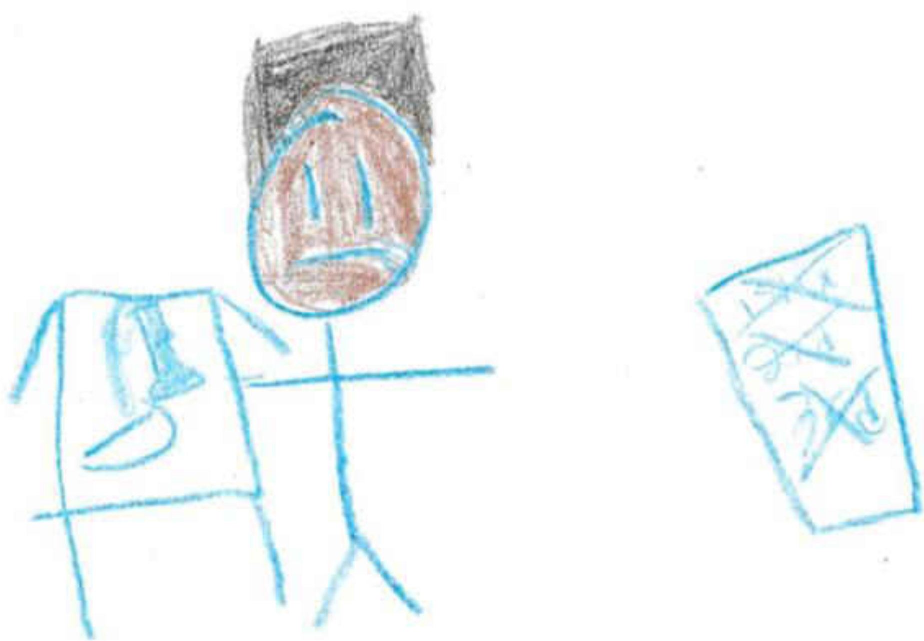


Figure 2: Eric's drawing of a scientist

Workplace

Most of the participants (*n*=6) chose to draw a scientist working indoors, although half expressed in the interviews that scientists can work indoors and outdoors. When asked to describe the workplace of a scientist working indoors, the laboratory was the most common workplace environment described by participants (*n*=8). Additionally, a beaker was the most common symbol of research drawn by participants (*n*=8).

> "In inside I would describe it like a big room full of technology and all kinds of beakers, but more stuff in it, and different chemicals, and a lot of unknown species. That's what I think would be in there."
>
> -Mary

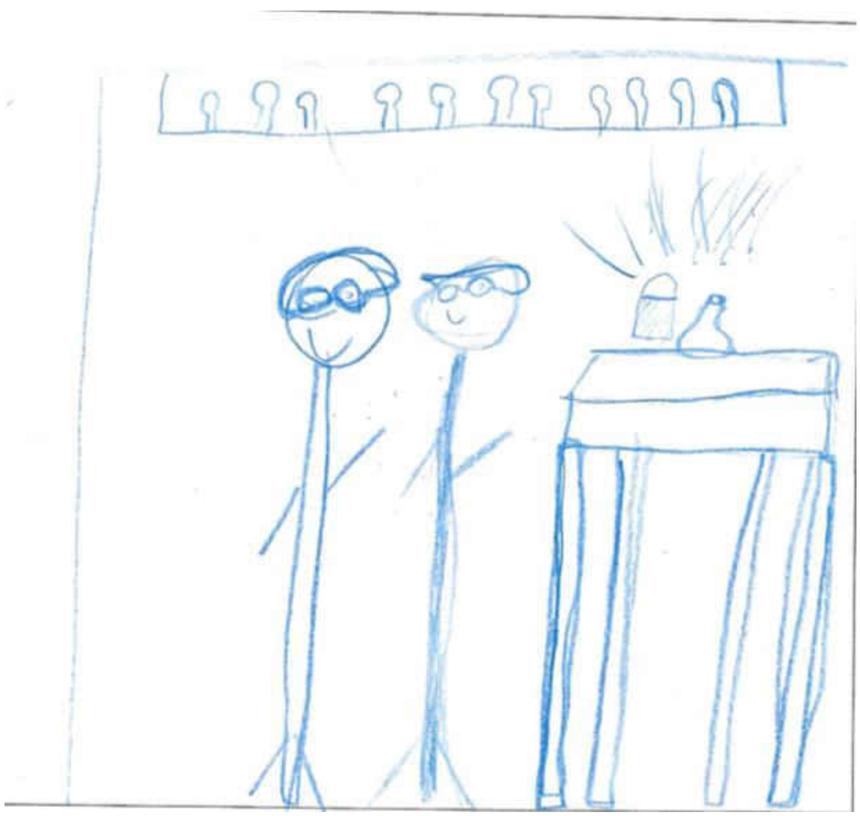


Figure 3: William's drawing of a scientist

Appearance

The most common feature among the scientists were their smiling faces, as 70% of the research participants drew a smile. The majority of the drawings were absent of common perceptions found in literature, such as scientists wearing lab coats, eyeglasses, and facial hair. Only one participant drew a scientist with a lab coat, and none of the scientists were drawn with facial hair.

Indications of Danger

Although most of the scientists were drawn with smiles, most of the participants (*n*=7) described the job of a scientist as dangerous. The job of a scientist was described as one involving “explosions”, “dangerous chemicals”, and “diseases” that pose health risks. Others described volcanos and threatening animals as a danger to scientists.

> “…they experience harmful stuff that they can get- like it was like a dangerous- like Ebola? They exposed to that, they could die, ’s what I'm saying, and they use a lot of dangerous chemicals that could- they got families. They have a lot of dangerous chemicals that could harm them or others.”
>
> - Mary
>
> “Because scientists they have all these mixtures and formulas they have to keep up. They have to be careful not to mix up the same things or it will explode and get everywhere and then they will have to clean it up. But it might catch on fire or something and it's not safe.”
>
> -Rose

Occupation Status

The majority of participants viewed scientists as having high occupational status (see Table 2), with money and importance displaying the most agreement among participants. For example, participants perceived that scientists are well compensated for their work, because scientists are viewed as contributing to the wellbeing of individuals, animals and the world at large. The perceptions of what is “a lot of money” or compensation for scientists ranged anywhere from $30,000 to over a billion, with a million dollars representing the mode salary.

> “Oh yes, it does. If you're doing something that's contributing to the world, helping the world find a cure, that means you getting paid a lot of money to find the cure to help millions of people around the world.”
>
> -Chris

In terms of importance, participants perceived the job of a scientist as important due to contributions to society. Participants spoke of the knowledge that scientists possess and share with others. This knowledge is related to cures for diseases, inventing everyday technology, and preventing natural disasters.

> “It just important, because scientists are the people that come up with different things to help the world, and that could probably potentially save our world from global warning and other disasters that might occur in the future. They'll already have a plan in order for when something like that happens, and there'll just be like a back up plan, they already know what to do. Scientists are basically kind of like a savior. Not like a savior, savior, but like somebody that saves you.”
>
> -Chris

Table 2 *Occupational Status of Scientists*

Participant	Gender	Grade	Composite Score	Status Level
Rose	Female	4	4.25	High
Mary	Female	4	4.50	High
Suzanne	Female	4	4.00	High
Tracy	Female	5	3.50	Medium
Sarah	Female	5	5.00	High
Eric	Male	4	4.25	High
Kevin	Male	4	4.25	High
Jerome	Male	5	3.75	Medium
Chris	Male	5	4.00	High
William	Male	5	4.75	High

Research Question Three

Data collected from Interview I was used to explore the participants' occupational and educational aspirations. First, the free-response occupational aspirations were coded using the Standard Occupational Classification (SOC; Standard Occupational Classification Policy Committe, 2009). The free-response occupational aspirations were coded as science (see Appendix A), engineering (see Appendix B), science and engineering-related (see Appendix C), and non-science and engineering occupations. Next, the presence of fixed-response science aspirations were noted, as well as, the presence of fixed-response college educational aspirations.

Overall, none of the participants expressed occupational aspirations in science when asked for her/his free-response occupational aspiration, and only half the participants expressed science occupational aspirations when asked directly if she/he would like to be a scientist (see Table 3). When asked, "What do you want to be when you grow up?", the majority of the participants (*n*=7) held idealistic occupational aspirations in non-S&E occupations, 20% (*n*=2) were in S&E-related occupations, and 10% (*n*=1) was in Engineering. Non-S&E occupations include football player, clothing/shoe designer, teacher, police officer, governor, and ballerina. The S&E-related occupation of pediatrician was expressed by two participants. Additional occupational aspirations expressed during the focus group included lawyer and athlete.

When asked, "What do you think you really will be when you grow up?", half of the participants held realistic occupational aspirations in non-S&E occupations, 30% (*n*=3) held S&E-related occupational aspirations, and 20% (*n*=2) were unsure/maybe. Seventy percent (*n*=7) of the participants expressed realistic occupational aspirations that differed from her/his idealistic occupational aspirations. The differences in the occupational aspirations could mean that given certain constraints, the participants did not believe that her/his idealistic occupational aspirations were attainable. Lastly, half of the participants (*n*=5) expressed that they would consider being a scientist when asked directly, while 40% (*n*=4) would not consider being a scientist, and 10% (*n*=1) was unsure/expressed maybe.

Table 3 *Occupational Aspirations*

Participant	Grade	Sex	Occupational Aspiration (Idealistic)	Classification	Occupational Aspiration (Realistic)	Classification	Occupational Aspiration - Scientist
Mary	4	Female	Teacher	Non-S&E	Lawyer Judge	Non-S&E	Absent
Rose	4	Female	Police Officer	Non-S&E	Doctor	S&E-related	Maybe
Suzanne	4	Female	Clothing Designer Ballerina	Non-S&E	Unsure	N/A	Present
Tracy	5	Female	Pediatrician	S&E-related	Pediatrician	S&E-related	Absent
Sarah	5	Female	Pediatrician	S&E-related	Model	Non-S&E	Present
Eric	4	Male	Engineer	Engineering	Track Star	Non-S&E	Present
Kevin	4	Male	Football Player	Non-S&E	Football Player	Non-S&E	Present
Jerome	5	Male	Football Player Shoe Designer	Non-S&E	Shoe Designer	Non-S&E	Absent
Chris	5	Male	Governor	Non-S&E	Architect	S&E-related	Absent
William	5	Male	Football Player	Non-S&E	Unsure	N/A	Present

In general, an overwhelmingly majority of the participants expressed college educational aspirations (see Table 4). The participants were asked, “Do you want to go to college?”. Ninety percent (*n*=9) of the participants expressed idealistic college aspirations whereas 10% (*n*=1) was unsure/expressed maybe. When asked, “Do you think you really will go to college?”, 90% (*n*=9) of the participants expressed realistic college aspirations, and 10% (*n*=1) was unsure/expressed maybe. There were no differences between the idealistic and realistic college educational aspirations, which would indicate that the participants believed that they will attend college given constraints.

Table 4 *Educational Aspirations*

Participant	Grade	Sex	Educational Aspiration – College (Idealistic)	Educational Aspiration- College (Realistic)
Mary	4	Female	Present	Present
Rose	4	Female	Present	Present
Suzanne	4	Female	Present	Present
Tracy	5	Female	Present	Present
Sarah	5	Female	Present	Present
Kevin	4	Male	Present	Present
Eric	4	Male	Maybe	I don't know
Jerome	5	Male	Present	Present
Chris	5	Male	Present	Present
William	5	Male	Present	Present

Research Question Four

Overall, the differences between females and males were minor in terms of occupational knowledge, some perceptions of scientists (e.g., work environment, occupational status), and college educational aspirations. However, there were a couple areas in which the differences were notable, particularly in reference to the gender of scientists drawn and occupational aspirations.

Occupational Knowledge

In general, females demonstrated slightly less occupational knowledge regarding scientists in comparison to their male peers. For example, females (*n*=3) were unsure of what an individual needed to know in order to be a scientist, and did not attempt to provide a response or a personal hypothesis. Additionally, females (*n*=3) were more likely to provide an inaccurate estimation regarding the importance of a college degree for the pursuit of a scientist career.

In terms of what a person needs to do in school to become a scientist, the responses between females and males differed somewhat. Females emphasized study skills and exposure to scientists, whereas males emphasized activities of experimentation and exploration (in addition to study skills). Overall, there were some differences between females and males regarding occupational knowledge of scientists.

Perceptions of Scientists

Generally, the most noticeable difference between females and males regarding perceptions of scientists was the representation of female and male scientist figures drawn. All of the male participants drew male scientists on the DAST. However, female participants (*n*=4) mostly drew female scientists. Additionally, whereas females (*n*=4) drew scientists who were identified as Black, males drew scientists who were identified as Black with slightly less frequency (*n*=3). Additionally, females (*n*=4) were slightly more likely to draw a scientist with a noticeable smile in comparison to males (*n*=3).

There were minimal differences in the type of scientist drawn. Females (*n*=3) mostly drew life scientists, such as medical and food scientists. Males (*n*=3) were slightly more likely to draw physical scientists, such as chemists.

In terms of the participants' perception of the scientist's work environment, females (*n*=4) drew scientists working indoors in a laboratory. Additionally, the presence of a beaker was the most common symbol of research within the drawings of female participants (*n*=5). Alternatively, males (*n*=3) mostly drew scientists working outdoors. The most common symbol of research among the drawings by the male participants was the beaker (*n*=3); although, the beaker was drawn with less frequency. Males (*n*=4) were slightly more likely than their female peers (*n*=3) to express indications of danger while doing the job of a scientist

Lastly, there were not any differences between females and males in terms of occupational status. They equally perceive scientist occupations to be of high occupational status as measured by the Occupational Status Dependent Measure. Overall, there were some differences between females and males regarding perceptions of scientists with the most notable differences related to the scientists' gender.

Aspirations

Overall, none of the participants expressed occupational aspirations in science when asked for her/his free-response occupational aspiration. Males (*n*=4) were slightly more likely than the females (*n*=3) to express non-S&E idealistic occupational aspirations, while females (*n*=2) were more likely to express S&E-related idealistic occupational aspirations. These findings were similar for realistic occupational aspirations. Additionally, females (*n*=4) were slightly more likely than males (*n*=3) to have expressed realistic occupational aspirations that differed from her idealistic occupational aspirations. This would indicate that given constraints the female participants may not believe that their idealistic occupational aspirations are attainable.

In general, males (*n*=4) were more likely to express aspirations related to being an athlete/football player. Additionally, when the participants were asked directly, “Would you like to be a scientist when you grow up?”, males (*n*=3) were slightly more likely to express science occupational aspirations than females (*n*=2).

In terms of college educational aspirations, each female (*n*=5) expressed idealistic college educational aspirations, while most of the male participants (*n*=4) expressed certainty of attending college. These results were similar for realistic college educational aspirations. This would suggest that most participants, females and males, believe that they would attend college given constraints; although, females were slightly more likely than males to express these aspirations. Overall, there were some differences between females and males regarding occupational and college educational aspirations. The most notable was the likelihood of males expressing non-S&E occupational aspirations of a professional athlete.

Summary of Findings

Overall, the participants displayed an understanding of work tasks performed by a scientist, which included examples of conducting investigations and research. However, the participants lacked some occupational knowledge in terms of preparation requirements to pursue the pathway of becoming a scientist. For example, some participants were unsure of what an individual needs to know or whether an individual would need to attend college to become a scientist.

In terms of perceptions of scientists, the participants expressed a somewhat limited view. For example, scientists were described as mostly male, worked in a lab, dangerous, and performed tasks related to the work of life and physical scientists. A notable characteristic of the scientists described reflected race (i.e., Black). Lastly, participants described scientists and the work of scientist as high status (i.e., high pay, important, difficult to learn and do).

Regarding aspirations, none of the participants expressed idealistic or realistic aspirations to become a scientist when asked as a free-response. Yet, at least half of the participants stated they would consider becoming a scientist when asked as a fixed-response. Additionally, mostly all of the participants expressed idealistic and realistic aspirations to attend college.

Finally, there were a couple of notable differences among female and male participants. These differences included the gender of scientists drawn and expressed occupational aspirations. For example, females displayed the tendency to draw female scientists. Although none of the participants expressed free-response science aspirations, males displayed the tendency to express aspirations of becoming an athlete.

In general, the findings from the current study were described within this chapter. The findings for each of the research questions were a culmination of various child-centered data collection methods, such as drawings (e.g., DAST), semi-structured interviews, and a brief questionnaire. The following chapter contains a discussion of these findings, which includes suggested implications of the study.

CHAPTER FIVE

The purpose of this qualitative case study was to explore the science occupational images, occupational and educational aspirations of African American/ Black elementary school students. An understanding of these constructs will assist educational professionals in addressing the nation's concern regarding the underrepresentation of African American/Black individuals in science careers.

Job estimates for S&E occupations suggest considerable growth within the United States. The National Science Board (2014, 2016) estimates that S&E occupations, which has increased at a faster rate than non-S&E occupations, will increase to 6.8 million in 2022. Yet, science occupations have remained vacant due to shortages in the workforce (Xue & Larson, 2015), reflecting the need for individuals with specialized skillsets and at least a postsecondary degree (Rothwell, 2014).

The concern surrounding shortages in the S&E workforce have led to efforts to increase the participation of underrepresented of minorities within science (President's Council of Advisors on Science and Technology, 2012), as Caucasian American/Whites comprise over 70% of the S&E workforce (National Science Board, 2016). Increasing the participation of minorities, such as African American/Blacks, will lead to a globally competitive economy (Ashcraft & Blithe, 2010; Babco, 2004; Page, 2008) and increased innovation (Babco, 2004). To address this concern, researchers and educators should consider the low attraction of science occupations among African American/Black students (Committee on STEM Education & National Science and Technology Council, 2013; President's Council of Advisors on Science and Technology, 2012).

Therefore, to better understand the phenomena, the study addressed four research questions:

1. What do African American/Black 4th and 5th grade students know of science occupations?
2. How do African American/ Black 4th and 5th grade students perceive science occupations and incumbents?
3. To what extent, do the aspirations of African American/Black 4th and 5th grade students align with the pursuit of science occupational paths?
4. What differences exist, if any, between female and male African America$^{n/}$Black ^{4t}h and 5th grade students in regard to science occupational knowledge, perceptions, and aspirations?

This final chapter discusses the findings and implications of those findings. Beginning with a description of limitations (which contextualize the results), the findings will be presented and organized by the research questions. The findings are followed by implications of the study, both for practice as well as for future research. Lastly the chapter concludes with a summary.

Limitations

The current study has implications for understanding scientist occupational images, occupational and educational aspirations of fourth and fifth grade African American/Black students. However, as with most research studies, regardless of attempts to minimize limitations, limitations still exist. The limitations for the current study included (a) the sampling strategy, (b) low response rate, (c) aspects of the school's context, (d) access to research participants and staff, and (e) modified/adapted instruments.

A qualitative case study design was used for the current study, with the purpose of mixing data to provide a greater understanding of the constructs of interest. Accordingly, the quantitative data presented in the current study do not compensate for the limitations of using approaches common in qualitative studies, such as purposive sampling. The current study consisted of a small, purposive sample of students (N=10) from a local elementary school. Given the qualitative nature of the study, the sampling strategy is appropriate, yet it limits the generalizability of findings to a larger population.

Second, the current study experienced a low response rate from participants. The recruitment sample consisted of approximately 80 students across the fourth and fifth grades. However, only 17 students (21%) agreed to participate based on the submission of parental consent and child assent forms. The recruitment process spanned a week, but initially was planned for two to three weeks. However, the school was involved statewide testing, that limited the amount of time for recruitment and data collection. For example, some students requested to submit their forms well into the data collection period. Therefore, these students were not included in the sample for random selection. Additionally, there may have been a difference between the students, who agreed to participate, and those students, who either did not submit their forms in a timely manner and those who did not choose to participate. This is especially the case given the school's description of having a STEM focus.

Third, the current research study is bounded within the context of a public charter elementary school with a focus on STEM. In Florida, any child may attend a public charter school within her/his assigned school district. However, charter schools have the autonomy to select students for enrollment based on several factors, which differs from the general enrollment of public schools (Florida Department of Education, 2017). Additionally, Oak Lake Charter is positioned as a school with a STEM focus. Although the school is still progressing towards this focus, Oak Lake Charter hosts a STEM club, and provides a STEM class to the K-4 students. This increased exposure to science concepts, science professionals, and discussions related to science occupations may have possible priming effects. As such, the findings from the current study have limited transferability based on the unique school attributes and student population; thus, the school context descriptions should be considered when determining the transferability of the findings.

The fourth limitation is inherent to any study conducted within a school context: the limited access to students and staff. The researcher was intentional as to when and how the research activities were conducted to minimize the impact on the students' academics. For example, the researcher was careful as to not conduct data collection activities during testing, whether it was classroom testing or school-wide. Additionally, the researcher refrained from collecting data during subjects that were regularly assessed state-wide, such as reading, math, and science. In doing so, this limited access to research participants (e.g., classroom observations were not conducted) and staff, thereby limiting the amount and depth of data collected. The limited access has likely impacted the descriptions of the school's context.

Lastly, the researcher used instruments, which were modified and adapted for the current study. The DAST (Chambers, 1983) and the Occupational Status Dependent Measure (Liben et al., 2001) were modified and adapted, respectively, due to the lack of science-related instrumentation available for scholarly research. Modifications to the DAST included (a) revised instructions, (b) a request for written descriptions of the scientist, and (c) the inclusion of questions, which assisted in interpretation of the images (Blerk, 2006; Groundwater-Smith et al., 2015; Walls, 2012). Additionally, the Occupational Status Dependent Measure was adapted for use in the current study. The original questionnaire's use by Liben and colleagues (2001) referenced various occupations, including scientist. Although these modifications were made based on usage in literature, the previously established validity and reliability may have been altered.

Discussion

The findings were presented in the previous chapter. However, the current section includes a discussion of those finding, which is organized by research question. The findings are reviewed, conceptualized according to Gottfredson's (1981, 2005) Theory of Circumscription and Compromise, and compared to extant literature when available. Additionally, implications for practice and future research are discussed.

Research Question One

This study explored the science occupational knowledge of African American/Black fourth and fifth grade students. In order to successfully pursue occupations, especially those in science, students must have accurate occupational knowledge. A lack of occupational knowledge may lead to an erroneous assumption regarding the requirements for any given occupation, thus leading to an incongruence between an aspiration and steps taken to prepare for such a career. Additionally, an individual may prematurely eliminate a viable occupational alternative, through the process of circumscription, due to inaccurate occupational knowledge (Gottfredson, 1981). Although as the participants age, their capability to understand the complexities of occupations may increase (Gottfredson, 2005), but the process of circumscription is suggested to be enduring (Gottfredson, 1981) unless effective interventions are implemented.

Within this study, the participants were prompted to draw a scientist, and were asked about the work tasks and preparation requirements of scientists. Mostly all of the participants demonstrated an understanding of what it meant to perform the job of a scientist, such as conducting research or investigations with some leading to discovery, for example. Similarly, experimentation was a common task, that scientists were described as performing in previous studies, such as one conducted by Walls (2011). The sample of African American/Black third grade students described scientists work tasks in terms of inventing, discovering, and experimenting.

The previous finding from the current study would suggest that participants may make accurate judgements of science occupations based on work tasks. Although the participants demonstrated some understanding of the core work tasks of scientists, the participants lacked some occupational knowledge as it related to preparation requirements of scientists. Half of the participants mentioned that they were unsure of what an individual needed to know in order be a scientist. These results are related to those suggested by the findings presented by Walls (2000). The accuracy of occupational knowledge was examined among mostly Caucasian American/White elementary, middle, and high school students. Although scientist occupational ratings were not presented in the study, the participants rated the science-related occupation of computer programmer. The author suggested that the third and sixth grade students demonstrated inaccurate judgements of the science-related occupation. These inaccurate judgements spanned each dimension including preparation requirements. For those who mentioned a science aspiration, this lack of knowledge may create barriers to attainment. For example, a participant, who decides to pursue a scientist occupational pathway in high school, may underestimate the importance of math courses to their science pursuits.

In addition to the expressed uncertainty of what an individual needed to know, only half of the participants stated that college was needed to be a scientist. As previously stated, this lack of knowledge could create barriers to attainment if an individual later decides to pursue science occupations. The importance of a college degree and/or specialized skillset is paramount in gaining access to science occupational vacancies.

However, this lack of occupational knowledge has been suggested by other researchers. For example, Phipps' (1995) seminal study examined the occupational knowledge of elementary school students (i.e., 8-11 years of age, 51% African American/Black). The participants were asked to demonstrate their knowledge of preparation requirements for their expressed aspiration. Similar to the participants of the current study, the elementary school students lacked some occupational knowledge related to what an individual would need to do in order to pursue her/his expressed aspiration. According to Phipps, the participants lacked the in-depth understanding of college enrollment to the pursuit of their occupational goals.

Lastly, a few participants of the current study understand the importance of attending college in order to be a scientist. However, some participants lacked deeper knowledge of the current labor demands for college educated scientists. Thus, those participants, who seem to lack occupational knowledge, may underestimate the need for a college degree if and when she/he decides to pursue a science occupational pathway. In doing so, the participants may lack the necessary academic courses for college enrollment. Nonetheless, the finding regarding the underestimation for a college degree was not suggested by Blackhurst and colleagues (2003) in a related study. The researchers examined the occupational knowledge of mostly Caucasian American/White elementary students. The fifth-grade participants seemed to make the connection between attending college and occupational attainment, for many of the participants mentioned the goal of pursuing a job as the need for a college degree. Notably, the participants in this related study appeared to overestimate the need for a college degree.

Research Question Two

In conceptualizing occupational images, the perceptions of occupations and incumbents are just as essential as the knowledge one possesses. The perceptions of scientist occupations and those individuals, who work as scientists, were explored within this study. Inaccurate and/or limited perceptions of an occupation (or incumbents) may influence an individual to forgo the occupation as an acceptable alternative (i.e., circumscription), as children and adolescents may deem the occupation incompatible with images of themselves (Gottfredson, 1981). This circumscription could even be the byproduct of participants perceiving the scientist occupation as being too difficult (Gottfredson, 1981, 2005; i.e., an aspect of occupational status); as, the participants may be experiencing stage three of the circumscription process.

The participants of this current study were asked to draw scientists, and later were interviewed. In terms of the type of scientists referenced, life and physical scientists were the most common types. A depiction of a chemist was the most common of physical scientists presented by participants. The image of scientist, working as a chemist, is prevalent throughout various studies (Finson, 2002; Mead & Me'traux, 1957). However, half of the participants presented life scientists, which is a deviation from what is suggested in previous studies, indicating a possible shift of what it means to work as a scientist. Nonetheless, the participants demonstrated limited perceptions of the type of scientists existing in the workforce. Similar to the concerns related to occupational knowledge, participants may forgo choosing a science occupation as an acceptable alternative (i.e., the process of circumscription) if she/he perceives the scientist occupational pathway as narrow.

Although participants of the current study did not present the most common type of scientist found literature (i.e., chemist), most participants presented their scientists in common working environments found in literature, such as indoors within a laboratory setting. Notably, beakers were commonly presented by the participants in the current study. The perception of scientists working indoors in laboratories is suggested throughout many scientist image studies (Barman, 1999; Walls, 2011), and the use of beakers are almost equally as prevalent (e.g., Walls, 2011). However, half of the participants in the current study expressed that scientists can work indoors and outdoors, which demonstrates some flexibility in where they perceive scientists to work. This finding is related to the results from a study conducted by Monhardt (2003) of Navajo elementary students in which most of the fourth, fifth, and six grade students portrayed scientists working outdoors. Lastly, the working conditions of a scientist were described as dangerous. Some of the participants mentioned that the job entailed explosions, working with dangerous chemicals and diseases. These findings are referenced in various studies (Chambers, 1983; Monhardt, 2003; Walls, 2011), and is a perception even shared by adults (Losh et al., 2008). Although the participants in the current study perceived scientists working indoors and outdoors, the limited perceptions of scientists working in laboratories or even in dangerous conditions may affect the likelihood that a participant would maintain this occupation as an alternative.

In terms of the perceived personal traits of scientists, most participants in the current study described their scientists as mostly male, Black, and appeared to smile. This finding is partially supported by previous studies. In most studies, participants reference scientists as male (e.g., Barman, 1999; Chambers, 1983; Losh et al., 2008). However, some aspects of the scientists drawn and described by participants of the current study differ from the images presented in literature. In a study conducted by Walls (2011), the African American/Black elementary participants described scientists as mostly

Indian/Indian American (40%), followed by Caucasian American/White (35%), and African American/Black (23%). In other studies, scientists were perceived as mostly Caucasian American/White; although, the samples were non-African American/Black students (Losh et al., 2008; Monhardt, 2003). Lastly, the scientist presented as smiling or happy was suggested in previous studies with an African American/Black sample (Walls, 2011); yet, a more serious portrayal of scientists was found in other studies with Caucasian American/White students (e.g., Losh et al., 2008; Mead & Me'traux, 1957). Notably, scientists in previous studies were referenced as wearing glasses, a lab coat, and described as having facial hair (Chambers, 1983; Walls, 2011). Overall, these aspects were absent in the drawings from participants in the current study. These findings from the current study would suggest that, at least for males, the perception of a male, Black, and smiling scientist is appealing. However, the females in the study, who perceive the scientist occupation as male, may eliminate the occupation as an acceptable alternative due to the incongruence of image and self.

Finally, the participants of the current study viewed scientists as having high occupational status, which indicated that the participants perceived the job of a scientist as (a) difficult to learn, (b) difficult to do, (c) high paying, and (d) important. These findings are similar to those in previous studies. For example, Liben and colleagues (2001) conducted a study with a Caucasian American/White sample of elementary school students. Although the study included a total of 25 occupations, the scientist occupation was included in a list of occupations in which the status was rated. The participants rated male-dominated occupations, such as scientist, as having high status. Nevertheless, the findings from the current study would suggest that participants may maintain the occupation of scientist as an acceptable alternative if this status level is congruent with their own ability level and image of self. Otherwise, the scientist occupation may be eliminated as an option if participants perceive a mismatch. For example, a participant, who rates the scientist occupation as high (i.e., difficult to learn and do, high paying and important), may decide that she/he will not be successful if they aspire to be a scientist, especially if the participant perceives the scientist job as difficult.

Research Question Three

The current study explored the occupational and college educational aspirations of African American/Black elementary students. The participants were asked to provide their idealistic and realistic aspirations (i.e., given constraints) for occupational and educational aspirations. A difference between idealistic and realistic aspirations may suggest a compromise in that the participants choose to express less compatible yet more accessible aspirations (Gottfredson, 1981, 2005). Nonetheless, exploring aspirations will provide an indication of whether the participants will pursue science pathways, as this exploration is a way to access each participants' zone of accessible alternatives (i.e., range of occupations for consideration; Gottfredson, 1981). In pursuit of a science pathway, participants may express science and college educational aspirations, for the pursuit of a college degree is advantageous in obtaining a scientist position.

Overall, none of the participants expressed occupational aspirations in science, whether idealistic or realistic, when asked the free-response question of "What do you want to be when you grow up?". However, half of the participants expressed idealistic science aspirations when asked directly, "Would you like to be a scientist when you grow up?". Thus, at least half of the participants may consider science occupations as an alternative when choosing an occupational path in the near future. There are a limited number of published studies in which the occupational aspirations of African American/Black elementary school students are explored. There are even less that explore science occupational aspirations, specifically, in which to compare the occupational aspirations findings of the current study. However, the findings of the current study are similar to those in a study of Black students in the U.K. (i.e., Archer et al., 2015). At least half of the Black students either expressed science aspirations, science-related aspirations, or once held a science aspiration.

In terms of college educational aspirations, the majority of the participants expressed aspirations, both idealistic and realistic. In the consideration of constraints, majority of the participants believe that they will attend college. These findings are dissimilar to some findings suggested in previous studies, especially those of individuals from lower socioeconomic backgrounds. For example, some researchers would suggest that African American/Black students (Perry et al., 2012) of low socioeconomic backgrounds (e.g., Strayhorn, 2009), such as the participants in the current study, typically express low educational aspirations. Although, there were reported exceptions in that some students of low socioeconomic status expressed college educational aspirations (Berzin, 2010; Lee et al., 2012).

Research Question Four

The current study explored gender differences in terms of occupational knowledge, perceptions of occupations, occupational aspirations, and educational college aspirations. The occupation of scientist is considered a male-dominated profession. As such, the exploration of gender differences could illuminate the lack of participation among African American/Black females in particular. For example, according to Gottfredson's theory (1981, 2005), participants have completed stage two, which is the orientation to sex roles. That is, participants may have forgone occupations of the opposite gender domination (i.e., females eliminating male-dominated occupations).

Nonetheless, there are a lack of studies in which gender differences were examined, and thus were not compared to the findings of the current study.

In relation to occupational knowledge, minor differences were found between females and males. The findings from the current study are related to those of previous studies. For example, Schmitt-Wilson and colleague (2012) replicated a seminal study (i.e., Walls, 2000) in which the occupational knowledge of rural, elementary and middle school students were assessed. The researchers assessed several occupations, which included scientist/chemist. Overall, the researchers suggested that there were no significant gender differences between females and males.

There were minor differences in occupational knowledge between females and males in the current study. Although, there were more notable differences in terms of gender perceptions of scientists, the females in the current study were more likely to draw female scientists, and this occurrence was shared in Chambers'(1983) seminal study.

Also, males in the current study only drew male scientists, which was also reported in a study of African American/Black elementary school students (Walls, 2011). This finding would suggest that the females may finding the image of scientist compatible with herself, and this is similar for the males in the current study.

Additionally, there were minimal differences in terms of the scientist's race and the presence of a smile. However, there are a lack of studies in which to compare these results. The lack of research in which to compare the results of the current study also extend to the minimal differences in terms of the type of scientist drawn, and other perceptions regarding the scientist's work environment and conditions.

Lastly in terms of perceptions, there were no differences found between females and males as it related to occupational status; that is, most females and males rated the scientist occupation as high status. This finding differs from findings in related studies, such as one conducted by Liben and colleagues (2001). The occupational status of a variety of occupations was assessed. The authors suggested that both female and male elementary students rated male-dominated occupations has high status. However, males were significantly more likely to do so.

Finally, there were some differences between females and males regarding their aspirations. Males were more likely to express non-S&E occupational aspirations. There is a lack of research in which the science aspirations are assessed among African American/Black students. However, these findings from the current study are dissimilar to those found in a study of Black elementary students in the U.K. Male elementary students were more inclined to express aspirations for science occupations in comparison to females (DeWitt &Archer, 2015). An additional difference between females and males in the current study regarding occupational aspirations is that males were more likely to express the aspirations of athlete/football player. These findings are consistent with those from previous studies of elementary samples (e.g., Bobo et al., 1998; Helwig, 1998) and other grade levels (Perry, et al., 2009).

However, there is a lack of consensus of whether gender differences exist when considering educational aspirations. There were minor differences among females and males within the current study, as all of the female participants expressed idealistic and realistic aspirations to attend college. Only one male was unsure of his idealistic and realistic college educational aspirations. Of studies in which educational aspirations were explored with students in other grade levels (e.g., middle school), there were gender differences, such as females were more likely to hold higher educational aspirations than males. However, some researchers, who explored educational aspirations with elementary students (e.g., Blackhurst & Auger, 2008), did not find differences by gender.

Implications for Educators and Counselors

The following are suggested practice implications related to the findings discussed above. Specifically, the practice implications are presented for increasing scientist occupational knowledge, shaping occupational perceptions of scientists, and addressing aspiration development.

Many of the suggestions support the need for collaboration among various education stakeholders, for aspiration development is a complex process, and would benefit from systemic interventions. The implications reference areas of involvement for administrators and teachers with a focus on professional school counselors (PSCs) when addressing the aspiration development of elementary school students.; as, PSC's are uniquely qualified to address STEM career awareness (Schmidt, Hardinge, Rokutani, 2012). Therefore, the researcher suggests the implementation of the American School Counselor Association (ASCA) National Model ® (2003, 2005, 2012). The PSC's comprehensive school counseling program, developed in accordance to the ASCA National Model ® (2003, 2005, 2012) should address career awareness through schoolwide interventions, classroom guidance, group and individual activities. Administrators could ensure that the PSC's time is protected, so that PSC's can deliver these services and others in an effective manner, that would benefit all education stakeholders.

Initial steps towards program implementation and addressing career awareness and academic planning should include developing a mission statement that aligns with that of the school, district, and state with an emphasis on the goals of STEM career awareness. Once the statement is drafted, the PSC can develop crosswalks comparing the ASCA career development standards (e.g., career information acquisition) with specific academic standards (e.g., science and math). Additional data collection methods can include interviews with staff, parents/guardians, and students.

For example, although participants understood the core tasks of a scientist, they lacked an understanding of the pathway to becoming a scientist. In addition, the participants perceived scientists in a somewhat limited way (i.e. life or physical scientist, male, working in a lab, and engaging in dangerous activities). Therefore, administrators, teachers and PSCs could collaborate by first assessing the current level of occupational knowledge and perceptions of the school's student population. Given the support of administrators, PSCs could conduct a needs assessment at the beginning of the school year (if applicable). PSCs may wish to introduce themselves to each class with the support of the classroom teacher, and ask for the students' assistance in helping to shape the school counseling program for the remainder of the school year. At that point, an informal needs assessment can be conducted, with an intentional focus on students' understanding of science pathways and perceptions of scientists. The PSC could facilitate a classroom discussion by asking the students to express what they know of scientists and their work. Additionally, the DAST (Chambers, 1983) which is a simple, fun, and effective way of assessing (at least partially) the perceptions of scientists, could be used in this way. The researcher suggests that PSCs use the modified DAST (see appendix F), as the directions provided will ask students to demonstrate what they know of scientists and their work. Additionally, the modifications will assist in gathering information regarding gender, work tasks, and work environment. Administrators, teachers, and PSC's could collaborate in scoring the DAST to determine how their students perceive scientists in general. The DAST checklist (Finson, et al., 1995) can be used to score the DASTs in an efficient manner. In addition to the DAST, PSC's could administer the Occupational Status Dependent Measure (Liben, et al., 2001) which provides a quick overview of how students perceive scientists in terms of occupational status (i.e., difficulty to learn, difficulty to do, earnings, and importance).

Once the informal needs assessment is complete and the need is identified, the PSC would share the results with administrators, including the classroom teachers (to increase buy-in) in devising ways to integrate career awareness and occupational information regarding scientists. Upon approval from administration, delivery services, based on findings from the needs assessments, could be implemented with an emphasis on (a) school-wide services, (b) classroom guidance/classroom instruction, (c) group services, (d) parent outreach, and (e) staff training.

For example, elementary students would benefit from exposure to various types of scientists, and discuss the science occupational pathways taken to attain jobs in science. Administrators and PSCs could design a science pathway series to take place throughout the school year in which they invite scientists from the local community to come to the school to share about their careers. Administrators, teachers, and PSCs could ensure that the various scientists invited for the scientist pathway series (suggested above) represent an array of specialties, ethnicities/races, and gender. If this becomes a challenge due to the limited scientist workforce, educational professionals could request the assistance from their local colleges and universities to connect with a more diverse pool of presenters. Additionally, educational professionals could supplement live presentations with video presentations in order to ensure a more diverse representation of scientists in general.

Classroom teachers could ask the students to complete related assignments after each scientist presentation. The assignments could include reflections about the main points communicated by the speaker, and present connections to how the scientist's pathway connects to the students' current course work. Alternatively, teachers could ask students to reflect on their own occupational and educational aspirations, by asking each of the following questions, "What do you want to be when you grow up?", "What do you think you really will be when you grow up?", " Do you want to go to college?", and "Do you think you really will go to college?". , "Would you like to be a scientist when you grow up?" This would be helpful in exploring a common concern that, some of the participants of the current study expressed aspirations to become a scientist only when prompted. This may indicate that becoming a scientist may be a possible option in the future, but that was not as appealing as their primary aspirations.

Related to educational aspirations, the participants of the current study were excited about the prospects of attending college. Therefore, the researcher suggests school-wide initiatives to encourage a college going culture. For example, hallways within the school could be named after popular local colleges and universities. Similarly to the scientist pathway series, community members from local colleges and universities could be invited to talk to the students about the advantages of attending college. The presenters could be asked to present these concepts in ways to elicit excitement about college, such as instilling the belief that all students can attend college. Teachers could follow-up with the reflection questions presented above regarding the students' own plans for college attendance.

This sentiment could also be shared by PSCs through classroom guidance instruction, which can serve as a complement to the school-wide activities and teachers' classroom instruction. Additionally, the PSC could highlight the importance of college attendance for science occupations, while connecting the students' current curriculum to upper-level science courses, math courses, and occupational tasks of scientists. This classroom guidance instruction could build on the foundation of study skills and other academic competencies (e.g., effective listening skills); thus, PSC's may wish to collaborate directly with classroom teachers to ensure that students meet various competencies and educational standards (i.e., completing a crosswalk as previously suggested) as a result of the PSCs classroom guidance instruction.

Relatedly, the majority of the participants viewed scientists as having high occupational status. An aspect of this high status is that participants perceive the job of a scientist as difficult to learn and do. Therefore, PSCs are encouraged to implement instructional practices that are culturally-relevant and motivating to students. Similarly, classroom teachers could vary instruction of science and related courses (e.g., math, computing) to meet the needs of all ability levels and learning styles. Classroom teachers could continue to emphasize fun and engaging ways of teaching science and related courses, so that all students feel confident in their ability to learn.

As a complement to school-wide activities and classroom guidance, PSC's could deliver small group instruction and/or small group counseling regarding career awareness. For example, PSC could facilitate small groups to address the underrepresentation of females and/or African American/Black students and provide specialized opportunities for exposure to science-specific career awareness topics. The PSC could choose various career awareness activities each week to assist in building a general academic planning and science career awareness foundation. Such activities may include, (a) a more involved discussion surrounding the students' own perceptions of scientists and college attendance, (b) inviting students, majoring in science, of varying races/ethnicities to speak to the group; or (c) asking the group participants to gather examples of diverse scientists presented in media to share with the group. Additionally, activities could include use of career genograms (e.g., Gibson, 2005) to explore how parent/guardian expectations and values may affect the students' own career awareness.

Parents/guardians are important stakeholders in the process of address career awareness and academic planning, and their involvement extends beyond the exploration of parent/guardian expectations and values. Administrators, PSC's and classroom teachers could encourage parents/guardians to discuss scientist occupational information with their children. For example, educational professionals could host a science night, highlighting academic assignments (e.g., displaying science projects), and PSCs in collaboration with teachers could provide dinner table topics surrounding the connection between elementary school academics and course trajectories leading to college. PSC's could communicate with their respective feeder schools in order to gain an understanding of course trajectories for colleges and universities in the area, and share these specific points with parents/guardians.

In addition, PSC's could send information home to parents about the importance of discussing college enrollment with their children (emphasizing that elementary school is the optimal time to have these discussions). Brief discussion points could be provided as a means to encouraging conversations surrounding such topics, including topics of occupational aspirations and how scientists are portrayed in media/society.

Relatedly, educators should be mindful of the images presented by textbooks and media accessed by students. How are scientists or individuals engaging in scientific exploration portrayed? Administrators could work with PSCs to identify a subset of media in which scientists represent a variety of personal characteristics and abilities. There are a number of checklists available through STEM and STEM-related organizations (e.g., the National Center for Women & Information Technology), that provide quick and useful tools for educators. Additionally, administrators may collaborate with classroom teachers to supplement the textbook (if narrow in presentation) to ensure that a diverse presentation of scientists is reflected in the teachers' instruction and within the classroom environment (e.g., posters on walls).

Throughout (or perhaps before) the implementation of the activities noted above, all of the staff should be encouraged to reflect on their perceptions. Thus, some questions to pose for reflection include: (a) What occupational images are presented to students through classroom instruction? (b) When describing a scientist, is the scientist referred to primarily as male or female? (c) What are the classroom teacher's (PSC's, administrators, etc.) own perceptions of scientists and their work? (d) Are females equally encouraged to pursue science, math, and technology courses? As such, all educational professionals should reflect on their own biases regarding scientists, STEM courses, and be cognizant of whether scientist occupations (and the tasks of scientists) are presented in an balanced manner. To address these questions, proactively or as an intervention, administrators and PSC's could host staff development meetings regarding the various science occupations and the importance of a college degree in the pursuit of such occupations. These discussion and presentations could have an emphasis on diversity within the science profession.

Implications for Future Research

The findings and aspects from this research lend themselves to a number of recommendations for future research surrounding the occupational images and aspirations of African American/Black elementary students. First, research recommendations for occupational images are presented followed by recommendations for research of aspirations.

Whereas participants understood the core works tasks of scientists, they lacked occupational knowledge regarding the actual preparation requirements of a scientist. Additional research is needed that explores the general occupational knowledge of elementary students, and specifically of African American/Black elementary students, with an emphasis on STEM careers. It is suggested that qualitative and/or mixed methods are employed in order to gain a deeper understanding of what students know of scientists and science occupational pathways. Mixed method designs in particular will allow researchers to increase generalizability of the findings, a limitation of the current study, while maintaining strengths of qualitative methods (e.g., thick, rich descriptions).

This future research is suggested within various educational settings in order to address one of the limitations of the study – public and private, as well as various contexts – STEM and non-STEM. Additional questions that warrant investigation include the following: (a) How will the level of occupational knowledge differ from context to context?; (b) How will the level of occupational knowledge differ from contexts in which

STEM is not emphasized?; (c) What are the sources for this knowledge – teachers, counselors, media, friends?; (d) In terms of media sources, are scientists presented in an accurate manner?; (e) Will the science occupational knowledge of African American/Black students become more accurate overtime?; and (f) Will African American/Black students have an increased understanding of the importance of a college degree for science pursuits? It is suggested that a longitudinal design be used to explore several of these questions. A longitudinal design could provide finding to the questions overtime. Additionally, the prolonged engagement in the school environment could overcome the effects surrounding limited access.

The previous recommendations regarding occupational knowledge can also be applied to future research regarding perceptions of African American/Black elementary school students. The participants of the current study expressed limited perceptions of scientists, particularly that scientists are male, work in the life or physical sciences, and that scientists' work is viewed as dangerous. Notably, most participants perceived scientists as Black, and females were more likely to draw female scientists. In addition to the aforementioned recommendations related to occupational knowledge, future research is needed that explore the sources of these perceptions. The participants of this study shared sources of information such as media, parents, peers, and teachers. It would be important to discover to what extent these sources impact their perceptions. A researcher could conduct a content analysis of the specific textbooks and media named as sources by African American/Black participants. Additionally, researchers could further explore the perceptions of scientist occupations as dangerous and hazardous: are the sources for these perceptions related to personal/school experiences or media consumption? Some participants of the current study drew Black and/or individuals working as scientists. It would be important to learn how the context of the study shaped the perception that female and/or Black individuals work as scientists. Similarly, it would be important to discover if African American/Black elementary students, enrolled in a public school without a STEM focus, drew female and/or Black scientists with the same frequency. Lastly, there were limited instruments available to study the construct of occupational images. Therefore, additional research is need on the validity and reliability of modified and/or adapted instruments such as the DAST and Occupational Status Dependent Measure with a larger sample.

As with occupational images (i.e., knowledge and perceptions), there are few studies that exist in which the aspirations of African American/Black elementary school students are explored. Therefore, additional studies are needed to assist in understanding the aspirations of this population in general. Specifically, further research is needed to explore the development of science aspirations of African American/Black students at the elementary school level. Generally, the participants of this study held aspirations that aligned with science occupational paths. However, the participants did not express occupational aspirations for science in response to a free-response aspiration question. Some expressed science aspirations only when asked directly (i.e., fixed-response question). This is despite the school's culture reflecting a STEM focus. Therefore, a greater understanding is needed of how the conceptions of science occupational aspiration development overtime. Additionally, the participants expressed college educational aspirations, and appeared excited about the possibilities of attending college. Additional research is needed to explore college going cultures with African American/Black elementary school students. As with occupational images, researchers can continue to add to the selection of evidence-based interventions by examining practices that address aspiration development. Also, additional research is needed that explores the gender differences among each of these constructs – occupational images and aspirations.

Conclusion

Currently, employers are experiencing shortages within the science workforce, as employers seek to find individuals with specialized skillsets and/or postsecondary degrees (Rothwell, 2014; Xue & Larson, 2015). This is compounded by the growing projections of S&E jobs, which are expected to exceed 6.8 million in 2022 (National Science Board, 2016). A more diverse workforce, such as increasing African American/Black representation, would address the shortage concerns. Yet, African American/Black individuals may perceive an incongruence between themselves and the science profession and/or incumbents. Additionally, African American/Black individuals may lack the appropriate occupational knowledge (e.g., unaware of the importance of a college degree) to pursue science pathways effectively.

Therefore, the current qualitative case study sought to explore the occupational images (i.e., knowledge and perceptions) and aspirations of African American elementary students; as, the elementary school level provides an entry point to addressing some of the nation's concerns of science workforce shortages. The researcher used child-friendly methods, such as (a) drawings (i.e., DAST; Chambers, 1983), (b) a brief questionnaire (i.e., Occupational Status Dependent Measure; Liben et al., 2001), and (c) semi-structured interviews with a small sample of African American/Black fourth and fifth grade students at a local K-8 school.

Overall, the participants lacked some occupational knowledge and expressed a somewhat limited view of scientists. In addition, none of the participants expressed free-response aspirations of being a scientist, although some expressed scientist aspirations when asked directly. Even for those who would consider becoming a scientist as an occupational alternative, the lack of occupational knowledge and their perceptions of scientists may inhibit their desire to pursue such occupations.

Therefore, the researcher suggests a number of implications, that focus on the collaboration among all education stakeholders in addressing the complex phenomenon of aspiration development. Many of the implications involve the leadership of PSCs, as they are uniquely trained and qualified to design career awareness and academic planning activities with all students. The practice implications include school-wide activities, classroom guidance, group activities, parent outreach, and staff training and reflection.

Nonetheless, additional research is needed on the constructs of interest, especially with African American/Black elementary students. The researcher suggests qualitative methods and child-friendly instrumentation for future research. Therefore, additional tools and the implications of their use for science aspiration research should be explored. Additionally, the researcher suggests studies involving the implementation of various interventions with elementary students and with African American/Black students in particular. Research-based interventions would assist school-based educators, and particularly PSCs in tackling the issue of disproportionate underrepresentation in college enrollment within the sciences, science degree attainment, and eventually science workforce participation.

APPENDIX A
SCIENCE OCCUPATIONS

SOC Code	Science Occupations
	Computer and Mathematical Scientists
15-1111	Computer and Information Research Scientists
15-1121	Computer Systems Analysts
15-1122	Information Security Analysts
15-1132	Software Developers, Applications
15-1133	Software Developers, Systems Software
15-1134	Web Developers
15-1141	Database Administrators
15-1142	Network and Computer Systems Administrators
15-1143	Computer Network Architects
15-1151	Computer User Support Specialists
15-1152	Computer Network Support Specialists
15-1199	Computer Occupations, All Other
15-2021	Mathematicians
15-2031	Operations Research Analysts
15-2041	Statisticians
15-2099	Mathematical Science Occupations, All Other
	Life Scientists
19-1011	Animal Scientists
19-1012	Food Scientists and Technologists
19-1013	Soil and Plant Scientists
19-1021	Biochemists and Biophysicists
19-1022	Microbiologists
19-1023	Zoologists and Wildlife Biologists
19-1029	Biological Scientists, All Other
19-1031	Conservation Scientists
19-1032	Foresters
19-1041	Epidemiologists
19-1042	Medical Scientists, Except Epidemiologists
19-1099	Life Scientists, All Other
	Physical Scientists
19-2011	Astronomers
19-2012	Physicists
19-2021	Atmospheric and Space Scientists
19-2031	Chemists
19-2032	Materials Scientists
19-2041	Environmental Scientists and Specialists, Including Health
19-2042	Geoscientists, Except Hydrologists and Geographers
19-2043	Hydrologists
19-2099	Physical Scientists, All Other
	Social Scientists
19-3011	Economists
19-3022	Survey Researchers
19-3031	Clinical, Counseling, and School Psychologists
19-3032	Industrial-Organizations Psychologists
19-3039	Psychologists, All Other

19-3041	Sociologists
19-3051	Urban and Regional Planners
19-3091	Anthropologists and Archeologists
19-3092	Geographers
19-3094	Political Scientists
19-3099	Social Scientists and Related Workers, All Other
	Science Postsecondary Teachers & Researchers
25-1021	Computer Science Teachers, Postsecondary
25-1022	Mathematical Science Teachers, Postsecondary
25-1041	Agricultural Sciences Teachers, Postsecondary
25-1042	Biological Science Teachers, Postsecondary
25-1043	Forestry and Conservation Science Teachers, Postsecondary
25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary
25-1052	Chemistry Teachers, Postsecondary
25-1053	Environmental Science Teachers, Postsecondary
25-1054	Physics Teachers, Postsecondary
25-1061	Anthropology and Archeology Teachers, Postsecondary
25-1062	Area, Ethnic, and Cultural Studies Teachers, Postsecondary
25-1063	Economics Teachers, Postsecondary
25-1064	Geography Teachers, Postsecondary
25-1065	Political Science Teachers, Postsecondary
25-1066	Psychology Teachers, Postsecondary
25-1067	Sociology Teachers, Postsecondary
25-1069	Social Sciences Teachers, Postsecondary, All Other

From "*Options for defining STEM (science, technology, engineering, and mathematics) occupations under the 2010 Standard Occupational Classification (SOC) system* (Attachment C)," by SOC Policy Committee, 2012, Retrieved from www.bls.gov/soc/attachment_c_stem.pdf. Adapted from public domain.

APPENDIX B
ENGINEERING OCCUPATIONS

SOC Code	Engineering Occupations
	Engineers
17-2011	Aerospace Engineers
17-2021	Agricultural Engineers
17-2031	Biomedical Engineers
17-2041	Chemical Engineers
17-2051	Civil Engineers
17-2061	Computer Hardware Engineers
17-2071	Electrical Engineers
17-2071	Electronics Engineers, Except Computer
17-2081	Environmental Engineers
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
17-2112	Industrial Engineers
17-2121	Marine Engineers and Naval Architects
17-2131	Materials Engineers
17-2141	Mechanical Engineers
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers
17-2161	Nuclear Engineers
17-2171	Petroleum Engineers
17-2199	Engineers, All Other
	Engineering Postsecondary Teachers & Researchers
25-1032	Engineering Teachers, Postsecondary

From "*Options for defining STEM (science, technology, engineering, and mathematics) occupations under the 2010 Standard Occupational Classification (SOC) system* (Attachment C)," by SOC Policy Committee, 2012, Retrieved from www.bls.gov/soc/attachment_c_stem.pdf. Adapted from public domain.

APPENDIX C
SCIENCE AND ENGINEERING-RELATED OCCUPATIONS

SOC Code	Science and Engineering-Related Occupations
	Architects
17-1011	Architects, Except Landscape and Naval
17-1012	Landscape Architects
	Actuaries
15-2011	Actuaries
	Health
11-9111	Medical and Health Services Managers
29-1011	Chiropractors
29-1021	Dentists, General
29-1022	Oral and Maxillofacial Surgeons
29-1023	Orthodontists
29-1024	Prosthodontists
29-2029	Dentists, All Other Specialists
29-1031	Dietitians and Nutritionists
29-1041	Optometrists
29-1051	Pharmacists
29-1061	Anesthesiologists
29-1062	Family and General Practitioners
29-1063	Internists, General
29-1064	Obstetricians and Gynecologists
29-1065	Pediatricians, General
29-1066	Psychiatrists
29-1067	Surgeons
29-1069	Physicians and Surgeons, All Other
29-1071	Physician Assistants
29-1081	Podiatrists
29-1122	Occupational Therapists
29-1123	Physical Therapists
29-1124	Radiation Therapists
29-1125	Recreational Therapists
29-1126	Respiratory Therapists
29-1127	Speech-Language Pathologists
29-1128	Exercise Physiologists
29-1129	Therapists, All Other
29-1131	Veterinarians
29-1141	Registered Nurses
29-1151	Nurse Anesthetists
29-1161	Nurse Midwives
29-1171	Nurse Practitioners
29-1181	Audiologists
29-1199	Health Diagnosing and Treating Practitioners, All Other
29-2011	Medical and Clinical Laboratory Technologists
29-2012	Medical and Clinical Laboratory Technicians
29-2021	Dental Hygienists
29-2031	Cardiovascular Technologists and Technicians
29-2032	Diagnostic Medical Sonographers
29-2033	Nuclear Medicine Technologists
29-2034	Radiologic Technologists

29-2035	Magnetic Resonance Imaging Technologists
29-2041	Emergency Medical Technicians and Paramedics
29-2051	Dietetic Technicians
29-2052	Pharmacy Technicians
29-2053	Psychiatric Technicians
29-2054	Respiratory Therapy Technicians
29-2055	Surgical Technologists
29-2056	Veterinary Technologists and Technicians
29-2057	Ophthalmic Medical Technicians
29-2061	Licensed Practical and Licensed Vocational Nurses
29-2071	Medical Records and Health Information Technicians
29-2081	Opticians, Dispensing
29-2091	Orthotists and Prosthetists
29-2092	Hearing Aid Specialists
29-2099	Health Technologists and Technicians, All Other
29-9011	Occupational Health and Safety Specialists
29-9012	Occupational Health and Safety Technicians
29-9091	Athletic Trainers
29-9092	Genetic Counselors
29-9099	Healthcare Practitioners and Technical Workers, All Other
	Science and Engineering Managers
11-3021	Computer and Information Systems Managers
11-9013	Farmers, Ranchers, and Other Agricultural Managers
11-9041	Architectural and Engineering Managers
11-9111	Medical and Health Services Managers
11-9121	Natural Sciences Manager
	Science and Engineering Precollege Teachers
25-2031	Secondary School Teachers, Except Special and Career/Technical Education
25-2032	Career/Technical Education Teachers, Secondary School
	Science and Engineering Technicians and Technologists
15-1131	Computer Programmers
15-2091	Mathematical Technicians
17-1021	Cartographers and Photogrammetrists
17-1022	Surveyors
17-3011	Architectural and Civil Drafters
17-3012	Electrical and Electronics Drafters
17-3013	Mechanical Drafters
17-3019	Drafters, All Others
17-3021	Aerospace Engineering and Operations Technicians
17-3022	Civil Engineering Technicians
17-3023	Electrical and Electronics Engineering Technicians
17-3024	Electro-Mechanical Technicians
17-3025	Environmental Engineering Technicians
17-3026	Industrial Engineering Technicians
17-3027	Mechanical Engineering Technicians
17-3029	Engineering Technicians, Except Drafters, All Other
17-3031	Surveying and Mapping Technicians
19-4011	Agricultural and Food Science Technicians
19-4021	Biological Technicians
19-4031	Chemical Technicians

19-4041	Geological and Petroleum Technicians
19-4051	Nuclear Technicians
19-4091	Environmental Science and Protection Technicians, Including Health
19-4092	Forensic Science Technicians
19-4093	Forest and Conservation Technicians
19-4099	Life, Physical, and Social Science Technicians, All Other
	Science and Engineering Postsecondary Teachers & Researchers
12-1031	Architecture Teachers, Postsecondary
25-1071	Health Specialties Teachers, Postsecondary
25-1072	Nursing Instructors and Teachers, Postsecondary

From "*Options for defining STEM (science, technology, engineering, and mathematics) occupations under the 2010 Standard Occupational Classification (SOC) system* (Attachment C)," by SOC Policy Committee, 2012, Retrieved from www.bls.gov/soc/attachment_c_stem.pdf. Adapted from public domain.

APPENDIX D
GOTTFREDSON'S THEORY OF CIRCUMSCRIPTION AND COMPROMISE RELATIONSHIPS AMONG THEORITICAL CONCEPTS

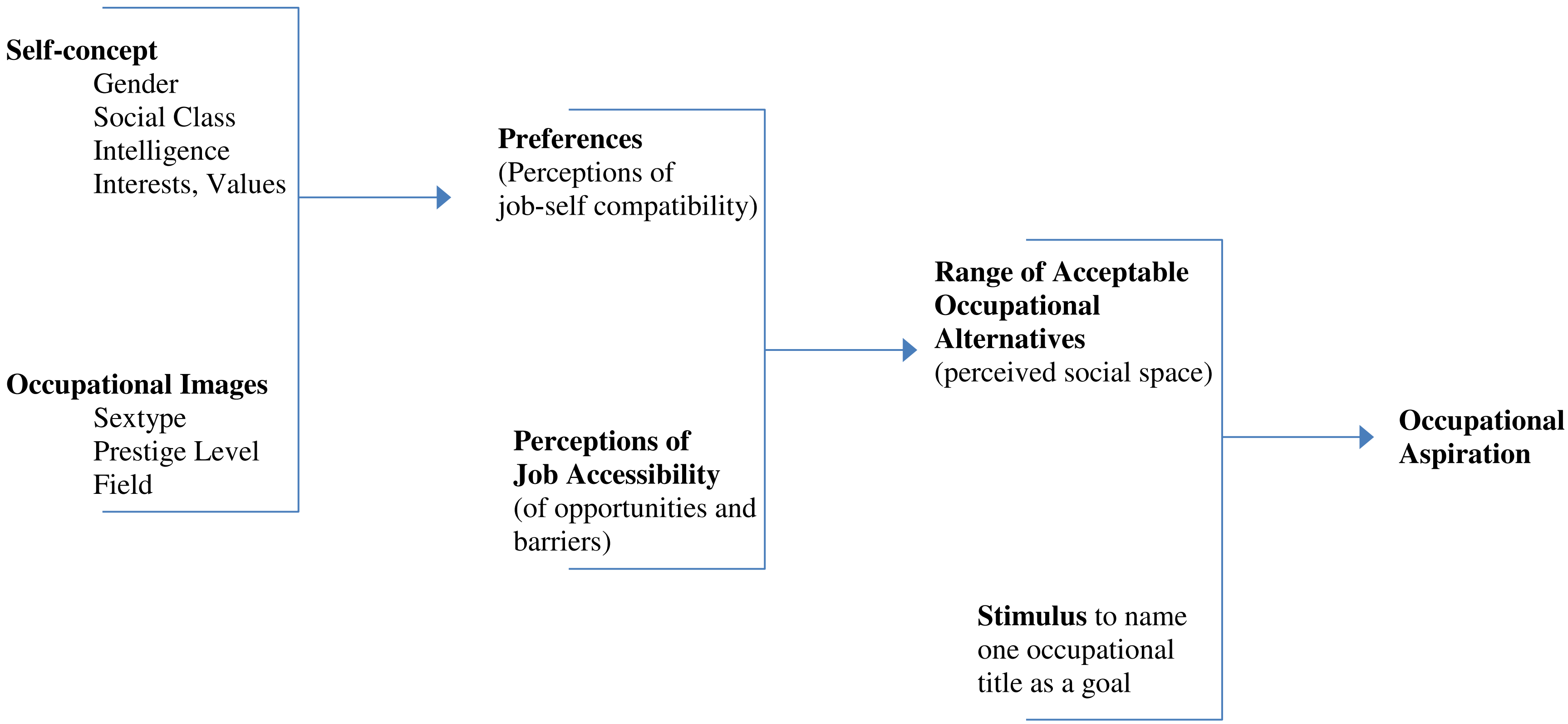


Figure 4: Relationships among theoretical constructs

From "Circumscription and Compromise: A Developmental Theory of Occupational Aspirations" by L. S. Gottfredson, 1981, *Journal of Counseling Psychology, 28*, p. 547. Copyright 1981 by the American Psychological Association.

APPENDIX E
OVERVIEW OF INFORMATION NEEDED

	Research Questions	Sub-Questions	Construct(s)	Methods	Data Collection Instruments	Data Analysis
RQ1	What do African American/ Black 4th and 5th grade students know of science occupations?	N/A	Occupational Images	Qualitative	DAST Drawings Semi-structured Interviews	DAST Drawings: Qualitative Directed Content Analysis Data Transformation Semi-structured Interviews: Qualitative Analysis
RQ2	How do African American/ Black 4th and 5th grade students perceive science occupations and incumbents?	Scientific RQ2a: How do African American/ Black 4th and 5th grade students perceive science occupations? Scientific RQ2b: How do African American/ Black 4th and 5th grade students perceive science incumbents?	Occupational Images	Qualitative Quantitative	Qualitative: DAST Drawings (w/ narrative descriptions) Semi-structured Interviews Quantitative: Occupational Status Dependent Measure	DAST Drawings: Qualitative Directed Content Analysis Data Transformation Semi-structured Interviews: Qualitative Analysis Occupational Status Dependent Measure: Composite Scores - Averaged Data Transformation

RQ3	To what extent, do the aspirations of African American/Black 4^{th} and 5^{th} grade students align with the pursuit of science occupational paths?	Scientific RQ3a: To what extent, do the occupational aspirations of African American/Black 4^{th} and 5^{th} grade students align with the pursuit of science occupational paths? Scientific RQ3b: To what extent, do the educational aspirations of African American/Black 4^{th} and 5^{th} grade students align with the pursuit of science occupational paths?	Occupational Aspirations Educational Aspirations	Qualitative	Semi-structured Interviews	Qualitative Analysis Data Transformation
RQ4	What differences exist, if any, between female and male African Amer^{ic}an/Bla^{ck} 4th and 5th grade students in regard to science occupational knowledge, perceptions, and aspirations?	Scientific RQ4a: What differences exist in science occupational knowledge, if any, between female and male African American/Black 4^{th} and 5^{th} grade students? Scientific RQ4b: What differences exist in science occupational perceptions, if any, between female and	Occupational Images Occupational Aspirations Educational Aspirations	Qualitative Quantitative	Qualitative: DAST Drawings Semi-structured Interviews Quantitative: Occupational Status Dependent Measure	Cross-Case Analysis

		male African American/Black 4^{th} and 5^{th} grade students? Scientific RQ4c: What differences exist in occupational aspirations, if any, between female and male African American/Black 4^{th} and 5^{th} grade students? Scientific RQ4d: What differences exist in educational aspirations, if any, between female and male African American/Black 4^{th} and 5^{th} grade students?				
Context	What is the school context in which the current research study is situated?	Context A: What is the school context in which the current research study is situated?	Contextual Factors	Qualitative	SCHOOL Review of: • School Website • PIP • SIP • Assessment Scores (aggregated)	Qualitative Content Analysis Qualitative Analysis

					Observation of (as needed): • General School Environment (e.g., lunchroom, hallways, etc.) Informal Interviews with (as needed): • Teachers • School Staff	

APPENDIX F
DRAW-A-SCIENTIST TEST

Draw-a-Scientist

Assigned Number: ________________________

Homeroom Teacher: ______________________

Age: ___________________________________

Gender: (please circle) Male Female

Instructions: Please draw a picture of a scientist working, and answer the following question below.

1. 1. Draw a picture of a **scientist** working. The picture should tell me what you know about scientists and their work.

2. What is the name of your scientist? ______________________________

3. Is the scientist working outdoors or indoors? ______________________

4. Write a short description of your scientist. What is the scientist doing in your picture__________________

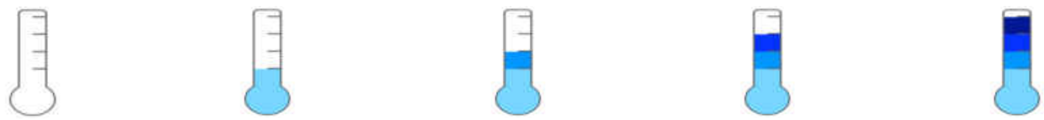
Thank you! ☺

APPENDIX G
OCCUPATIONAL STATUS DEPENDENT MEASURE

Number: ________________________ **Homeroom Teacher:** __________________

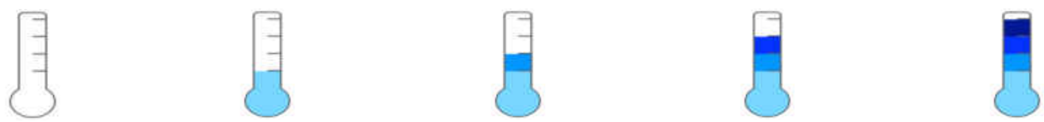
Instructions: Please circle one response to each of the following questions.

2. How hard do you think it is to learn to be a **scientist**?



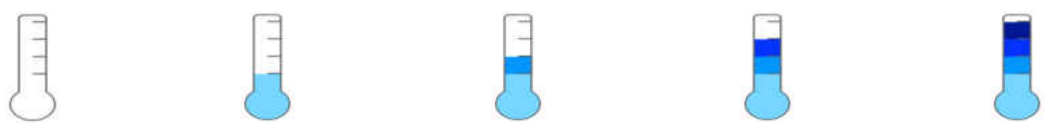
none or not at all	a little or a little bit	medium or a medium amount	pretty or pretty much	very or very much

3. How hard do you think it is to do the job of a **scientist** every day?



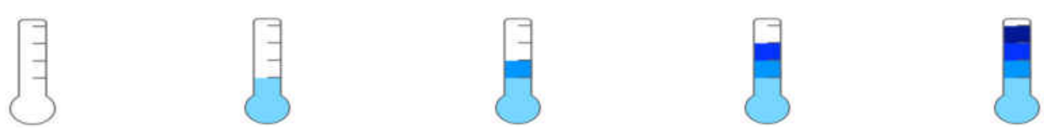
none or not at all	a little or a little bit	medium or a medium amount	pretty or pretty much	very or very much

4. How much money do you think a **scientist** gets paid?



none or not at all	a little or a little bit	medium or a medium amount	pretty or pretty much	very or very much

5. How important is the job of being a **scientist**?



none or not at all	a little or a little bit	medium or a medium amount	pretty or pretty much	very or very much

Thank you! ☺

APPENDIX H
INTERVIEW I PROTOCOL: ASPIRATIONS

Interview I Protocol: Aspirations

BASIC INTERVIEW INFORMATION	
Date:	
Location:	
Approximate Time–Limit:	30 - 45 Minutes
Start Time:	
End Time:	

INTERVIEWEE DEMOGRAPHICS & INFORMATION		
Assigned Code (numeric):		
Pseudonym / Code Name:		
Grade Level:	☐ 4th Grade	☐ 5th Grade
Gender:	☐ Female	☐ Male
Occupational Aspiration:		
Occupational Aspiration Category:	☐ Science / Engineering ☐ Science/Engineering-Related	☐ Non-Science/Engineering ☐ Other
College Aspiration:	☐ Yes	☐ No

RECORD		
Purpose	**Script**	**Notes**
Record Keeping	*-Press record button-* This is the start of interview one, aspirations, for participant number _________ on __________ (day, date) at ________ (time).	

INTRODUCTION		
Purpose	**Script**	**Notes**
Greeting	Hi! Thank you for completing the drawings and questionnaire (point to items). Again, my name is Ms. LaMothe, and I am a student at the University of Central Florida. You were selected for an interview, because I would like to know more about you and your thoughts regarding careers/jobs. This interview is the first of two interviews, and the second interview will take place on another day. Each interview will last about 30 – 45 minutes. The interviews will be audio-recorded (point to device); but, I am the **only** person, who will have access to the recording. The recording just helps me to take notes; so, I don't forget your answers. Your name will not appear on your drawings or questionnaire; and, will not be used in the interviews. Your participation is voluntary. This means that you can stop at any time; and, you won't get in trouble if you decide not to continue. Please try your best to answer the questions. There are no right or wrong answers; and, it is okay to say, "I don't know". Also, you can ask me any questions that you have during the interview. Do you have any questions before we begin? *-Answer participant's questions, if any-*	
Assent to proceed	**Are you interested in continuing, and speaking with me today?**	☐ Yes ☐ No
If no -	Thank you for your time thus far. I really appreciate it. Please return back to the classroom/lunchroom.	

If yes – Test Recorder	Great. Now, I am going to stop the recorder, and play your answer back to make sure your voice was recorded. *-Play back participant's response-* *-If voice is difficult to hear, place the recorder in a different position and/or ask participant to speak louder-*	
Pseudonym	Before we begin, I would like you to think about a special code name. We will use this code name instead of your real name throughout the interview. Also, this code name will be used in the group discussion, that will take place on a different day. **What would you like to use as your special code name?**	Pseudonym: ________________

INTERVIEW QUESTIONS: ASPIRATIONS		
Purpose	**Script**	**Notes**
Q1: Idealistic Occupational Aspiration	Okay, let's begin. Today, I would like to know more about what you want to be when you grow up. **What do you want to be when you grow up?** *Follow-up:* What does a __________ do at work?	
Q2: Realistic Occupational Aspirations	**What do you think you really will be when you grow up?** *Follow-up:* What does a __________ do at work?	

Q3: Occupational Aspirations If there is a difference between idealistic and realistic occupational aspirations	**When asked, "What do you want to be when you grow up? – you mention ____________** (*Reference answer to question 1)*, **but you didn't mention that as your answer to number 2. Tell me about that.** *Prompt:* What are your reasons for thinking that you really will be _________ *(Reference answer to question 2)* instead of ____________ *(Reference answer to question 1)*?	
Q4: Scientist Aspiration If didn't list scientist as aspiration	**Would you like to be a scientist when you grow up?** *Prompt:* Would you like to use science in your job when you grow up? *Follow-up:* What kind of scientist? *Follow-up:* What do you think you would like/dislike about being a scientist? *Prompt:* What do you think you would like/dislike about using science in your job when you grow up?	☐ Yes ☐ No
Q5: Idealistic College Aspiration	**Do you want to go to college?** *Follow-up:* Tell me a little bit more about that. *Prompt:* What do you think you would like/dislike about being a college student? What do you think you would like/dislike about going to college?	☐ Yes ☐ No
Q6: Realistic College Aspiration	**Do you think you really will go to college?** *Follow-up:* Tell me a little bit more about that. *Prompt:* What are the reasons that you think you really will/will not go to college?	

Wrap-up	**Is there anything else that you would like to add about what you want to do when you grow up or college?** **Thank you for sitting down to speak with me today.** *-Summarize main points from interview-* **Do this sound about right to you?** *-Note clarifications that participant provides-* **Thanks again for your time. Enjoy the rest of your day.** *-Instruct participant to classroom/lunchroom-*	

Physical Setting

Description:

Drawing of physical setting below.

APPENDIX I
FOCUS GROUP PROTOCOL

Focus Group Protocol: Aspirations and Scientist Occupational Images

BASIC FOCUS GROUP INFORMATION	
Date:	
Location:	
Approximate Time–Limit:	30 - 45 Minutes
Start Time:	
End Time:	

INTERVIEWEE 1: DEMOGRAPHICS & INFORMATION		
Assigned Code (numeric):		
Pseudonym / Code Name:		
Grade Level:	☐ 4th Grade	☐ 5th Grade
Gender:	☐ Female	☐ Male
Occupational Aspiration:		
Occupational Aspiration Category:	☐ Science / Engineering ☐ Science/Engineering-Related	☐ Non-Science/Engineering ☐ Other
College Aspiration:	☐ Yes	☐ No

INTERVIEWEE 2: DEMOGRAPHICS & INFORMATION		
Assigned Code (numeric):		
Pseudonym / Code Name:		
Grade Level:	☐ 4th Grade	☐ 5th Grade
Gender:	☐ Female	☐ Male
Occupational Aspiration:		
Occupational Aspiration Category:	☐ Science / Engineering ☐ Science/Engineering-Related	☐ Non-Science/Engineering ☐ Other
College Aspiration:	☐ Yes	☐ No

INTERVIEWEE 3: DEMOGRAPHICS & INFORMATION		
Assigned Code (numeric):		
Pseudonym / Code Name:		
Grade Level:	☐ 4th Grade	☐ 5th Grade
Gender:	☐ Female	☐ Male
Occupational Aspiration:		
Occupational Aspiration Category:	☐ Science / Engineering ☐ Science/Engineering-Related	☐ Non-Science/Engineering ☐ Other
College Aspiration:	☐ Yes	☐ No

INTERVIEWEE 4: DEMOGRAPHICS & INFORMATION		
Assigned Code (numeric):		
Pseudonym / Code Name:		
Grade Level:	☐ 4th Grade	☐ 5th Grade
Gender:	☐ Female	☐ Male
Occupational Aspiration:		
Occupational Aspiration Category:	☐ Science / Engineering ☐ Science/Engineering-Related	☐ Non-Science/Engineering ☐ Other
College Aspiration:	☐ Yes	☐ No

INTERVIEWEE 5: DEMOGRAPHICS & INFORMATION		
Assigned Code (numeric):		
Pseudonym / Code Name:		
Grade Level:	☐ 4th Grade	☐ 5th Grade
Gender:	☐ Female	☐ Male
Occupational Aspiration:		
Occupational Aspiration Category:	☐ Science / Engineering ☐ Science/Engineering-Related	☐ Non-Science/Engineering ☐ Other

College Aspiration:	☐ Yes	☐ No

INTERVIEWEE 6: DEMOGRAPHICS & INFORMATION		
Assigned Code (numeric):		
Pseudonym / Code Name:		
Grade Level:	☐ 4th Grade	☐ 5th Grade
Gender:	☐ Female	☐ Male
Occupational Aspiration:		
Occupational Aspiration Category:	☐ Science / Engineering ☐ Science/Engineering-Related	☐ Non-Science/Engineering ☐ Other
College Aspiration:	☐ Yes	☐ No

RECORD		
Purpose	**Script**	**Notes**
Record Keeping	*-Press record button-* This is the start of the focus group for females/males on ___________ (day, date) at _________ (time).	

INTRODUCTION		
Purpose	**Script**	**Notes**

Greeting	Hi! Thank you for agreeing to participate in the focus group. Again, my name is Ms. LaMothe, and I am a student at the University of Central Florida. You were selected for a focus group, because I would like to know more about you and your thoughts regarding careers/jobs. This focus group will last 40 – 45 minutes. The focus group will be audio-recorded (point to device); but, I am the **only** person, who will have access to the recording. The recording just helps me to take notes; so, I don't forget your answers. Your name will not appear on your drawings or questionnaire; and, will not be used in the focus group. Therefore, I would like you to write the special code that you chose on your name tags. I have them listed here if you don't remember. *-Pause for students to complete their name tags.-* Before we begin, there are special rules to ensure we have an enjoyable discussion. First, all information that is shared in the focus group remains in this room. Second, allow each person a moment to speak without interrupting. Third, please be respectful during our discussion. Your participation is voluntary. This means that you can stop at any time; and, you won't get in trouble if you decide not to continue. Please try your best to answer the questions. There are no right or wrong answers; and, it is okay to say, "I don't know". Also, you can ask me any questions that you have during the interview. Do you have any questions before we begin? *-Answer participant's questions, if any-*	

Assent to proceed	**Are you interested in continuing, and speaking with me today?**	☐ Yes ☐ No
If no -	Thank you for your time thus far. I really appreciate it. Please return back to the classroom/lunchroom.	Participant(s) who chose not to continue:__________________
If yes – Test Recorder	Great. Now, I am going to stop the recorder, and play your answer back to make sure your voice was recorded. *-Play back participants' responses-* *-If voices are difficult to hear, place the recorder in a different position and/or ask participants to speak louder-*	

INTERVIEW QUESTIONS		
Purpose	**Script**	**Notes**
Q1: Opening Question – Idealistic Occupational Aspiration	Okay, let's begin. Today, I would like to know more about what you want to be when you grow up, and what you think of certain jobs. **What do you want to be when you grow up?** *Follow-up:* What are some reasons for wanting to be a __________?	

Q2: Idealistic College Aspiration	**Do you want to go to college?** *Follow-up:* Tell me a little bit more about that. *Prompt:* What do you think you would like/dislike about being a college student? What do you think you would like/dislike about going to college?	
Q3: Scientist Aspirations	**Would you like to be a scientist when you grow up?** *Prompt:* Would you like to use science in your job when you grow up? *Follow-up:* What do you think you would like/dislike about being a scientist? *Prompt:* What do you think you would like/dislike about using science in your job when you grow up?	
Q4: Knowledge of Work Tasks	**What are some other things that scientists do at work?** *Prompt:* What type of work does a scientist do? *Prompt:* Tell me a little bit more about it.	
Q5: Knowledge of Preparation Requirements	**Do you think a person will need to go to college in order to be a scientist?** *-Give explanation of college, if necessary-* *Prompt:* Tell me more about that. Please explain.	

Q6: Perceptions of Occupational Status	**In what ways, is it easy/hard to learn to be a scientist?** *Prompt:* You mentioned that it is easy/hard to be a scientist. Please tell me more about that. Please explain.	
Q7: Perceptions of Occupational Status	**In what ways, is it easy/hard to do the job of a scientist everyday?** *Prompt:* You mentioned that it is easy/hard to do the jobs of a scientist every day. Please tell me more about that. Please explain.	
Q8: Perceptions of Occupational Status	**How is a scientist's job important/not important?** *Prompt:* You mentioned that the job of being a scientist is/is not important. Please tell me more about that. Please explain.	
Q9: Occupational Image Context	**How did you find out about [type of scientist]/scientists?** *Prompt:* Do you know anyone who is a scientist/uses science in their job? Tell me more about that. How do they use science in their job? *Follow-up:* Do you all discuss scientists in class/school/home? Tell me more about that. What did you discuss?	

Wrap-up	**Thank you for sitting down to speak with me today.** **Thanks again for your time. Enjoy the rest of your day.** *-Instruct participant to classroom/lunchroom-*	

Physical Setting

Description:

Drawing of physical setting below.

APPENDIX J
INTERVIEW II PROTOCAL:
OCCUPATIONAL IMAGES OF SCIENTISTS

Interview II Protocol: Occupational Images of Scientists

BASIC INTERVIEW INFORMATION	
Date:	
Location:	
Approximate Time–Limit:	30 - 45 Minutes
Start Time:	
End Time:	

INTERVIEWEE DEMOGRAPHICS & INFORMATION		
Assigned Code (numeric):		
Pseudonym / Code Name:		
Grade Level:	☐ 4th Grade	☐ 5th Grade
Gender:	☐ Female	☐ Male
DAST: Type of Scientist Drawn		
DAST: Presence/Absence of Indicator(s):		

RECORD		
Purpose	**Script**	**Notes**
Record Keeping	*-Press record button-* This is the start of interview two, occupational images of scientists, for participant number __________ on ___________ (day, date) at _________ (time).	

INTRODUCTION		
Purpose	**Script**	**Notes**
Greeting	Hi! Thank you for speaking with me last _______ (day/week). Again, my name is Ms. LaMothe, and I am a student at the University of Central Florida. You were selected for an interview, because I would like to know more about you and your thoughts regarding careers/jobs. This is the last interview; and, it will take about 30 – 45 minutes. This interview will be audio-recorded (point to device); but, I am the **only** person, who will have access to the recording. The recording just helps me to take notes; so, I don't forget your answers. Again, your name will not appear on your drawings or questionnaire; and, will not be used in the interview. Your participation is voluntary. This means that you can stop at any time; and, you will not get in trouble if you decide not to continue. Also, you can ask me any questions that you have during the interview. Please try your best to answer the questions. There are no right or wrong answers; and, it is okay to say "I don't know". Also, you can ask me any questions that you have during the interview. Do you have any questions before we begin? *-Answer participant's questions, if any-*	
Assent to proceed	**Are you interested in continuing, and speaking with me today?**	☐ Yes ☐ No
If no -	Thank you for your time thus far. I really appreciate it. Please return back to the classroom/lunchroom.	

If yes – Test Recorder	Great. Now, I am going to stop the recorder, and play your answer back to make sure your voice was recorded. *-Play back participant's response-* *-If voice is difficult to hear, place the recorder in a different position and/or ask participant to speak louder-*	

INTERVIEW QUESTIONS: OCCUPATIONAL IMAGES		
Purpose	**Script**	**Notes**
Q1: Opening Question - DAST Drawing	Okay, let's begin. *-Reference DAST-* **Tell me about your picture/drawing.** *Prompt:* What is the scientist doing in the picture? *-Point to item of interest-* *Prompt:* Tell me about this. *Follow-up:* What might you add to the picture if you had more time to draw? *Prompt:* Tell me more about that.	
Q2: Knowledge of Work Tasks	**What are some other things that scientists do at work?** *Prompt:* What type of work does a scientist do? *Prompt:* Tell me a little bit more about it.	

Q3: Knowledge of Work Environment	**Where do scientists work?** *Prompt:* Tell me a little bit more about it. Describe the area/environment to me. *Prompt:* What does their ____________ (area/environment) look like? *Follow-up:* Where is the _____________ (area/environment)? What is going on in the _____________ (area/environment)?	
Q4: Knowledge of Preparation Requirements	**What are some things that a person needs to know in order to be a scientist?** *Prompt:* What can they do at school that might help prepare them to be a scientist?	
Q5: Knowledge of Preparation Requirements	**Do you think a person will need to go to college in order to be a scientist?** *-Give explanation of college, if necessary-* *Prompt:* Tell me more about that. Please explain.	☐ Yes ☐ No

Q6: Perceptions of Occupational Status	*-Reference Occupational Status Dependent Measure-* **In what ways, is it easy/hard to learn to be a scientist?** *Prompt:* You mentioned that it is easy/hard to be a scientist. Please tell me more about that. Please explain.	
Q7: Perceptions of Occupational Status	**In what ways, is it easy/hard to do the job of a scientist everyday?** *Prompt:* You mentioned that it is easy/hard to do the jobs of a scientist every day. Please tell me more about that. Please explain.	
Q8: Perceptions of Occupational Status	**How is a scientist's job important/not important?** *Prompt:* You mentioned that the job of being a scientist is/is not important. Please tell me more about that. Please explain.	
Q9: Occupational Image Context	**How did you find out about [type of scientist]/scientists?** *Prompt:* Do you know anyone who is a scientist/uses science in their job? Tell me more about that. How do they use science in their job? *Follow-up:* Do you all discuss scientists in class/school/home? Tell me more about that. What did you discuss?	

Wrap-up	**Thank you for sitting down to speak with me today.** *-Summarize main points from interview-* **Do this sound about right to you?** *-Note clarifications that participant provides-* **Thanks again for your time. Enjoy the rest of your day.** *-Instruct participant to classroom/lunchroom-*	

Physical Setting
Description:

Drawing of physical setting below.

APPENDIX K
PARENT/GUARDIAN INFORMED CONSENT

Science Occupational Images and Aspirations of African American/ Black Elementary Students

Informed Consent

Principal Investigator: Saron LaMothe, M.A.

Faculty Advisor: W. Bryce Hagedorn, Ph.D.

Investigational Site: Oak Lake Charter School
Orange County Public Schools (OCPS)

How to Return this Consent Form: Two copies of this consent form are provided to you. If you consent for your child to participate in this research study, please sign one copy of the consent form, and return the form to your child's homeroom teacher. The second copy of the consent form is for your records.

Introduction: Researchers at the University of Central Florida (UCF) study many topics. To do this, we need the help of people who agree to take part in a research study. You are being asked to allow your child to take part in a research study, which will include 10 students at Oak Lake Charter School. Your child is being invited to take part in this research study because he or she is a 4th or 5th grade student; and, was identified as African American and/or Black.

Saron LaMothe, who is affiliated with the College of Education and Human Performance at UCF, is conducting this research study. Due to the researcher's status as a doctoral student, she is guided by W. Bryce Hagedorn, Ph.D., a UCF faculty advisor in the Department of Child, Family, and Community Sciences.

What you should know about a research study:

- • Someone will explain this research study to you.
- • A research study is something you volunteer for.
- • Whether or not you take part is up to you.
- • You should allow your child to take part in this study only because you want to.
- • You can choose not to take part in the research study.
- • You can agree to take part now and later change your mind.
- • Whenever you decide it will not be held against you or your child.
- • Feel free to ask all the questions you want before you decide.

Purpose of the research study: The purpose of this study is to explore the knowledge and aspirations of African American/Black elementary students, as it relates to science occupations. In general, African American/Black individuals are underrepresented in science occupations, science degree attainment, and science postsecondary majors. Exploring the antecedents to career choice will assist educational professionals in addressing the underrepresentation of African American/Black individuals in the science workforce.

What your child will be asked to do in the study:

Your child will be asked to take part in a drawing activity, and complete a brief questionnaire during their special area period. The drawing activity and the brief questionnaire will be a part of your child's regular curriculum.

Therefore, copies of these completed assignments will be given to the researcher (devoid of any personal information) if you give consent for your child to take part in this research study.

Additionally, your child may be asked to participate in two individual interviews and a focus group during their special area class period. Therefore, your child will not miss any instructional time associated with language arts, math, or science.

Your child does not have to answer every question or complete every task. You or your child will not lose any benefits if your child skips questions or tasks.

Additionally, the researcher will observe your child during class. The researcher will not interact with your child during this time, and will not participate in any class activities or assignments. Therefore, your child's instructional time will not be disrupted by the presence of the researcher.

Location: The researcher will meet with students during the school day at Oak Lake Charter School.

Time required: The total time for each student to participate in the study is three hours divided over a span of four weeks. Students will be asked to meet with the researcher in a classroom setting to complete a drawing activity and questionnaire; which, will be a part of your child's regular curriculum. Additionally, students will be asked to meet with the researcher in a private setting, provided by the school, for the purposes of conducting individual interviews and a focus group. During the individual interviews, students will be alone with the researcher for 45 minutes at a time during each interview for a total of 1 hour and 30 minutes. However, students may request a peer and/or school personnel to attend the interviews if he/she does not want to be alone with the researcher. All activities will take place during the special area class period, and will not impact instructional time in language arts, math or science.

Audio Recording: If your child is selected for an individual interview and focus group, your child will be audio- recorded during each. If you do not want your child to be audio-recorded, your child will still be able to participate in the study. Please discuss this with the researcher. If your child is audio-recorded, the recording will be kept in a locked, safe place, that can be accessed only by the researcher. The audio recording will be erased when the research study has concluded.

Risks: There are no expected risks for taking part in this study. There are no reasonably foreseeable risks or discomforts involved while taking part in this study.

Benefits: There are no expected benefits to your child for taking part in this study.

Compensation or payment: There is no compensation, payment or extra credit for your child's participation in this study. However, a small token gift (e.g., a pencil and/or eraser) will be provided to all potential participants at the start of the research study. Receipt of a small token does not obligate your child to participate in the study.

Confidentiality: We will limit the personal data collected in this study. Your child's name will not appear or be included on any materials collected for this study. Initially, a number will be assigned to your child, and included on all your child's materials. The number linking the materials to your child will be destroyed once he/she has completed all data collection activities. In addition, your child will be asked to choose a pseudonym to use during the interviews and focus group. This pseudonym will not appear on any written documentation or reports.

Efforts will be made to limit your child's personal information to people who have a need to review this information. We cannot promise complete secrecy. Organizations that may inspect and copy your information include the IRB and other representatives of UCF.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, or think the research has hurt your child, please contact Saron LaMothe, Doctoral Candidate, College of Education and Human Performance at (407) 230-7117 and/or saronlamothe@gmail.com, or W. Bryce Hagedorn, Ph.D., Faculty Advisor, College of Education and Human Performance at (407) 823-2999 and/or bryce.hagedorn@ucf.edu.

IRB contact about you and your child's rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901.

You may also talk to them for any of the following:

- • Your questions, concerns, or complaints are not being answered by the research team.
- • You cannot reach the research team.
- • You want to talk to someone besides the research team.
- • You want to get information or provide input about this research.

Your signature below indicates your permission for the child named below to take part in this research. DO NOT SIGN THIS FORM AFTER THE IRB EXPIRATION DATE BELOW

Name of participant
Signature of parent or guardian Date

❑ Parent
❑ Guardian (See note below)

Printed name of parent or guardian

Note on permission by guardians: An individual may provide permission for a child only if that individual can provide a written document indicating that he or she is legally authorized to consent to the child's general medical care. Attach the documentation to the signed document.

IRB Expiration Date:

University of Central Florida IRB IRB NUMBER: SBE-17-13536
IRB APPROVAL DATE: 02/07/2018 IRB EXPIRATION DATE: 02/06/2019

APPENDIX L
CHILD ASSENT

Science Occupational Images and Aspirations of
African American/ Black Elementary Students

Child Assent

My name is Saron LaMothe, and I am a student in the College of Education and Human Performance at the University of Central Florida. I am working with my advisor, W. Bryce Hagedorn, Ph.D., on a research study. A research study is a way to answer questions by collecting information.

I am conducting this research study, because I want to find out more about your thoughts on certain jobs in science. I am inviting you to participate because you are either a 4th or 5th grade student at Oak Lake Charter School, and are identified as an African American and/or Black student.

If you agree to participate in this study, you will be asked to do the following during your special area class period.

- You will be asked to draw a picture and complete a brief questionnaire. The total estimated time to complete the drawing and questionnaire is 45 minutes, approximately.

- You may be asked to participate in two interviews and a group discussion about what you think about certain jobs. The interviews and group discussion will be auto-recorded; and, each will take about 45 minutes if you are chosen. Therefore, the total estimated time to complete the interviews and group discussion is a little over 2 hours, approximately. Students will be chosen at random, which is like pulling a number out of a hat.

If your parent(s) or guardian(s) has given permission for you to participate in this research study, the final decision is up to you. You will not receive a grade for participating. Also, it will not affect you or your grades if you choose not to participate.

If you agree to participate in this study, you can stop at any time. You will not get in trouble if you decide not to participate or withdraw from the research study. The special gift that you received is yours to keep whether or not you choose to participate in this study.

I will do my best to protect your privacy. Therefore, your name will not appear or be included on any materials collected for this study. A number will be assigned to you, and included on all your materials. In addition, you will be asked to choose a special code name if you are selected for an interview and group discussion.

If you have any questions or want more information, please talk to your parent(s) or guardian(s), and ask him or her to contact Saron LaMothe at 407-230-7117 and/or saronlamothe@gmail.com, or my advisor, Dr. W. Bryce Hagedorn at (407) 823-2999 and/or bryce.hagedorn@ucf.edu.

If you would like to participate, please print your name and write today's date below.

Name Date

APPENDIX M
DRAW-A-SCIENTIST PROTOCOL

Draw-A-Scientist Test (DAST) Protocol

Pass out DAST. Please do not answer student questions regarding what to draw or answer. However, it is okay to remind them to try their best.

Instructions:
During this activity, you will draw a picture and answer a few questions. I would like you to use the colored pencils/crayons/markers to complete the drawing. However, you may take out and use your own colored pencils/crayons/markers. Please try your best. There are no right or wrong answers. You will have 35 – 40 minutes to complete this activity and a questionnaire, which I will pass out later. I will let you know when your time is almost up.

First, draw a picture of a scientist working. The picture should tell me what you know about scientists and their work.

After approximately 15 minutes, remind students that they should be almost finished with the drawing.

After approximately 5 minutes –remind students that they should answer the following questions.

2. What is the name of your scientist?

3. Is the scientist working outdoors or indoors?

4. Write a short description of your scientist. What is the scientist doing in your picture?

After approximately 10 minutes, collect the scientist drawing activity, and pass out the Occupational Status Dependent Measure.

APPENDIX N
OCCUPATIONAL STATUS DEPENDENT MEASURE PROTOCOL

Occupational Status Dependent Measure Protocol

Pass out the Occupational Status Dependent Measure.

Next, I would like you to use a pen or pencil and circle one answer to the following four questions. Please try your best. There are no right or wrong answers, and your answers will not braded.

6. 1. How hard do you think it is to learn to be a scientist?

None or not at all

A little or a little bit

Medium or a medium amount

Pretty or pretty much

Very or very much

2. How hard do you think it is to do the job of a scientist every day?

None or not at all

A little or a little bit

Medium or a medium amount

Pretty or pretty much

Very or very much

3. How much money do you think a scientist gets paid?

None or not at all

A little or a little bit

Medium or a medium amount

Pretty or pretty much

Very or v much

7. 4. How important is the job of being a scientist?

None or not at all

A little or a little bit

Medium or a medium amount

Pretty or pretty much

Very or very much

Collect questionnaire.

APPENDIX O
OBSERVATION PROTOCOL

Observation Protocol

OBSERVATION INFORMATION
Date:
Location:
Activity/Event:
Start Time:
End Time:

Physical Setting

Description:

Drawing of physical setting below.

PAGE 1 of ___

TIME	OBSERVATIONS	COMMENTS

PAGE ___ of ___

APPENDIX P
UCF IRB LETTER

University of Central Florida Institutional Review Board Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246

Telephone: 407-823-2901 or 407-882-2276 www.research.ucf.edu/compliance/irb.html

Approval of Human Research

UCF Institutional Review Board #1 FWA00000351, IRB00001138

To:
Date:
Dear Researcher:
On 02/07/2018 the IRB approved the following human participant research until 02/06/2019 inclusive:

From:

Saron N. LaMothe February 07, 2018

Type of Review: Project Title:

Investigator: IRB Number: Funding Agency: Grant Title:

Research ID:

UCF Initial Review Submission Form
Expedited Review
Science Occupational Images and Aspirations of African American/Black Elementary Students
Saron N. LaMothe
SBE-17-13536

N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 02/06/2019,
approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

All data, including signed consent forms if applicable, must be retained and secured per protocol for a minimum of five years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained and secured per protocol. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.
This letter is signed by:

Page 1 of 2

Signature applied by Gillian Morien on 02/07/2018 02:54:11 PM EST Designated Reviewer

APPENDIX Q
INTERVIEW I: ASPIRATIONS TRANSCRIPTIONS

Interview I: Aspirations
Participant 42

SL:	[inaudible 00:00:13] So, like, what do you want to be when you grow up?
Participant 42:	I want to be a teacher.
SL:	A teacher? Okay. And what does a teacher do?
Participant 42:	A teacher helps kids or other people learn new things.
SL:	All right. And so you want to be a teacher. What do you think you really will be when you grow up?
Participant 42:	Well, my mom said that I'm good with reading, and following directions, and I really like Judge Judy.
SL:	You really like Judge Judy? Okay.
Participant 42:	And she said that you would make a good lawyer, and sometimes after doing my homework, I usually get on my phone and research how to be a judge.
SL:	Oh, okay.
SL:	So, are you interested in being a lawyer or a judge or both?
Participant 42:	Both.
SL:	Both? Okay.
Participant 42:	I know how to defend myself, I know, 'cause when I got in trouble one time, she said, "You think that he's guilty," I said, you think he's, the boy, who's guilty. I said no, because it was an accident. I said, because I was walking and then he, and I bumped into him and he turned around.
Participant 42:	I'm not guilty, and he's not guilty, so we're free to go.
SL:	Oh, okay. So you kind of argued your point. Who were you speaking to, your teacher?
Participant 42:	Mm-mm (negative), it was like, I think assistant principal?
SL:	Oh, assistant principal? Okay, so you kind of stated your argument, right? Okay, all right. So, you know, you mentioned that you want to be a teacher, but you say you really think you'll be a judge and a lawyer.
SL:	So, tell me about the differences. What are your reasons for thinking that you'll really be a judge or a lawyer and not a teacher?
Participant 42:	Well, I really don't like, I don't like being around a lot of people, I'm kind of shy, but I really like to boss people around.
SL:	Okay.
Participant 42:	[inaudible 00:02:34] but I like to make sure people have fair and rights of their selves, and so I've, someone who's not guilty, or not guilty for the incident or anything, I want to help prove it.
SL:	Okay.
Participant 42:	Prove the truth.

SL: Okay. So you want the truth to come out, and you're not shy about saying something about it, even though for the most part you said you're shy around people, but that's kind of like one of those times when you're not, you'll speak up. Okay.

SL: And so, you mentioned that you want to be a teacher, you really think you'll be a lawyer and a judge. Would you like to be a scientist when you grow up?

Participant 42: Well, that's my favorite subject in school, that's one of my favorites. Reading, science, but science, my most favorite. I just like doing experiments and learning new things in life, and sometimes I do my own little experiment at home.

SL: Do you?

Participant 42: Mm-hmm (affirmative).

SL: Okay, like what kind of experiments?

Participant 42: I had tried vinegar and baking soda, and I almost blew up the whole house. That took me like two hours to clean up.

SL: Oh

Participant 42: But it was a fun experiment.

SL: Yeah.

Participant 42: But my mom said that, next time do it outside, but she said that [inaudible 00:04:05] doing experiments, how you don't care what it is, you just like doing it. But I just really like it, when I used to be homeschooled I used to, me and my mom, we used to, like a little experiment, so we did them.

Participant 42: Every experiment they have, we usually, we go to the store. If we don't have, we go to the store and get it. And I just love science, that's one of my favorite. I just like doing experiments and learning new things.

SL: Okay. So in terms of being a scientist when you grow up, is that something you'd like to do or no?

Participant 42: Well, no, I just want to be a judge when [inaudible 00:04:50].

SL: Okay, so you don't want to be a scientist when you grow up. But you like science, it's one of your favorite subjects. But you still will rather be, you know, you have your sites set on being that judge and lawyer, right?

SL: Okay, makes sense.

SL: What are, in terms of being a scientist, though, I'm curious, what are some things that you dislike about, because you spoke about liking experiments and things like that, but what do you dislike about, maybe becoming a scientist, if you were to become one.

Participant 42: Well, this is kind of, 'cause you gotta do hard work. You have to use big words that I don't know, and stuff, and you gotta research. But sometimes, it's like, it was, sometimes experiments go wrong and it makes some people could die, or anything, and I just don't

	want to be around something that would, I just don't want to be around danger.
Participant 42:	Like, sometimes scientists be around dangerous chemicals and diseases and stuff, and I don't want to get caught a disease or anything.
SL:	Mm-hmm (affirmative). You don't want to be exposed to those things, okay.
SL:	Do you want to go to college?
Participant 42:	Yes.
SL:	Yes? You seem really excited, tell me about that, because your eyes kind of lit up when you answered.
Participant 42:	Yeah, I do want to go to college because I see, when my grandma, she say, "You go to college," she say, "you better do anything." But I say, "I just wanna go to college to learn," I say, "I want to graduate," I say, "I want a diploma, and I want to get a job and work myself up."
Participant 42:	And I say, if I'm going to go to lawyer school, I think it is?
SL:	Law school? Mm-hmm (affirmative).
Participant 42:	I say, I want to graduate there and become a lawyer or a judge.
SL:	Okay, so what are some things that you think you would like about going to college.
Participant 42:	I think I'll meet nice people. I'll learn more stuff, or get a better understanding.
SL:	Mm-hmm (affirmative).
Participant 42:	And I will be able to go to library study sometimes, or like, hm, I think I would just learn more than I'm learning, if I don't go to college, I will know less than I know.
SL:	Mm-hmm (affirmative).
Participant 42:	But I think if I go to college, I will learn more, and be smarter.
SL:	Okay. What are some things that you think you will dislike about going to college?
Participant 42:	Getting up early.
SL:	Getting up early?
Participant 42:	Or, like, getting up early or, I think, being around a lot of people.
SL:	Mm-hmm (affirmative).
Participant 42:	'Cause like, I think they have an auditorium full, like [inaudible 00:08:08] but I don't know that, sometimes I guess I just don't like being around people, there's one thing. I could be in like a 22 children class.
Participant 42:	I can't be in 200 class, people, but sometimes I just feel [crosstalk 00:08:25].
SL:	Mm-hmm (affirmative), yeah.
Participant 42:	Like, so when people look at me, I turn away, or I walk somewhere.

SL: Mm-hmm (affirmative).

Participant 42: And I just don't, I just like, if it's my mom or anybody in my family, I'm good, talking to a friend, but, we have a presentation and I'm kind of scared, 'cause I don't know if I'm gonna stutter or anything.

Participant 42: I just don't, it just kinda scares me just talking in front of a lot of people.

SL: Yeah.

Participant 42: Even though I knew them for a long time.

SL: Mm-hmm (affirmative).

Participant 42: I just be kinda nervous. That's one thing, I had a presentation, I barely went at the classroom, 'cause I'm scared and I don't want to get embarrassed in front of people.

SL: And so you're thinking, in terms of college, maybe run into certain situations like that. Yeah, okay.

SL: Now, you said that you want to go to college. Do you think that you really will go to college when you grow up?

Participant 42: Yes.

SL: Yes? Okay. Tell me about that.

Participant 42: I really want to go to college because I'm smart, 'cause I know I'm, all I know is I'm smart and I know if I work hard and I want to do it, I will work hard and to get to college.

SL: Mm-hmm (affirmative).

Participant 42: I will work hard, I think I will be smarter, like if I graduated high school, during high school I'm gonna graduate college stuff, like college math stuff.

SL: Like, take some college level courses. Mm-hmm (affirmative).

Participant 42: And then when I get to college, I'll know certain stuff that will help me.

SL: Mm-hmm (affirmative).

Participant 42: And I think if I study hard enough and stay focused, I will go to college.

SL: Yeah, okay. Is there anything else that you want to share with me, in terms of what you want to be when you grow up, or college?

SL: No, no? All right, I'm just going to summarize some, like the main points, just to make sure I understand. So just let me know if this sounds about right to you.

SL: Let's see. So, in terms of what you want to be when you grow up, you mentioned that you want to be a teacher, but what you think you really will be when you grow up, you mentioned, a judge or a lawyer. Well, both, really. I guess, lawyer on the path to being a judge.

SL: And, you mentioned that, because you're good at reading, following directions, and it sounds like your mom kind of really

	gave you a few hints, like hey, this is what you'll be good at doing. Okay.
Participant 42:	She encouraged me to do it.
SL:	She encouraged you to do it. Okay, great way of saying that. In terms of the differences as to, this is what you want to be, teacher, and what you'll end up being, judge, lawyer. Judge or a lawyer, is that sometimes you feel kind of shy.
SL:	But being in a crowd or being in front of people, however, the time that you're not so shy, it sounds like, is that when you want to defend someone or if you want to stand up for what's fair. So you kind of get some courage there, and you're a little more outgoing in those particular situations.
SL:	Which ties into the work of being a lawyer and a judge.
SL:	In terms of if you'd like to be a scientist, you mentioned no, you like doing experiments, you even conduct experiments at home, but things that you would dislike about having a job as a scientist is that sometimes they use big words, there's research involved, and even sometimes it's dangerous if you're exposed to certain chemicals and things like that.
SL:	In terms of whether you want to go to college, you said yes, you even looked a little excited when you said yes. You said you like to learn, you want to be smarter. Meet people, but you're not looking forward to waking up early in the morning, it sounds like that.
Participant 42:	My thing.
SL:	Or being in situations where you would present some information in front of a class, a large class. So you may not feel as comfortable with that, but you said that you really think you'll end up in college because you're smart, you're independent, and you work hard. And so that's going to get you to college.
SL:	Does that sound about right?
Participant 42:	Mm-hmm (affirmative).
SL:	Yes. Okay.

Interview I: Aspirations
Participant 46

SL:	Just tell me, what do you want to be when you grow up? And speak up just a little bit for me.
Participant 46:	Football player.
SL:	I'm sorry?
Participant 46:	A football player.
SL:	A football player, okay. That's an interesting career. And tell me what does a football player do? When you say football player, what do you mean?
Participant 46:	Tackle, run the ball.
SL:	Yeah? Okay. And so you said that you want to be a football player when you grow up.
Participant 46:	Yes.
SL:	So now I want you to think about what do you think you really will be when you grow up?
Participant 46:	In football?
SL:	Well, do you, so you say you want to be a football player. Do you think you'll become a football player do you think you'll be something else?
Participant 46:	Become a football player.
SL:	A football player, okay. All right.
SL:	Okay, so you say you want to be a football player, but would you like to be a scientist when you grow up?
Participant 46:	Yes.
SL:	Yes? Okay. And so what do you think you would like about being a scientist?
Participant 46:	Discovering, discover earth.
SL:	Discover earth? Okay, tell me a little bit more about that.
Participant 46:	Plants.
SL:	Plants, okay. And what do you think you would dislike about being a scientist?
Participant 46:	Bugs. Bugs.
SL:	Bugs, okay. And so tell me a little bit more about that. What it is about that that you dislike?
Participant 46:	They look nasty.
SL:	They look nasty? Kinda creepy?
Participant 46:	Yes.
SL:	Okay. And do you want to go to college?
Participant 46:	Yes.
SL:	You do. And tell me a little bit more about that, about going to college.

Participant 46: To get my degree and be a football player.
SL: Okay. What do you think you would like about going to college?
Participant 46: I don't know.
SL: You don't know? And that's okay. That's okay. Because remember, we said it's okay to say you don't know. What do you think you would dislike about going to college?
Participant 46: Sleeping there.
SL: Sleep, where I'm sorry?
Participant 46: Sleeping there.
SL: Sleeping there. Oh, okay. Tell me about that. What do you mean?
Participant 46: Because I want to stay home and sleep in my own bed.
SL: Oh, okay. So you're saying that you're not really looking forward to sleeping in maybe a dorm room if you have to move to go to college? You want to stay here at home. Yeah? Okay. And do you think, I know you said that you want to go to college. Do you think you really will go to college?
Participant 46: Yes.
SL: Yes, okay. And ... just wait a little. So tell me a little bit more about that. What are your reasons that you think you really will go to college? Do you want to wait a little bit?
Participant 46: To do better.
SL: Oh I'm sorry go ahead. To do better?
Participant 46: To do better.
SL: And tell me more about that. What does that mean?
Participant 46: To get better at school work.
SL: Get better at school work. Is there anything that you would like to add that I didn't ask you?
Participant 46: No.
SL: No? Okay. So I just want to make sure that I understand some of the things that you mentioned to me okay? So you mentioned that you want to be a football player and not only that you want to be a football player, you really think you will be a football player right?
Participant 46: Yes.
SL: And when I asked you if you wanted to be a scientist you said yes. You would like to discover earth and work with plants. But you're not fond of bugs right? Is that correct?
Participant 46: Yes.
SL: Okay. You mentioned that you want to go to college. And not only that you want to go to college, you really think you will go to college. But one of the things that you're not really looking forward to is sleeping somewhere other than your bedroom. Right?
Participant 46: Yes.
SL: And that when you go to college you want to stay here so that you can sleep in your own bedroom right?

Participant 46:	Yes.
SL:	Okay. And your, one of the reasons why you really think you'll go to college is because you really want to do better. You want to do better or get better at your school work. Can you tell me a little bit more about that? What do you mean about get better at your school work?
Participant 46:	Like get done before time's over.
SL:	Oh okay. So completing your school work on time.
Participant 46:	Yes.
SL:	Okay. Okay. And so okay. And so that's one of the reasons why you think you really will go to college, because you really want to complete your work on time and you think college will help you with that?
Participant 46:	Yes.
SL:	Yes. Okay.

Interview I: Aspirations
Participant 47

SL:	What do you want to be when you grow up?
Participant 47:	A police officer.
SL:	A police officer? And what does a police officer do?
Participant 47:	The save people and help people when they're in trouble. And when they do it feels like everyone's safe and they won't have to worry about anything else.
SL:	Okay. Now you said you want to be police officer, what do you think you really will be when you grow up?
Participant 47:	I think I will be a doctor.
SL:	A doctor?
Participant 47:	Mm-hmm (affirmative).
SL:	And what does a doctor do?
Participant 47:	They kind of do the same thing as police officers, but they help people at a hospital if they're feeling sick or bleeding or something.
SL:	Okay. Do you want to be a particular type of doctor?
Participant 47:	I want to be the ones who give birth to babies and stuff.
SL:	Oh. Okay. Okay. So do you like babies?
Participant 47:	Mm-hmm (affirmative).
SL:	You do? So you mentioned that you want to be a police office, but you really think you'll be a doctor. So those two are different. So, tell me about, what are your reasons for thinking that you'll be a doctor instead of a police officer?
Participant 47:	Because sometimes, so if my friend's crying or if she's bleeding, I'll tell someone about it. And I'll get a bandaid or something to cover it up so it won't leak as much. And if she's crying about something that's hurting her then I'll tell an adult about it and they might take them to the hospital.
SL:	Okay. So is it that through personal experiences, you kind of see yourself doing things that a doctor may do??
Participant 47:	Yes.
SL:	All right that makes sense. So, you want to be a police officer, you really think you'll be a doctor. Would you like to be a scientist?
Participant 47:	Maybe.
SL:	Maybe, okay. Tell me about that.
Participant 47:	Because scientists they have all these mixtures and formulas they have to keep up. They have to be careful not to mix up the same things or it will explode and get everywhere and then they will have to clean it up. But it might catch on fire or something and it's not safe.
SL:	Oh. Okay. Uh huh. Is that something that you would dislike about being a scientist?

Participant 47:	Um, no, because I kind of like dangerous stuff.
SL:	Okay. Okay.
Participant 47:	But it's like, I don't want to get hurt. But, if you are a police officer, you're going to get hurt because some people hurt police officers too.
SL:	Mm-hmm (affirmative).
Participant 47:	So I don't know.
SL:	Okay. So, that's why you're a little unsure?
Participant 47:	Mm-hmm (affirmative).
SL:	So what are some other things that you would like about being a scientist?
Participant 47:	I like blowing up stuff.
SL:	You like blowing up stuff? Yeah.
Participant 47:	I like having the long coat thingy.
SL:	Mm-hmm (affirmative).
Participant 47:	I like have those goggles.
SL:	Mm-hmm (affirmative).
Participant 47:	And I like helping doctors make formulas for people who make the cure for something. If they need a cure for cancer, the scientist can help the doctors find a special formula. They help the people that needs the formula.
SL:	What are some things that you think you would dislike about being a scientist?
Participant 47:	When you have to rush to do something or you have to really think hard about what you should do. Or if someone needs it so quick that they can't ... Like if they need it right away then you'll have to rush and you might do something wrong.
SL:	Mm-hmm (affirmative).
Participant 47:	[inaudible 00:04:58] and if you do something wrong then the formula won't be right and then you'll get blamed because you made the formula.
SL:	Mm-hmm (affirmative).
Participant 47:	Yeah. If you do that, then you might get fired from your scientist job and then you'll have to find another job. But you won't find another job that quick because you have to do interviews and stuff, or applications and stuff.
SL:	Mm-hmm (affirmative). Yeah. So, the science, if you do something that's incorrect, you might lose your job and then you don't know how long it'll take to find another job as a scientist.
Participant 47:	Mm-hmm (affirmative).
SL:	Okay. All right. So, do you want to go to college?
Participant 47:	Yes.
SL:	Yes?
Participant 47:	Mm-hmm (affirmative).

SL: Okay. Tell me about that.

Participant 47: College is kind of an adult, but you are training for an adult and your dream job that you want to do. It takes a lot of time, but if you take a lot of time then you'll get closer and closer to your career that you want to do.

SL: Mm-hmm (affirmative).

Participant 47: And if you do that, then you'll master your dream job and you'll be happy with yourself and you'll enjoy it.

SL: Yeah. What are some things that you would like about going to college?

Participant 47: Like at college you kind of become more mature. And you meet new people and some people they help you, really help you. And when they help you they get you on the ... So if you're on the wrong path, then they'll get you on the right path and tell you to focus. And tell you a lot of stuff to meet your dream job.

SL: Mm-hmm (affirmative).

Participant 47: And when they do that, then you'll become happy. And you'll become satisfied with yourself. And you won't have to be angry with yourself if you don't do the right thing.

SL: What are some things that you think you would dislike about going to college?

Participant 47: That I have to be away from my mother for a long time.

SL: That you have to ...

Participant 47: To be away from my mother.

SL: Oh, away from your mother.

Participant 47: And that it costs a lot of money. And that's why I want a scholarship for something to go to college, because I like to dance. And that's what I love to do. And if I get a scholarship for dance and I can go to college and I won't have to pay for it, all the way.

SL: Mm-hmm (affirmative).

SL: Yeah. So, you're really thinking about college?

Participant 47: Mm-hmm (affirmative).

SL: So you say you really want to go to college. Do you think you really will go to college?

Participant 47: Yeah.

SL: Yes? Okay. Tell me about that.

Participant 47: I think I'll go to college because I just like to travel and get to go places and learn about new stuff in different places. And some colleges are really far, so then you'll get to meet new people that you haven't seen before. Or you'll get to do things that you haven't done before like, write a 20 page long book.

Participant 47: And if you do that then you'll get to, that will go on your ... What is it called? I think it's called, I forgot. It's what babysitters give to parents or nannies.

SL:	What babysitters give to parents?
Participant 47:	Mm-hmm (affirmative). It's a paper of their history.
SL:	Oh. Oh. So if it's a job then it may be like a resume?
Participant 47:	Yeah, that.
SL:	Okay.
Participant 47:	Yeah, if you get a resume and give it to the people that you want to work for and they see that you've been good in college, then it's a big possibility that you'll get that job.
SL:	Oh. Yes. Yes. So it sounds like you're saying you really think you really will go to college because you want to gain that experience to put on your resume because you like to learn things, meet new people, travel. Okay. Is there anything else that you would like to tell me about what you want to be when you grow up or college?
Participant 47:	No. Not much.
SL:	No? Okay. So you said that you really want to be a police officer, but you think you really will be a doctor. And with both of those jobs they kind of help people. The reason why there's a difference, is because you find yourself helping people in a way that doctors may help someone. Like you mentioned if your friend is bleeding, you put a bandaid or give bandaid to your friend and help your friend out.
SL:	You said you're not sure as to whether you want to be a scientist or not? Is that correct?
Participant 47:	Yeah.
SL:	Okay. Even though you like 'dangerous things' but sometimes with being a scientist if you make a mistake then you might lose your job. You said that you really want to go to college. And again, you like to learn new things.
Participant 47:	Yes.
SL:	You're not happy about being away from your mom though, but it sounds like you're kind of thinking about, oh let's see if I can visit mom, while you're in college. You think you really will go to college as well.
Participant 47:	Yes.
SL:	Because you like to travel, you like to learn and you want to build up your resume. You want some things on your resume so you can get that dream job.
Participant 47:	Yes.
SL:	Does that sound about right?
Participant 47:	Yes.

Interview I: Aspirations
Participant 412

SL:	What do you want to be when you grow up?
Participant 412:	When I grow up I want to be an engineer.
SL:	An engineer? Okay, what does an engineer do?
Participant 412:	An engineer, they fix things and they build things.
SL:	Okay. Now, you say that you want to be an engineer when you grow up. What do you really think you will be when you grow up?
Participant 412:	A track star.
SL:	A track star? Okay, what does a track star do?
Participant 412:	They run, and they can qualify for the Olympics.
SL:	Oh, okay. Do you watch the Olympics?
Participant 412:	Yes.
SL:	Yeah? Okay, so when I asked you what you want to be when you grow up, you mentioned an engineer.
Participant 412:	Yes.
SL:	Then I asked you what you really think you will be when you grow up, and you said a track star.
Participant 412:	Yes.
SL:	So, tell me about that because I notice they're different. What are your reasons for thinking that you really will be a track star, instead of an engineer?
Participant 412:	It's because I really don't build things a lot, but when I do build thing, they look very nice. But I think I'm gonna be a track star because I'm very fast and that I'm willing to do what it takes to be up in the top of running.
SL:	What does that mean, the top of running?
Participant 412:	Be, like, one of the fastest runners in the world.
SL:	Yeah, okay. So you mentioned that you want to be an engineer, you think you really would be a track star, but would you also like to be a scientist when you grow up?
Participant 412:	Yes, my mom is actually one, a scientist.
SL:	Oh, your mom's a scientist?
Participant 412:	Yes.
SL:	Okay. What do you think that you would like about being a scientist?
Participant 412:	Well, being a scientist and create anything, and make a mess sometimes and you learn from your mistakes. If you mess up on something, there'll be no one there that is saying bad things about you or anything. And you make a mess to make better things.
SL:	Make a mess? So what do you mean by make a mess?

Participant 412: Like, if I was going to make a cure for something, then if I made a mess with it, with the ingredients I need for it, but I could make a mess but still do the right thing, and it'll finally work. And it'll take that to make something better.
SL: Oh, so kind of like you just keep trying? Like, trial and error
Participant 412: Yes.
SL: Okay, and sometimes you may make a mistake but eventually you'll make what you set out to make?
Participant 412: Yes.
SL: Okay, okay. What do you think you would dislike about being a scientist?
Participant 412: That sometimes it can be dangerous and that scientists, they don't really get a lot of money, but ... yeah.
SL: Okay, and how would it be dangerous?
Participant 412: 'Cause I'll go back to if I was making a cure, if it takes dangerous ingredients and if I get hit with one, I'll get hurt or even worse, die.
SL: Oh, okay. Okay, so there are just certain aspects of the scientist job that can be harmful to you?
Participant 412: Yes.
SL: Yeah, okay. When you say they don't make a lot of money, how much money is that?
Participant 412: Like, $50,000.
SL: Okay, 50,000? Okay. So you're saying that they make 50,000? That's what you're saying?
Participant 412: Yes.
SL: Okay, okay, and that's not a lot of money?
Participant 412: I would like to have at least $100,000.
SL: 100,000? Okay.
Participant 412: Yes.
SL: So tell me, do you want to go to college?
Participant 412: That depends. I'll go to college if I don't have my own business, but if I have my own business that helps and it gives me money, I don't really have to go to college.
SL: Okay, and what kind of business would you like to own?
Participant 412: I would like to own a engineering business.
SL: Oh, okay. Related to you being an engineer?
Participant 412: Yes.
SL: Like, your own engineering firm, kind of?
Participant 412: Yes.
SL: Okay. What do you think you would like about being a college student, if you choose to go to college?
Participant 412: Well, sometimes some colleges, they have very good food.
SL: They have very good food?
Participant 412: Yes.

SL:	Okay.
Participant 412:	And that you can make a lot of friends that are good people, that's your first chance of getting out in the real world without your parents there to hold your hand, and that you make your own choices of what friends you want and it's time for you to be careful.
SL:	Okay, you said time for you to be careful?
Participant 412:	Careful, yes.
SL:	Okay, and what do you think you won't like about being a college student or going to college?
Participant 412:	Well, because there are a lot of bad things like if I was trying to study, people are always having parties at colleges and they're loud. So if I'm trying to study, I can't study 'cause of that.
SL:	Oh, okay. So maybe the parties would interfere with-
Participant 412:	Yes, with my study.
SL:	... you being able to study. Okay. So you mentioned that if you don't have your own engineering business that you would go to college.
Participant 412:	Yes.
SL:	Tell me, do you think you really will go to college?
Participant 412:	I don't know, because I'm already about to start a business with origami.
SL:	I'm sorry. What kind of business?
Participant 412:	Origami business, so in origami.
SL:	Origami business? Okay, so you already have headstart on this?
Participant 412:	Yes.
SL:	Okay, so because you're starting your own business now.
Participant 412:	Yes.
SL:	... that you don't think you would go to college. Is it because, like you mentioned earlier, kind of like, if you have your business, you don't wanna go?
Participant 412:	If I have it by high school, I don't really need to go.
SL:	You don't really need to go? So, in terms of that, is that more of a choice that you're just making, or is it because, maybe, you think that you won't be successful, or something like that?
Participant 412:	It's a choice.
SL:	A choice? Okay, that's what I kinda figured based on your answers, but I just wanted to make sure, yeah. Okay. All right. Is there anything else that you would like to share with me in terms of jobs or college?
Participant 412:	Also, I would also like to be a NASCAR driver.
SL:	A NASCAR driver?
Participant 412:	Yes.
SL:	What does a NASCAR driver do?

Participant 412: They race, and they can get sponsors for them and endorsements.
SL: And endorsements?
Participant 412: Yes.
SL: Okay. Is there anything else?
Participant 412: They make a lot of money.
SL: What's a lot of money? How much do they ... I really don't know how much they make. How much do they make?
Participant 412: The minimum is about $20 million.
SL: Minimum, huh?
Participant 412: Yes.
SL: Okay.
Participant 412: And if you're one of the highest of the highest NASCAR drivers, they get from 140 million to 143 million.
SL: Okay, so I just want to make sure ... just kind of go over your answers. I want to make sure I have an understanding of what you shared with me. Just wanted to make sure we're still recording.
SL: So, Flash.
Participant 412: Yes?
SL: You mentioned that when you grow up you would like to be an engineer.
Participant 412: Yes.
SL: Because you like to fix and build things.
Participant 412: Yes.
SL: And when I asked you what do you think you really will be when you grow up, you mentioned a track star. In terms of being an engineer, you said that engineers, they don't get paid as much as you would like. They get paid about 50,000, but you would like to make at least 100,000 a year.
Participant 412: Yes.
SL: And you said that you also wouldn't mind being a scientist. Your mom is a scientist.
Participant 412: Yes.
SL: What does your mom do?
Participant 412: She's an environmental scientist, and she helps ... She goes out to lakes and stuff and check them. Then the good thing is that, she does all of that hard stuff, and then on her pay day she gets to, her and some of her co-workers, they go out to eat.
SL: And they go out to eat? So when you say that you would like to be a scientist, what kind of scientist would you like to be?
Participant 412: I think I'd like to be engineering scientists.
SL: An engineering scientist?
Participant 412: Yes.
SL: So what is the difference between an engineer scientist and an engineer?

Participant 412: Well, an engineering scientist, it is like a scientist mixed with an engineer, so you have all the greens and then you're building things. You build better things. Then a regular engineer, they just build things, like out of the blue, out of what they have, what pops up in their mind.

SL: Okay, so an engineer kinda of ... They create things and they build those things that they want to create?

Participant 412: Yes.

SL: But an engineering scientist would still build things, but it's more like they're improving on something?

Participant 412: Yes.

SL: Okay, got it, got it. Thank you so much for explaining that to me. I do appreciate it.

Participant 412: You're welcome.

SL: So in terms of college, just kind of going back to summarizing. In terms of college, you mentioned that if you have your own business, you don't want to go to college.

Participant 412: No.

SL: But if you don't have a business, then you would go-

Participant 412: Yes.

SL: ... to college. What is the reason for that in terms of if you don't have a business and then you would go to college?

Participant 412: 'Cause my dad told me that if I have a business, I'm making enough money that I can study things myself and get my own private teacher.

SL: Oh, okay. Okay, so the business will provide money-

Participant 412: Money.

SL: ... for you to continue to learn.

Participant 412: Yes.

SL: So if you don't have a business then you won't have that money, so then you would just go to college instead?

Participant 412: Yes.

SL: And to learn. Okay. So when I asked you if you really think you would go to college, you said you don't know, but it's because you're not sure.

Participant 412: Yes.

SL: It depends on if you have the business or not, and you already have-

Participant 412: I'm already starting.

SL: Starting. You're already starting your business, your origami-

Participant 412: Yes.

SL: ... business. Okay, then you also mentioned that you wouldn't mind being a NASCAR driver, because they make several million dollars.

Participant 412: Yes.

SL: With endorsements, I did not know that. Okay, so is there anything else?

Interview I: Aspirations
Participant 413

SL:	My first question is, what do you want to be when you grow up?
Participant 413:	I'm thinking about being a designer.
SL:	A designer? What kind of designer?
Participant 413:	For designing clothes.
SL:	Okay.
Participant 413:	My mom says I'm great at dancing, and I like to dance on my tippy toes, so maybe a ballerina.
SL:	What does a ballerina do?
Participant 413:	They dress pretty, and they twirl around a lot, and I would like to do that.
SL:	What would you say a clothing designer does at work?
Participant 413:	Make clothes for famous people. Make dresses and stuff like that.
SL:	You mentioned that you'd either like to be a clothing designer or a ballerina, and that's what you want to do. What do you think you really will do when you grow up?
Participant 413:	I don't know.
SL:	You don't know? That's okay. That's quite okay. You mentioned that you would either want to be clothing designer, ballerina, but you're not sure what you think you really will be when you grow up. Can you tell me some reasons that you're not sure what you'll be instead of becoming a clothing designer or ballerina?
Participant 413:	I don't really like to get out there. I'm more to myself. I don't really talk to people much. Just stay to myself.
SL:	How does that relate to being a clothing designer or ballerina?
Participant 413:	Because when you're on the sewing machine and stuff like that, it's quiet. You only hear the sewing machine. And I like quiet.
SL:	You like quiet. Oh, okay. So, you're saying actually, being a clothing designer, it'll help you to kind of stay quiet, so you're not putting yourself out there, actually?
Participant 413:	Yes.
SL:	Okay. In terms of what you think you really will be, would you still say you don't know?
Participant 413:	I don't know still.
SL:	You're just unsure about what the future holds for you?
Participant 413:	Yeah, I don't know.
SL:	Would you like to be a scientist when you grow up?
Participant 413:	Yeah, sort of. I've been thinking about a teacher, because my teacher, she's say I think out of the box sometimes.
SL:	Okay. So you mentioned teacher, I'm sorry. So you're saying your teacher said that?
Participant 413:	Yes.

SL:	Okay. And that's why you said you think you might like being a scientist, because you think out of the box?
Participant 413:	Yes.
SL:	Got it, okay. What do you think that you would like about being a scientist?
Participant 413:	You get to mix different things together, make a mess, and then find out why.
SL:	Make a mess and find out why, yeah. What do you think you would dislike about being a scientist?
Participant 413:	I don't think I would dislike anything.
SL:	Oh, okay. So are there some other things that you would like, then, about being a scientist?
Participant 413:	I think so. You get to work with other people, and find out different things that you don't know. And you might not know something, but your fellow scientists, they might know it. And they would tell you, and you would put all your thoughts together, and then you would get your final answer.
SL:	Yeah, kind of like collaborating with other scientists, yeah, to find an answer. Okay. Do you want to go to college?
Participant 413:	Yes.
SL:	Yes? Oh, you seem excited about that. Tell me about that.
Participant 413:	I've always wanted to go to college. I don't want to skip that. I just want to see how it feels to go, and I want to learn more, and do different things.
SL:	What do you think you would like about going to college?
Participant 413:	I've heard some colleges, they have different basketball teams, and soccer teams. I like to do soccer. I just like to do soccer.
SL:	Do you play soccer now?
Participant 413:	I used to.
SL:	You used to?
Participant 413:	Yeah.
SL:	Yeah. So one of the things that you think you would like to do in college, is to play soccer?
Participant 413:	Yes.
SL:	Yeah? What are some things you think you might dislike about going to college?
Participant 413:	You might not know anyone there. It's kind of scary at first, but then you get used to it.
SL:	Yeah. Okay. So you said you want to go to college. Do you think you really will go to college?
Participant 413:	I think so.
SL:	Yeah?
Participant 413:	Yes.
SL:	Tell me about that.

Participant 413:	I think I would end up going to college because my mom, I think she would pay for it, if we have to pay, I think she would pay for it, because she pushes me a lot to keep myself up, and never be low.
SL:	What do you mean by that?
Participant 413:	She would never push me down. She would push me up. She would help me with my homework if something is hard for me to understand, she would help me, and that's why I would think why.
SL:	Okay. So mom will be there for you-
Participant 413:	Yes, and dad too.
SL:	And dad, and make sure that you-
Participant 413:	I don't think they went to college. I think that's why they want me to go to college.
SL:	Do you talk to them about college and things like that?
Participant 413:	Yeah.
SL:	Yeah. Okay. Is there anything that you would think that you would like to share, in terms of what you want to be when you grow up, or going to college?
Participant 413:	I don't think so.
SL:	No? Okay, so I just want to make sure I understand. Sometimes it takes me a little while, so if you'll bear with me. But in terms of what you want to be when you grow up, you mentioned that you would either like to be a clothing designer, or a ballerina. And in terms of what you think you really will be when you grow up, you said you're not quite sure just yet.
SL:	But, in terms of being a clothing designer, something that you kind of notice is that, with the clothing designer, if they're kind of sewing something, or working on a garment, it's an activity in which they're by themselves, basically. So, you feel comfortable with that particular situation.
SL:	In terms of being a scientist, you said yes, because you were told you think out of the box. One thing that you're not so sure about, in terms of being a scientist, is sometimes you have to mix things up and ... Well, actually no. You said that is something that you like, right?
Participant 413:	Yeah.
SL:	Mix things up-
Participant 413:	And make a mess.
SL:	Find out why, yeah. Sorry about that. I do apologize. But, in terms of being a scientist, something that you said you dislike, you said there's nothing really, that you would dislike about being a scientist. So you actually like to kind of make that mess, and find out, "Okay, let's see. Let's find a solution to this. Let's be creative." You kind of like that process.

SL: In terms of, if you want to go to college, you said yes. You would like to learn more, learn different things. Something that you might dislike about going to college is not knowing anyone there, and kind of that whole process of getting to know people.

SL: You said you think you will really go to college because it sounds like mom and dad talk to you about college, and they really want you to go. If it comes down to mom having to pay for college, mom would do that for you, to make sure that you go.

Interview I: Aspirations
Participant 51

SL:	What do you want to do when you grow up?
Participant 51:	I want to play football and I want to design shoes.
SL:	Oh. Football and design shoes. Okay, so tell me about those jobs. When you say play football, what do you mean?
Participant 51:	I want to go pro.
SL:	Go pro? Okay. Any particular position?
Participant 51:	Running back.
SL:	Running back. Okay.
Participant 51:	But I might play receiver cuz I'm getting real tall.
SL:	And then you said also design shoes. Tell me about that. Tell me about that job. What is that like?
Participant 51:	I want to do it because I want to make shoes to wear and to where everyone can afford the shoes.
SL:	Oh.
Participant 51:	And I want to make shoes that people would like.
SL:	What kind of shoes?
Participant 51:	They're gonna have ... It's gonna be money.
SL:	Okay. Cool. What do you call a person who designs shoes? What's their job?
Participant 51:	A shoe designer. That's it.
SL:	Shoe designer. Oh okay. Shoe designer. Okay. All right. You said that you like to play football, either a running back or a receiver. And you also like to be a shoe designer. Is that at the same time?
Participant 51:	Yes.
SL:	Yeah? Okay. What do you think you really will be when you grow up?
Participant 51:	Shoe designer.
SL:	Shoe designer? Okay. You mentioned that you would like to be a football player/shoe designer. And then what you really think you'll be is a shoe designer. I noticed those are a little different. Tell me what is it about ... What are your reasons for thinking that you really will be a shoe designer and not a football player/shoe designer?
Participant 51:	Cuz most people did good but some of them that are really good, sometimes they don't get drafted.
SL:	Oh. Okay. All right. Say that again?
Participant 51:	I said that I think I would have a better shot at shoe designing than football because most people that are really good at football, they don't get drafted.

SL: Okay. Okay. That's kind of the road block that you're thinking about. If you don't get drafted, then you think you'll just be a shoe designer

SL: You mentioned that you want to either be a football player, shoe designer. And you said that you really think you'll be a shoe designer, depending on what happens with the draft. Would you also consider being a scientist?

Participant 51: Sometimes science is very tricky, so I might not say scientist because the way I think I got to ... Some people when I do learn something they show me .... They tell me, but I got to go back and look it up and have a visual.

SL: Okay.

Participant 51: That would be better.

SL: Okay. So, you're saying when someone presents you with information and science, sometimes you just have to go back and you need a visual? Okay. And because of that, you're saying that no, you're not thinking about being a scientist. Okay. Other than that, what do you think that you might dislike about being a scientist?

Participant 51: A scientist? Most of the time, when scientists do experiments sometimes they be looking for a lot of strange things and I don't like ... Sometimes they be doing stuff with frogs and I can't ... Frogs, they're disgusting to me.

SL: Yeah. Okay. Just certain things about science ... Certain things that you learn in science that you just don't have an interest in doing.

Participant 51: [inaudible 00:05:42] like nature. It's a lot of weird things in nature. Sometimes if I'm doing an experiment I might run into it and freak out a little bit.

SL: Yeah. What is it about that freaks you out a little bit?

Participant 51: Like frogs. If you pick it up, it's slimy.

SL: Oh. Yeah. When they dissect frogs and things like that?

Participant 51: And like-

SL: Or are we talking about live frogs?

Participant 51: Alive frogs.

SL: Alive frogs? Okay.

Participant 51: And sometimes snakes. They a part of nature so you can run into a snake any time.

SL: Especially here in Florida. There are a lot of snakes here. Okay. That makes sense based on what you said. Do you want to go to college?

Participant 51: Yes, ma'am.

SL: Yes? Okay.

Participant 51: Florida State.

SL: Which one?

Participant 51:	Florida State.
SL:	Oh, you already know. Okay.
SL:	Tell me, what do you think you'd like about going to college?
Participant 51:	I would like ... Most of the time, I would like going to college and learning more. Most of my friends, they playing football in college so I would like the competitiveness against them.
SL:	Oh, okay. Competition and learning more. What do you think you would dislike about going to college?
Participant 51:	Some people say that your freshman year you can't have a car at college.
SL:	Oh. I didn't know that. Okay. So, I guess it just depends on the school, huh? Okay. Some freshman can't have a car.
Participant 51:	And most of the time the one thing that would keep me from college, the one thing that's difficult, I like doing extra curricular things so I might not have the time to be working and have my own money to do stuff, like go out and stuff like that.
SL:	Okay. I was just going to ask you what do you mean by that? Go out meaning what?
Participant 51:	Go out to eat, celebrate for a game.
SL:	Okay.
Participant 51:	Going out to eat and go with my friends and the football team.
SL:	And football team. Okay. You said you want to go to college. Do you think you really will go to college?
Participant 51:	Yes.
SL:	Yes? Okay. And what are your reasons? What are the reasons that you think you really will go to college?
Participant 51:	Because I'm smart and the high school that I'm going to is ... I'm very athletic, so I might have a scholarship with that and grades.
SL:	And you were going to say something about the high school that you're going to? What high school is that?
Participant 51:	Jones.
SL:	Jones? Okay. Okay. You think you really will go because you have that athletic ability and you're going to try to get a scholarship. Right?
Participant 51:	Mm-hmm (affirmative).
SL:	To pay for your way to go to college. Is there anything else that you think I should know about what you want to do when you grow up or going to college? No? Okay. I just want to go over some of this, just to summarize, just to make sure I understand what you're saying.
SL:	You mentioned that you want to be a football player, either running back or a receiver.
Participant 51:	Mm-hmm (affirmative).

SL: And also be a shoe designer. And you want to do that at the same time.

Participant 51: Yes.

SL: But in terms of what you think you really will be when you grow up is focusing on designing shoes; being the shoe designer. And you mentioned one of the reasons why those two answers were different is because of the draft and being recruited by a college or university and making it to the draft and getting drafted.

Participant 51: Mm-hmm (affirmative).

SL: Well, you didn't say college or university. I'm sorry. But the recruiter going to the college or university and recruiting you and then actually making it to the draft, cuz that's a whole process, right? The draft, itself.

SL: You mentioned that in terms of being a scientist, you said that you're not interested in being a scientist because there are just some things in nature that just kinda bug you; no pun intended. But snakes and frog can be kinda slimy, so you're just not interested in that kind of thing.

SL: In terms of college, you said that you want to go to college because you would like to learn more. And then also, you're pretty competitive so you will enjoy the competitive nature of ... Was that just related to football?

Participant 51: Mm-hmm (affirmative).

SL: Yeah.

Participant 51: With my friends.

SL: With your friends.

Participant 51: Cuz they said they going to a different colleges, cuz we all said we going to the same high school but we're gonna go to a different college to ... We know we all good, but we wanna see if you could do this, we would like to see other people talent because we all on at the same time if we at the same school.

SL: Oh okay. That makes sense. You're saying, okay, you're going to Florida State but your friends may go to a different university. Okay.

Participant 51: One of them going to Clemson.

SL: Clemson. So you're thinking okay, when football season rolls around and we're all playing football, let's see whose team is the best, right? Kind of thing?

Participant 51: Mm-hmm (affirmative)

SL: Is that about it? Yeah? Okay. But one of the things that you said that you would dislike about going to college is you're thinking that you might not have time for extra-curricular activities like going out with your friends to celebrate if you want. And then also maybe not having a car.

SL:	In terms of do you really think you'll go to college you said yes because you're going to focus on getting a scholarship, right? Because you're pretty ... You have a pretty high athletic ability, so that's what you're going to ... That's what you want to achieve. Is that about right?
Participant 51:	Mm-hmm (affirmative).
SL:	Does that sound right to you?
Participant 51:	Yes ma'am.
SL:	Okay.

Interview I: Aspirations
Participant 55

SL:	Actually my first question is what do you want to do when you grow up?
Participant 55:	When I grow up I want to get into politics and to start off I'm thinking about being governor.
SL:	Being governor. So tell me more about that, what does a governor do?
Participant 55:	The governor is basically like the president of the state and it makes the decisions for the state and it to call in like the national guard if anything happens.
SL:	Okay. So you mentioned that you want to be governor when you grow up.
Participant 55:	Yes.
SL:	Now I would like you to tell me what do you think you really will be when you grow up?
Participant 55:	When I grow up I really think I'll be a architect. Like building.
SL:	Mm-hmm (affirmative).
Participant 55:	It's like I don't wanna be it but that's what I think is gonna happen.
SL:	And what does an architect do?
Participant 55:	They design blueprints for buildings and things that's in construction and stuff like ...
SL:	Okay, okay. Now you mentioned that you think you really will be an architect so but before you said you really want to be a governor. So tell me about that difference. What are your reasons for thinking that you would really be an architect and not a governor?
Participant 55:	I think I really be an architect because I love taking things apart and try to put them back to together and see if they still work. And governor, that's just like something I want to do.
SL:	Okay. So I'm just trying to understand. So when you say that you want to be an architect, why not a governor since that's what you want to do?
Participant 55:	It's the other way. I wanna be a governor and not a architect.
SL:	You said you really think you'll be. You really think you'll be an architect. But not a governor. So what's the difference there?
Participant 55:	I would think I'll be an architect because it's like the governor has a lot of responsibilities and things that I have to carry. Like a lot of weight if I become a governor. I really like can't hold that much pressure.
SL:	Okay. Now you mentioned that you want to be a governor. You really think you'll be an architect but would you like to be a scientist when you grow up?

Participant 55: No.
SL: No, okay. So tell me about that.
Participant 55: Science is really not my strong point. I know a lot about science but not as much. I really don't think that's what my path is and what I'm going later in life.
SL: Okay. So tell me about your path.
Participant 55: My path is just, I would say like manly work. It's a lot of construction. Like politics and life. [inaudible 00:03:51]
SL: That's why I wanted to know more about it. So you said that your path ... So you mentioned manly work. What does that mean for a scientist? You're saying that the scientist isn't manly work. Is that what you're saying, or.
Participant 55: Yes.
SL: Yep. Okay, okay. I just wanted to make sure I understood. What do you think that you would dislike about being a scientist if you had to be a scientist?
Participant 55: If I had to be scientist I would dislike remembering a lot of things. And the components and elements of stuff like in the periodic table.
SL: Mm-hmm (affirmative).
Participant 55: Just a lot of things to memorize.
SL: Yeah. Do you think you would like anything about being a scientist?
Participant 55: I think I probably like, probably inventing something new and getting paid a lot of money for it.
SL: Oh, okay. Okay. But it's not a part of your path. Do you want to go to college?
Participant 55: Yes.
SL: Yes, okay. So tell me a little bit more about going to college.
Participant 55: When I go to college I would like to go a high-ranking college like Yale or Harvard. So I can get a few degrees and so I can just keep working and get smarter. So people can accept at more top notch jobs so I could get the best job possible.
SL: Okay. You say get a few degrees. What kind of degrees would you like to get?
Participant 55: Probably my Masters and Doctors. What is that called?
SL: A doctorate?
Participant 55: Yes, the doctorate.
SL: Would you like to study anything in particular?
Participant 55: I would like to study politics.
SL: Politics? Okay. Going along with the governor theme, right?
Participant 55: Yes.
SL: Like your path to be governor. What do you think you would dislike about going to college?

Participant 55: I'm not really much of a early person, like a early bird. Having to get up early and leave my dorm and go in the school.

SL: Mm-hmm (affirmative). Mm-hmm (affirmative). Like earlier than you have to get up to go here?

Participant 55: Yes.

SL: Okay. You said you want to go to college. Do you think you really will go to college?

Participant 55: Yes.

SL: Yes? Okay. So tell me a little bit about that. What are your reasons that you think you will go to college?

Participant 55: More reasons that I think I will go to college?

SL: Mm-hmm (affirmative).

Participant 55: Because I have, it's a drive in me. 'Cause my family ... It's not really known to be going to college and so I wanna be, not the first but one of the few people in my family to go to college and finish college.

SL: Mm-hmm (affirmative). Oh, okay. The first to finish college.

Participant 55: But my sister is a little ahead of me.

SL: How old is your sister?

Participant 55: She's 13.

SL: She's 13? Oh, okay. So a little bit.

Participant 55: Yes.

SL: She's in 7th grade. Is it-

Participant 55: I'm hoping that I will skip a grade in order to catch up with her and still go to college before her.

SL: Oh, okay. So you want to beat sister to college, huh?

Participant 55: Yes.

SL: All right. Is there anything else that you would like to share with me in terms of what you wanna do when you grow up or college?

Participant 55: For college, if I don't get accepted to one of those college, football it will be like my ... I won't say like my last but it'll be one of my careers that I have in mind. But I know the NFL is gonna be hard to go to. Very, very hard but I tried to think about playing varsity if I don't get accepted. Into those colleges - Yale and Harvard.

SL: Okay. So kind of like being a football player as a backup plan.

Participant 55: Yes.

SL: Yeah. Okay. All right. So I'm just going to summarize what you ... Are some of the things that you mentioned to me. I just want to make sure that I have a good understanding. Okay?

Participant 55: Okay.

SL: So you mentioned that you would like to go into politics and in particular be a governor, that's what you want to do when you grow up. But you mentioned that in terms of what you really think you will end up doing is being an architect.

Participant 55: Yes.

SL: And one of the reasons why there is a difference is that being a governor there's a lot of pressure. That comes with that job. But also you'd love buildings and things like that. So you're also very interested in being an architect anyway.

Participant 55: Yes.

SL: In terms of being a scientist, you said "no" because it's not really your path. You seem to have some things that you really want to do in life and being a scientist is not necessarily one of those things. But also you prefer jobs that you perceive to be-

Participant 55: Manly.

SL: Yeah, manly, yeah. And in terms of college you said a definite yes.

Participant 55: Mm-hmm (affirmative).

SL: I could see when I asked that question you were like, "Yes! I want to go to college." Not only do you want to go to college, you already have an idea of some of the colleges you want to go, which are what we will call ivy league colleges. Such as Harvard, Yale. They're the top of the top colleges. Because you want to get smarter. But one of the things that you are a little unsure about, you don't if you'll like is getting up early enough to go to some of those classes. But you also mention if you're not accepted to one of those colleges then a backup plan could be to be a football player.

SL: In terms of whether you think you really will go to college, you again, you definitely said "yes" because you have this drive. Not only do you have this drive, you have this goal to beat sister. You wanna be the first person in your family to go to college. Is that-

Participant 55: And finish.

SL: Oh, and finish. You're right. I put finish here. So you're right, that is a difference. To go to college and finish college.

Participant 55: All years. All five, 10. I don't care how long. I wanna finish college.

SL: You're also interested in degrees such as a Masters degree and Doctorate degree.

Participant 55: Yes.

SL: So you not only want get your Bachelors degree, which is usually about four years. But you want to go beyond that too.

Participant 55: Yes.

SL: Okay. And you're interested in studying politics. [inaudible 00:11:27]

Participant 55: [inaudible 00:11:29] college

SL: Does that sound about right?

Participant 55: Yes.

SL: Okay.

Interview I: Aspirations
Participant 58

SL:	What do you want to be when you grow up?
Participant 58:	I want to be a pediatrician when I get older.
SL:	Oh, a pediatrician. And what does a pediatrician do?
Participant 58:	They help little children, and I want to be a baby nurse [inaudible 00:00:31] it's a baby nurse.
SL:	Okay. Now you mention what you want to be, a pediatrician when you grow up. What do you think you really will be when you grow up?
Participant 58:	A beautiful black woman, and I will [inaudible 00:00:54].
SL:	Just, excuse me, I mean, you kind of answered it, but I didn't hear the job.
Participant 58:	The job, I really want to be a pediatrician.
SL:	Oh, okay, so you want to be a pediatrician, and you think when I grow up, I really will be a pediatrician.
Participant 58:	Because I believe in myself.
SL:	Because you believe in yourself.
Participant 58:	We all have to have confidence in yourself.
SL:	Mm-hmm (affirmative)-so you know that what you want, you will achieve, because you believe in yourself and you have confidence?
Participant 58:	Mm-hmm (affirmative)-
SL:	Okay, I know you said you want and will be a pediatrician, do you think you would like to be a scientist when you grow up?
Participant 58:	Maybe an engineer.
SL:	Okay. Is that a no for scientist, but yes for engineering?
Participant 58:	Yes, but I don't know, it's like between.
SL:	Between? Okay, tell me about that, no that's okay, yeah, tell me about that, what do you mean?
Participant 58:	[crosstalk 00:02:02] know because sometimes I can't, I have allergies in me and stuff, and yes because I love experiments.
SL:	Okay.
Participant 58:	[inaudible 00:02:17] so it'd be, you know.
SL:	Yeah. Okay, you really can't what?
Participant 58:	I really can't be it because I have a lot allergies.
SL:	Okay.
Participant 58:	So no.
SL:	Tell me about that, how is that related to the job of being a scientist? How would that effect your job?
Participant 58:	Because I have, you know how smokes comes out science experiments, and I have asthma.
SL:	Oh, you have asthma.
Participant 58:	But I never had an asthma attack, so, my mom takes care of me.

SL:	Yeah. So these are during experiments, and then there's a little bit -
Participant 58:	No, it's like, we don't really do experiments in our school because no one listens to our science teacher.
SL:	Oh, okay. So in terms of the smoke, where would the smoke come from?
Participant 58:	From the science thing? I don't know.
SL:	What is it called?
Participant 58:	Potions?
SL:	Oh, okay, oh, I see what you're saying, so from like chemicals and things like that, okay, okay.
Participant 58:	I can't really put chemicals on my skin, because I got eczema.
SL:	In terms of being a scientist, what do you think you would like about being a scientist?
Participant 58:	Being able to learn new things, and I like frogs, I love to dissect them and stuff.
SL:	Mm-hmm (affirmative)-
Participant 58:	I would help to do that.
SL:	Mm-hmm (affirmative)-
Participant 58:	I just like finding new things. And sciences gets you through life.
SL:	Tell me about that.
Participant 58:	If you think scientific, like say if you need to clear your car, I mean fix your car and stuff, you can, if you're a scientist you'll be able to because you have a scientific mind.
SL:	What is a scientific mind?
Participant 58:	It's like a mind, I don't even know, I've just heard that term.
SL:	You've heard the term? So you probably kind of know, you know what it means, but it's kind of hard to put in words, like what it is?
Participant 58:	Mm-hmm (affirmative)-
SL:	Okay, do you want to go to college?
Participant 58:	Yes.
SL:	Oh you [crosstalk 00:04:47] you were like yes!
Participant 58:	My first two years of college I want to go to Valencia College because I want to stay with my mom so I can help her and get money, and then my next two, then the rest of it, I want to go FMU, or what's it called [inaudible 00:05:16].
SL:	What do you think you would like about going to college?
Participant 58:	That I'll be able to like, so that I can prove to my mom and dad that I'm a smart little woman, and I'm, and God is always gonna [inaudible 00:05:36] do anything.
SL:	Mm-hmm (affirmative)-so you kind of want to demonstrate and prove that to your mom and dad?
Participant 58:	And I want to be able to give them, be a good older sister to my other two sisters so that they can do the same thing, they won't be like, if I was to be on the streets, they would probably follow me,

	but I don't want them to be following me if I do anything bad, so I'm gonna do good things and go to college so that they can follow me.
SL:	So you want to be a good example to your two sisters. Younger sisters.
Participant 58:	Especially my baby sister, she's only four years old, my other sister, she's on the other side.
SL:	Okay. You mean the other campus?
Participant 58:	Yes.
SL:	Okay, do you think you really will go to college?
Participant 58:	Yes, I believe in myself and I will go to college!
SL:	Okay, very good. Is there anything else that you would like to tell me about what you want to do when you grow up or about going to college?
Participant 58:	For first job, I would like to work at Publix.
SL:	Sorry?
Participant 58:	My first job, I would like to work at Publix or something.
SL:	Oh okay.
Participant 58:	Because it's really a good job, and I want to have a summer job when I get older, and help out children and I would like to be a tutor for them. But if I really don't be a pediatrician, I really be a teacher.
SL:	So a pediatrician or a teacher. So you really have this theme where you like to work with, you want to work with kids.
Participant 58:	Mm-hmm (affirmative).
SL:	Yeah, okay.
Participant 58:	I want to be a psychologist, too.
SL:	A psychologist? What kind? What would you like to do?
Participant 58:	If children, you can't, if they're children, children, their mind is formed, it's like they have anger issues and stuff, I want to be able to train them to do good and don't, just help them out with their parents because if your parents, the more that you whoop your children, this is what I learned from a psychologist once, she my mom friend, she said, the more that you, cause this lady, she whipped her child, and made her child mind go, and she said the more you whoop your child, the worser it get.
SL:	Mm-hmm (affirmative)-
Participant 58:	So I don't want them, I want to help children out so they won't get in trouble and so that life can be even more better instead of getting in trouble.
SL:	Yeah, but again, it's that theme, working with children. Mm-hmm (affirmative)-so you mentioned you want to be a pediatrician -
Participant 58:	And when I get my college money, I want to be able to help my mom pay her bills, and then I want to have a Thanksgiving drive

	for homeless people, give away, donate to churches, I want to be able to have my own business, and have a homeless shelter for people that need help, and I want to be able to provide food for them, and I want to be able to provide clothes, shoes, old shoes and stuff, and for Christmas, me and my mom, we always go out to the homeless shelter, and we give all of our old toys, and sometimes we buy new toys, and I want to do that when I get older, be able to give to there, and we got clothes and shoes and stuff, so that's what I want to be able to do.
SL:	Okay, and you said in doing so, you want to have your own business?
Participant 58:	And I want to be able, one teacher, she taught us not to do bad in school, so that if somebody on campus, they're a visitor, and they maybe have a scholarship for your child, and you have to do good, I want to be able to have a scholarship because my teacher, her soon, he was doing good because he was trying, he was taking this man to visit because he was really the person to take him out to visit the classes, and then the next day, he got a scholarship, so that's what I want to be able to do.
SL:	Okay, alright, not bad. So let me kind of summarize what you said, okay, I just want to make sure I understand.
Participant 58:	Okay.
SL:	I won't mention everything, but just kind of the main points. So you mentioned that you want to be a pediatrician, right? And not only do you want to be a pediatrician, you really think you will be because you believe in yourself. Also that, well, you talked about you having this theme where you like to work with children and work with kids. You also mention that you would like to be a baby nurse as well, but I kind of understand where you were going with that. You mentioned that in terms of being a scientist, now does it sound like that answer to that was no?
Participant 58:	Yes, it was no.
SL:	Okay, because you said you would rather be something like an engineer.
Participant 58:	Yeah.
SL:	But you kind of talked about in terms of scientists, because of your asthma, like smoke and things and fumes from chemicals would really bother you, and that would just be uncomfortable for you.
Participant 58:	Yes.
SL:	But you do like to learn things, but it's just some of those things kind of bother you -
Participant 58:	Yes, a lot.
SL:	You mentioned that you want to college, not only do you want to go to college, you have a plan to go to college.

Participant 58:	Mm-hmm (affirmative)-
SL:	You said for the first two years you would like to go to Valencia, after that maybe [inaudible 00:12:00], you said you really want to show mom and dad that you're kind of prove to them that you're smart, and that God can get you through.
Participant 58:	Mm-hmm (affirmative)-
SL:	Oh, you also mentioned [inaudible 00:12:16].
Participant 58:	And prove to my sisters.
SL:	Right, be an example to your sisters, because they look up to you, and based on the decision that you make now [crosstalk 00:12:26].
Participant 58:	That's what my dad always says, or my mom says. When I do something wrong they said your sister and your little sister's gonna look up to you and they're gonna start doing the same thing that you do, so don't do it.
SL:	Okay. You also mentioned that you really do think that you'll go to college, because you believe in yourself, and you were very confident when you said that. You were like, I believe in myself. Some of the other jobs that you want to do, you said maybe your first job work at Publix, what would you like to do when you work at Publix?
Participant 58:	I love being a cashier. Or either, I want to actually be able to do good so that I can move up steps, I can be a cashier, then a head cashier, then a customer service manager, I'll not work on the dairy and stuff over there because I'm allergic to dairy, and I won't work on the food part [inaudible 00:13:45] and I'll be able to go up to and be able to be a store manager.
SL:	So you even have a plan for that as well
Participant 58:	Yes I have private plans, so much on my mind.

Interview I: Aspirations
Participant 59

SL:	My first question to you is what do you want to be when you grow up?
Participant 59:	A pediatrician.
SL:	Oh. Okay. You were pretty confident about that.
Participant 59:	Mm-hmm (affirmative).
SL:	Tell me, what does a pediatrician do?
Participant 59:	A pediatrician works with the little kids and babies.
SL:	Mm-hmm (affirmative).
Participant 59:	And so I love working and helping kids out so I want to be a pediatrician.
SL:	Okay. You want to be a pediatrician. What do you think you really will do when you grow up? I'm sorry. What do you really think you'll be when you grow up?
Participant 59:	A model.
SL:	A model? Okay. What does a model do?
Participant 59:	It's like where you take a lot of photos and you're trying on different things. It's like a commercial.
SL:	Mm-hmm (affirmative).
Participant 59:	Something like they do.
SL:	Okay. In a commercial. You mentioned that you want to be a pediatrician, but you really think you'll end up being a model.
Participant 59:	Yes.
SL:	Tell me about the reason for that difference. What are the reasons that you think that you really will be a model and not a pediatrician?
Participant 59:	Well, when I was growing up a lot of people told me that I was pretty so I thought that since I'm so confident that I think a model will be a great choice for me also.
SL:	Okay. Would you like to be a scientist when you grow up?
Participant 59:	Yeah. I like to work on technology and things like that.
SL:	Oh. Tell me about that.
Participant 59:	It's like different inventions that I feel like I can test out and things and stuff and I'm actually working on a science project right now.
SL:	Oh. Okay.
Participant 59:	Yeah.
SL:	What kind of science project are you working on?
Participant 59:	It's a cyber security project. It deals with how to block out a wifi signal.
SL:	Cyber security. What do you think you would like about being a scientist?

Participant 59:	I think I would like about being a scientist is working with different things I've never tried before.
SL:	Mm-hmm (affirmative). Like what?
Participant 59:	Like what's inside a computer and how does it work and things like that. Yeah. I think I would be able to test that out as I get older.
SL:	Okay. And what do you think you would dislike about being a scientist?
Participant 59:	I don't know.
SL:	You don't know. That's okay. If you think of anything, just let me know. Okay?
Participant 59:	Okay.
SL:	Do you want to go to college?
Participant 59:	Yes I do.
SL:	Yeah? Okay. Another really excited answer there. Okay. Tell me about that.
Participant 59:	Well, I really do want to get my degree and I really do want to be a pediatrician so I do want to go to college.
SL:	So you really want that degree so you can be a pediatrician?
Participant 59:	Yes.
SL:	Okay. What do you think you would like about college?
Participant 59:	Just that I'd be able to do everything that will help me get my degree so I college is like one of my biggest choices I should do and I love going to school.
SL:	You love school. Okay. You mentioned do everything that will help you to be a pediatrician. What's everything? What are some of those things?
Participant 59:	Like learning what a pediatrician does and how to do it and things like that and yeah, that's it.
SL:	Okay. What do you think you would dislike about college?
Participant 59:	I don't know.
SL:	You don't know? Okay. And again, if you think of anything, just let me know.
Participant 59:	Okay.
SL:	Do you think you really will go to college?
Participant 59:	Yes.
SL:	Yes. Okay. Tell me about that.
Participant 59:	I think I'll really go to college because it's like I'm focused in class and my mother and my father encourage me so I have that feeling inside me that I will make it to college.
SL:	Mm-hmm (affirmative). Do your parents talk to you about college often?
Participant 59:	Not often but they do talk to me about college sometimes.
SL:	Sometimes.
Participant 59:	Mm-hmm (affirmative).

SL: Alright. In terms of what you would dislike about being a scientist, is it still you don't know or have you thought of something? Okay. And what about dislike about going to college? Anything? Okay. Alright.

SL: So I just want to make sure I understand what you shared with me and so I'm just going to summarize the main points, and so tell me if it's right, not right.

Participant 59: Mm-hmm (affirmative).

SL: You mentioned that you would like to be a pediatrician. You like to work with children.

Participant 59: Mm-hmm (affirmative).

SL: And that's what you want to be when you grow up.

Participant 59: Yes.

SL: In terms of what you really think that you'll be when you grow up and that you think that you'll be actually a model.

Participant 59: Yes.

SL: And maybe to appear in photos, photography, as well as commercials. You were told that you're very pretty.

Participant 59: Pretty. Yes.

SL: You're thinking hmm I think that's I will be when I grow up because of that. In terms of if you'll like to be a scientist, you said yes, you really like technology. You're working on a project called cyber security.

Participant 59: Yes.

SL: You really like technology.

Participant 59: Yes.

SL: That's one of the things that you would like about being a scientist. In terms, of dislike, you don't really have anything that you can think of, that you would dislike, in terms of being a scientist. No?

Participant 59: Okay.

SL: Okay. I saw your expression, so I'm like what, is there something? Okay. In terms of do you want to go to college? You mentioned yes, because you really want that degree do be a pediatrician.

Participant 59: Yes.

SL: That's really important to you. And you think you would like learning about being a pediatrician and what a pediatrician does and things like that.

Participant 59: Yes.

SL: In terms of what you would dislike about going to college, don't have anything just yet, and you said you don't know. And that's okay. Do you think you will really go to college? You said yes.

Participant 59: Mm-hmm (affirmative).

SL: And I can tell my your expression that you really meant that. You mentioned that you're focused and mom and dad encourage you to go to college at times, whenever you happen to speak to them about it.

Participant 59: Yes.

SL: Does all of that sound about right?

Participant 59: Yes.

Interview I: Aspirations
Participant 514

SL:	What do you want to be when you grow up?
Participant 514:	I wanna play football.
SL:	Football? Any particular position?
Participant 514:	Yeah. Either quarterback or wide receiver.
SL:	Ah. What do those positions do?
Participant 514:	Well, the quarterback, they throw the ball. And then the wide receiver catches the ball.
SL:	Okay. Okay. So, either quarterback or a wide receiver. All right. You said you want to be either a quarterback or wide receiver; basically a football player-
Participant 514:	Mm-hmm (affirmative).
SL:	-When you grow up. What do you think you really will be when you grow up?
Participant 514:	I don't think that I will make it to football because not many people make it to football, but if I try hard enough I could. But if that doesn't happen, then I don't have a second plan yet.
SL:	No? Okay. Okay. Primarily, it's just football player, kinda thinking about other things, basically. Is that about right?
Participant 514:	Mm-hmm (affirmative).
SL:	Okay. That makes sense. What would be the reason for you not ... I know you started to say something, but tell me more about some of the reasons why you may not be a football player?
Participant 514:	Well, because sometimes there's a really good person whose in high school and he's really, really good. And then when he got to college he was good but he wasn't as good as he is in high school. He was good in college and then he didn't make it to the NFL. And then basketball is like football because you gotta go through high school then college then football ... I mean, the bigger league. But there's this man who was really, really good. He was better than Jordan, but he didn't make it.
SL:	Ah. Okay. What I'm hearing you saying is that sometimes you can be really good and still not make it and still not be drafted or make it on the team.
Participant 514:	Yeah.
SL:	Basically. You mentioned basketball. Do you also want to be a basketball player? Or are you just mentioning as an example?
Participant 514:	I play basketball, too.
SL:	You play basketball, too.
Participant 514:	But I'm better at football.
SL:	Oh, okay. That's why you mentioned you want to be a football player.

Participant 514: Yes.
SL: Okay. Okay. You're just saying sometimes things just happen and you could be really, really good and just not make it.
Participant 514: Yep.
SL: On a ... Are we referring to a NFL team?
Participant 514: Not really.
SL: No? What do you mean by that?
Participant 514: Cuz it doesn't matter what team that I'm on, it's just that you just kinda ... I just wanna play football.
SL: Okay. Okay. It doesn't matter if it's the NFL or if it's another football league-
Participant 514: It doesn't matter, but I play mostly out ... I play a lot of sports. I know how to play baseball. I know how to play basketball. I know how to play soccer. Yeah, stuff like that.
SL: Oh. So, football, soccer and basketball.
Participant 514: And a little bit of baseball.
SL: And a little bit of baseball. All right! Out of that, are you saying ... because you said that you're a better football player than a basketball player. So, when you consider all those, what would you say you're best at?
Participant 514: Well, I say football still.
SL: Football still? Okay.
Participant 514: But if we had to put it in places, I would do football, basketball, baseball, then soccer.
SL: Okay. All right. But definitely sports are your thing.
Participant 514: Yes.
SL: Yeah? Okay. You mentioned that you would love to be a football player, but would you also like to be a scientist when you grow up?
Participant 514: Yeah. Or I'd be like an engineer.
SL: Okay. Tell me about being scientist.
Participant 514: Well, scientists, they discover stuff and make stuff and they test things and they know how to work with chemicals and stuff that I do not know.
SL: Okay. What do you mean you do not know? [inaudible 00:04:50]?
Participant 514: It's like I know what it is but I don't know what it's called.
SL: Oh, okay. Okay. You're talking about the specific chemicals that they're using, you're not sure. Okay. What do you think you would like about being a scientist?
Participant 514: The experiments.
SL: The experiments? Oh, that was really quick. Do you enjoy your experiments-
Participant 514: Yes.
SL: -Here at school? Okay.

Participant 514:	Mm-hmm (affirmative). I like the experiment every day with the ... We put pepper in the water and then we put soap on our hand and then put it in there and [inaudible 00:05:26] of the pepper on the side, went away from the soap.
SL:	Oh, okay. What do you think you would dislike about being a scientist?
Participant 514:	Like when you do ... When stuff go bad or like ... I don't think it's true, but when I see this TV show it was like something happened and then there was stuff that got on their hands and then they touched their face, the color that was on their hand turned their face that color.
SL:	Oh. Okay. So, just when the ... Was it an experiment that they were doing?
Participant 514:	Mm-hmm (affirmative).
SL:	Oh, okay.
Participant 514:	It was like they put two chemicals together. They were both clear, but they were two different things. And they put ... I think it was green and orange. It was like a reddish, orangish color. And then it had ... It didn't explode but it came up and then he was trying to clean it up with a paper towel and a whole bunch paper towels so it wouldn't go through it, but it still went through it and got on his hand. And then something got in his face and he tried to wipe it off and then the stuff that was on his hand got on his face.
SL:	Oh, no. So, one thing that you may dislike about being a scientist is that sometimes things don't work out the way you think they should or-
Participant 514:	Yeah.
SL:	-To plan. Yeah. Okay. Do you want to go to college?
Participant 514:	Mm-hmm (affirmative).
SL:	You do? Well that was really ... You really ... Okay.
Participant 514:	I wanna go-
SL:	Tell me about that, because you looked a little excited when you said that.
Participant 514:	Cuz it's three schools that I want to go to.
SL:	Oh, okay. What schools?
Participant 514:	The one that I think I might go to is ... What's it called? What's it called? The one with the snakes. FAMU. That one.
SL:	Ah. FAMU. Okay.
Participant 514:	Cuz my grandma, my auntie went there.
SL:	Okay, so you have family members who graduated from FAMU, or at least went to FAMU.
Participant 514:	I think my auntie ... She graduated two years ago, I think. And she's doing that test to be a lawyer.
SL:	Oh, okay.

Participant 514: She's saying that it's a really, really, really, really, really, really, really hard test. So, she would ... Every time she watch us she would be studying and then we would be in the room and then after a few hours she' come in there and check on us and then go back to studying for the test.

SL: What are the other two colleges are you-

Participant 514: UCF and what's the other? Oh. UCLA.

SL: Oh. UCLA. Okay. What do you think that you would really like about being a college student or going to college?

Participant 514: I really, really, really, really want to know what they learn cuz it be looking like scribble scrapper. My uncle, he go to UCF and then he'll be coming home and I'll see what he be working on and he'll tell me to try to solve one on a separate piece of paper and it just got wrong.

SL: It just got wrong.

Participant 514: Yeah.

SL: Because you weren't there in class with him, right? To know what they were learning.

Participant 514: I think it was A plus B something, something, something.

SL: You're curious about what they're learning in school.

Participant 514: Mm-hmm (affirmative). And plus, I want to live in a dorm. I want to see how it feels. And then-

SL: You want a little bit ... I'm sorry.

Participant 514: I want to live in a dorm to see what-

SL: Oh, live in a dorm.

Participant 514: Yeah.

SL: Okay. And see how it feels. Okay. What are some things that you think you would dislike about going to college?

Participant 514: Waking up early in the morning.

SL: Oh. Is that waking up early for ....

Participant 514: Classes or if you don't have classes or if I'm on the football that's when the team gotta go to practice or-

SL: Oh.

Participant 514: -Stuff like that.

SL: Uh-huh. Okay. Okay.

Participant 514: Or if we went to sleep in [inaudible 00:09:57] we have to wake up early before we got to go to class and then clean up and then go to class. Stuff like that.

SL: Okay. You said that you want to go to college. You seem pretty excited about that. Do you think you really will go to college?

Participant 514: Mm-hmm (affirmative).

SL: Yeah?

Participant 514: Well, I want to but if I don't have enough money to go to college or ... I'm also trying to get a scholarship to go to college. Yeah.

SL: What do you think? Do you think you really will go to college?
Participant 514: Mm-hmm (affirmative).
SL: Yeah? Okay.
Participant 514: Well, if I get a job it'll be enough.
SL: If you get a job or if you get a scholarship.
Participant 514: Yeah.
SL: You think you'll go to college.
Participant 514: I think you need money anyways cuz all your gonna do is just pay for your books and then you also need to pay for you to eat and stuff-
SL: To live, right?
Participant 514: Yeah.
SL: Yeah. Okay. Okay. What happens if you don't have that money? Do you think you really will go to college?
Participant 514: Mm-hmm (affirmative).
SL: Okay.
Participant 514: I'm gonna ask my mom and my dad and see what we have from there.
SL: Okay. All right. That sounds like a plan. Is there anything else that you would like to tell me about jobs or going to college? Like what you want to do in going to college?
Participant 514: If I don't play football, basketball, soccer or baseball, I would like to .... It's this place. The place that make milk? I want to make milk. It's called-
SL: The place that makes milk.
Participant 514: It's called T.G. Lee, something like that. It be on the milk carton.
SL: Oh. Okay. Okay.
Participant 514: I'm gonna work for that.
SL: Tell me about that. What do you mean you want to work for T.G. Lee?
Participant 514: I want to be one of those people who ... The ones that put the stuff in the truck or drive the truck. Cuz I want to drive a really, really, really big truck.
SL: Okay. Is it that you saw a T.G. Lee truck or something?
Participant 514: Mm-hmm (affirmative).
SL: Yeah.
Participant 514: It was on the highway. It was a big old sign, T.G. Lee, it had a label and a big circle around it.
SL: Okay. What I hear you saying is that if you don't end up being a professional athlete that you would like to be a truck driver for T.G. Lee?
Participant 514: Yeah.

SL: Okay. All right. I'm just gonna quickly summarize what you said, okay? Just to make sure I understand what you're saying; make sure I have it right.

SL: You mentioned that in terms of what you want to be when you grow up that you want to be a football player and in particular, a wide receiver or a quarterback.

Participant 514: Mm-hmm (affirmative).

SL: In terms of what you think you really will be when you grow up, you said pretty much the same thing, right?

Participant 514: Mm-hmm (affirmative).

SL: Okay. And this goes along the way ... Here we go. [inaudible 00:13:22]. You would like to be a scientist or an engineer, but we were for the most part talking about scientist. And that something that you would like about being a scientist is kind of like the discovery and doing experiments.

Participant 514: Mm-hmm (affirmative).

SL: And working with chemicals. But you're not so sure about when the experiments go wrong or they don't go as planned.

Participant 514: Yep.

SL: In terms of college, you already know which colleges you want to go to. FAMU was at the top of your list, but also UCF and UCLA.

Participant 514: Mm-hmm (affirmative).

SL: And you're curious about what people learn in college basically because you know people who are in college and they showed you the work and you're like what's that? You want to know more. And something that you might dislike is getting up early.

Participant 514: Yes.

SL: For classes or practice.

Participant 514: Cuz when we wake up early in the morning to come to school, we be waking up at six cuz we gotta be here at eight. But sometimes that I be a little sleepy I be moving slow and then be late to school.

SL: Oh. Okay.

Participant 514: Cuz I-

SL: You already know that about yourself. Oh, okay.

Participant 514: But sometimes I go to sleep at eight. No ... Yeah eight or nine and I still be sleepy. So, I kept doing it and doing it and going to sleep at seven and then I kept sleeping at seven. The first day it was like I wasn't tired. I mean, I was tired. And then the rest of the days I wasn't tired. I started going to sleep at seven. And then this morning I woke up ... I went to sleep at eight but I wasn't sleepy so I was like, yay.

SL: Okay. You're already anticipating that based on how you feel when you get up early to come here to school.

Participant 514: Mm-hmm (affirmative).

SL: In terms of whether you think you will really go to college, you mentioned the need for money. Whether that's you getting a job or getting a scholarship. But even if you don't have the money, you think you still would really go to college because you're going to ask mom and dad to help you come up with a plan. Either they help you or you all come up with a plan.

Participant 514: Yeah. Going on the sleepy thing, we're doing a test on Monday and Tuesday. Well, last week I know I did an FSA on reading. And I took a Red Bull in the morning so I could stay up, but-

SL: You drunk a Red Bull?

Participant 514: Mm-hmm (affirmative). It was only a little bit though.

SL: Okay.

Participant 514: And then I was still sleepy. But Monday and Tuesday I started doing tests. In the morning, I was wide awake and then when I got into the test I was sleepy.

SL: Ah. You're concerned that if you feel like this now, when you go to college you might still feel the same way, right? Even after drinking a Red Bull. Yeah.

Participant 514: It's like the first time I drank it I was wide awake. I was up all night. But [inaudible 00:16:56] was a weekend on a Saturday.

SL: Is there anything else you want me to know about what you want to do when you grow up or college?

Participant 514: Yes.

SL: Yes?

Participant 514: Also, I want to be a construction worker. I like building stuff. But the only thing that I'm really scared of doing construction work here is when we have to build all the way up and we're all the way on the top on that thing, cuz a man working up there was walking on the thing. And the man had a string .... I mean, like a harness. And he fell. But he didn't fall. He just stayed where he was. And then he climbed back up an got on the thing cuz he was getting held by the harness.

SL: Okay. You're saying you don't mind being a construction worker, but being high on the scaffolding if it's a tall building or something that may be a little scary.

Participant 514: Okay. I don't like roller coasters, but the one at Fun Spot ... Not the wooden one. The wooden one scared me. The blue and yellow one, I like the blue and yellow one. I don't know why. I know one time we went there to Fun Spot so we get started from the front and then all the way to the back. And then when we got to the roller coaster I kept giggling and kept giggling and kept giggling. And then they was like you not tired? Cuz I know you scared of roller coasters. And then I said nope.

SL: No.

Participant 514:	Then I got on one more time, then we left.
SL:	All right. Okay.
Participant 514:	I felt like I was on the [inaudible 00:18:32].

APPENDIX R
INTERVIEW II: OCCUPATIONAL IMAGES TRANSCRIPTIONS

Interview II: Occupational Images
Participant 46

SL:	I would like you to explain what your scientist is doing in this picture.
Participant 46:	Watering plants.
SL:	Watering plants? Okay. So tell me a little bit about your scientist.
Participant 46:	He is -
Participant 46:	He is clever.
SL:	He's clever? Okay. Tell me about that.
Participant 46:	I'm not sure.
SL:	Not sure? Okay. So your scientist is watering plants. Where is your scientist right now?
Participant 46:	Outside.
SL:	Outside. Okay. What if you had more time, what would you add to your picture?
Participant 46:	Him discovering bees.
SL:	Discovering -
Participant 46:	Bees.
SL:	Bees? Okay. And tell me a little bit about that.
Participant 46:	Like how honey is made.
SL:	Okay. So the scientist is... are they making the honey? Are they trying to discover how honey is made?
Participant 46:	Just how honey is made.
SL:	Okay, got it. Is there anything else you would add to the picture?
Participant 46:	No.
SL:	No? Okay. What are some other things that scientists do at work?
Participant 46:	Do liquids in science.
SL:	Okay, tell me about that.
Participant 46:	Like... (long pause) I'm not sure.
SL:	You're not sure? Okay, no problem. So but they kind of mess around with liquids you're saying?
Participant 46:	Yeah.
SL:	Okay. You're just not sure what they're doing with the liquids exactly.
Participant 46:	Yes.
SL:	Okay. Alrighty. And where do scientists work? If you can kind of describe their environment for me.
Participant 46:	Sometimes outside and inside.
SL:	Okay outside and inside. So when they're outside, what does that look like?
Participant 46:	Explosions.
SL:	Ooh, tell me about that.
Participant 46:	Like volcanoes.

SL:	Like a volcano?
Participant 46:	A volcano explosion.
SL:	Okay. And what about indoors? What does that look like?
Participant 46:	Chemicals changing colors.
SL:	Chemicals changing colors? Okay. Alright. And what else is around them?
Participant 46:	Other scientists.
SL:	Other scientists. Okay. So what are the other scientists doing?
Participant 46:	Observing.
SL:	Okay. So they're kind of looking at one scientist do what?
Participant 46:	And taking a hypothesis.
SL:	Taking a hypothesis?
Participant 46:	Yes.
SL:	Okay. What are some things that a person would need to know if they want to become a scientist?
Participant 46:	Very smart.
SL:	Very smart? Yeah. What else is there?
Participant 46:	Not sure.
SL:	Not sure? Okay, no problem.
SL:	Okay, so you were saying that a scientist would need to be smart. What are some other things that they would need to know in order to be a scientist?
Participant 46:	I'm not sure.
SL:	Not sure? Okay. What do you think they have to do at school to be a scientist?
Participant 46:	Do science with teachers.
SL:	Do science with teachers? Mm-hmm (affirmative). So tell me about that.
Participant 46:	They do other chemicals.
SL:	Okay, alright. And do you think a person would need to go to college in order to be a scientist?
Participant 46:	Yes.
SL:	Okay. Tell me about that.
Participant 46:	They have to have a degree to be a scientist.
SL:	Okay, they have to have a degree to be a scientist. What kind of degree do you think they'll have to have?
Participant 46:	Science.
SL:	Science degree? Okay. Alright. Anything else about a person going to college?
Participant 46:	You have to pay.
SL:	Oh, you have to pay what, the school? Kind of like tuition?
Participant 46:	You have to pay to go to college.
SL:	Oh like pay tuition, yeah. To go to college. Okay. Is there anything else?

Participant 46:	No.
SL:	No? Alrighty. And so on this page, you mention that it's pretty hard to learn to be a scientist. So in what ways is it pretty hard to learn to be a scientist?
Participant 46:	Some chemicals can get on your skin.
SL:	Mm-hmm (affirmative).
Participant 46:	And it can stay there.
SL:	Oh and it can stay there, okay. So how are these chemicals getting on the skin? It's just something that it happens at school?
Participant 46:	No.
SL:	No, okay. So in what ways do you think it's hard to learn to be a scientist?
Participant 46:	You have to study lots of things.
SL:	Oh, a lot of studying. What are some things you think they have to study?
Participant 46:	Everything on Earth.
SL:	So everything on Earth, huh? That sounds like a lot.
Participant 46:	Outside.
SL:	Outside? Yeah? Okay. And you said that it's very hard to do the job of a scientist every day. In what ways is it very hard to do the job of a scientist every day?
Participant 46:	You have to do chemicals every day.
SL:	Mm-hmm (affirmative).
Participant 46:	And you probably don't see your family.
SL:	And you probably - I'm sorry.
Participant 46:	Don't see your family.
SL:	Oh, now that - what do you mean by that?
Participant 46:	Like if someone was countries away from you and your family like, if my family was in New York and I had to go to New Jersey, the [inaudible 00:09:15] city, it's gonna be far.
SL:	Mm-hmm (affirmative). Okay. So sometimes families are separated when you're a scientist.
Participant 46:	Yes.
SL:	Okay. And you said that scientists get paid a lot of money. You said very much under how much money do you think scientists get paid. So tell me about that.
Participant 46:	Probably billions.
SL:	Billions? That is a lot of money. Okay. And how, you said that it's somewhat important referring to the job that a scientist does. You said it was a medium amount of importance. So tell me about that.
Participant 46:	Because we have to have oxygen.
SL:	Because we have to have oxygen? Okay. And what do you mean by that? What does a scientist have to do with oxygen?
Participant 46:	They can cut the trees and look inside.

SL:	Okay.
Participant 46:	Cut all the trees and look inside.
SL:	Mm-hmm (affirmative).
Participant 46:	And trees give us oxygen.
SL:	Okay, okay. Now last question, how did you find out about scientists?
Participant 46:	Not sure.
SL:	Not sure? Okay. Do you all talk about scientists in school?
Participant 46:	No.
SL:	No? What about at home? No? Okay.

Interview II: Occupational Images
Participant 47

SL:	So it's Mr. ... What's the name of your scientist?
Participant 47:	Skopobob.
SL:	Skopobob! Okay. And tell me, what is your scientist doing in the picture.
Participant 47:	He's blowing stuff up.
SL:	He's blowing stuff up? Okay. And tell me a little bit more about what's going on there.
Participant 47:	He mixed some stuff and it's about to explode like a volcano.
SL:	Um hmm. Okay. And your scientist has like an interesting body here. What's going on here?
Participant 47:	He had on a lab coat with all these different type of buttons and these nerdy glasses.
SL:	Uh huh.
Participant 47:	And he's always happy. And he's bald.
SL:	And he's always happy. And he's bald? Okay! Thank you so much for that detail, I do appreciate it. If you had extra time, what would you add to the picture?
Participant 47:	Maybe a table.
SL:	Uh huh.
Participant 47:	Or ... just a tad bit of hair.
SL:	A tad bit of hair? Yeah, okay.
Participant 47:	And some arms.
SL:	And some arms? Oh, that's right! He doesn't have any arms there. And is there anything else you would add?
Participant 47:	No.
SL:	No? Okay.
Participant 47:	Maybe a chair.
SL:	A chair?
Participant 47:	Yeah.
SL:	Would he be standing or sitting?
Participant 47:	Standing.
SL:	Standing? Okay. What are some other things that a scientist might do at work?
Participant 47:	They might communicate with other scientists. And to like, how to find cures for different types of stuff.
SL:	Oh ... Okay. Tell me about that.
Participant 47:	If, well ... They've like study some different kinds of stuff. Like on animals, or like sea life, or the trash that goes into the sea, with animals ... and they might talk about land, or land animals, or sea animals, or new animals that they didn't discover yet.
SL:	Okay.

Participant 47:	When they find a new species.
SL:	And, you've mentioned that they talk to other scientists. What are they talking about?
Participant 47:	They're talking about, maybe, how they can fix something and how they can cure somethings too.
SL:	Okay, okay. So where do scientists work?
Participant 47:	In a science lab.
SL:	In a science lab? Okay. If you look around the science lab, what does it look like?
Participant 47:	It has these glass bottles. They have like, different colors of liquids and like tubes, skinny tubes going into something else. And it's a bottle and then something drips into something and it explodes and then it goes through a different tube then just makes something.
SL:	Okay. Is there anything else you see in the lab as you look around?
Participant 47:	If you walk in, it's like a counter where all these, they're like shaped like, they're like fat at the bottom and skinny at the top, and then it's just like a whole bunch of those all around.
SL:	Okay. And what are some things that a person needs to know in order to be a scientist?
Participant 47:	You have to know what to mix in with other things, unless like the whole place is gonna blow up. Or you have to know how to be careful and not drop anything or things gonna just go on the floor and all your hard work's just a waste.
SL:	Uh oh. Okay. And what can a person do at school to help them prepare to be a scientist?
Participant 47:	Oh, we can have a lot of science fairs and like, we can buy like science material and just study everything that scientists do.
SL:	Okay. And what do you mean by science material?
Participant 47:	Telescopes, microscopes, a magnifying glass, just stuff that you can see tiny things up close and you can study what's in it and how did it get in here.
SL:	Okay, alright. Thank you.
SL:	Do you think that a person will need to go to college in order to be a scientist?
Participant 47:	Some people need to.
SL:	Oh. Some do. Okay, so tell me, what do you mean by some people?
Participant 47:	Some people might not get the concept of it, but others might from high school, but some might not have taken a class on science but they want to be a scientist. But others might have took a class on science and they get it and they know what to do.
SL:	And so if they get it in high school, do they go to college or ... no?
Participant 47:	No.

SL: No. Okay. Because you're saying if they get it in high school, they won't need college in order to be a scientist?

Participant 47: Uh huh.

SL: But if they don't get it in high school, they kind of need to take extra classes so they can understand science a little bit better.

Participant 47: Yes.

SL: Okay, got it. So, I'm going to turn the page here.

SL: Oh, so you said your scientist is actually working outdoors?

Participant 47: Uh huh.

SL: Can you explain the environment that your scientist is in?

Participant 47: He's outside. I didn't put any outside pictures on it, but he's outside so the roof won't come down and expose.

SL: Oh, I see. Okay, so your scientist, does he have all the same things that you described before, but it's just that those things are outside?

Participant 47: Uh huh.

SL: Okay, so that if there's an accident, the roof doesn't come down or it doesn't damage the building.

Participant 47: Uh huh.

SL: Got it! Okay, thank you so much. Let's see, mixing different types of [inaudible 00:07:07]. Okay.

SL: I noticed you said an old, white coat.

Participant 47: Um hmm.

SL: So tell me about that.

Participant 47: Because the other ones, they have the buttons, but the other part has these right here, where you put the button inside ...

SL: Oh, okay.

Participant 47: It has those on the side, but at the top is none right there, so he can't buckle that up. But he don't buckle this side because these are in the way.

SL: Oh, okay.

Participant 47: They got covered up.

SL: They got covered up. Okay. So just kind of regular buttons on this side, but on the other side, the buttons are there but he can't button them up because they're kind of covered up. Okay, got it.

SL: Alright, so here you mentioned in terms of how hard you think it is to learn to be a scientist, you said it's very hard to learn to be a scientist. Tell me about that.

Participant 47: Because you have to take a lot of classes. It starts to get boring, but you still have to pay attention unless you won't be a scientist.

SL: Um hmm. What classes do you think a scientist would need to take?

Participant 47: Maybe history, and maybe algebra, maybe like another math class, because you have to learn math to be a scientist because if you don't know math, you wouldn't how much to put in or how much not to put in.

SL: Ah. And what are you referring to when you say how much to put in?

Participant 47: Like, measuring cups, or something that you measure, or if you put too much in a measuring cup you could mess up the whole thing. If you put just the right amount then you won't mess it up.

SL: Okay, alright. And in terms of how hard do you think it is to do the job of a scientist everyday, you said it's pretty hard. Tell me about that.

Participant 47: Because sometimes you can lose chemicals and you don't know where you put them. And then you'll have to make a new batch of it and that can probably take like an hour, or so.

SL: Um hmm.

Participant 47: But, you might have a backup one that you can use.

SL: Okay. Alright. And in terms of how much money you think a scientist gets paid, we have it all the way over here. You said "very much". So, tell me about that. How much is that, would you say?

Participant 47: Because ... Oh, how much?

SL: Oh, go ahead. What were you going to say?

Participant 47: I think they get paid a lot because they help people with like, if the hospital needs things to help people get better, like medicines, they make the medicine that ... because hospitals they get paid a lot, too. So, the people that help the hospital get paid a lot, they should get paid more than the hospital because they make medicine and help people get better.

SL: Okay. And how much, when you say "very much", how much money would you say that is?

Participant 47: Maybe like, a million ... every two months.

SL: A million every two months? Okay.

Participant 47: Or two million every ... two months.

SL: Every two months?

Participant 47: Two million every two months.

SL: Okay. And you mentioned that, in terms of how important the job of being a scientist is, you said it's about medium. Medium importance. Tell me about that.

Participant 47: Because people think scientist is not a job because they don't really see scientists' lab is like a place where scientists work. So, people don't really see that as often because I don't see scientist's labs everywhere. I never saw scientist lab before. But like, people think it's not a real job and that they just do it, just to do it. And that they don't have nowhere to work, they just work at their house or something.

SL: Okay, and who are these people that you're referring to?

Participant 47:	Community people, or people who work at a known place and they think that since they work at a known place that scientists don't work at a known place, too.
SL:	Um hmm. And what do you mean by known place? Like just a place that ...
Participant 47:	Where people just go, like all the time. Or where people mostly go to buy stuff.
SL:	I see. So you're saying you feel like people who work in a place like, maybe like a grocery store ...
Participant 47:	Like Walmart?
SL:	Like Walmart. Because it's a known place, they go there to buy things. Those people might not think that scientists actually have real jobs because they don't see where the scientist works. It's kind of like, out of sight, out of mind kind of thing. I don't see where you work, so your job isn't real.
Participant 47:	Um hmm.
SL:	Okay. Got it. Thank you so much for explaining that to me. Appreciate that.
SL:	How did you find out about scientists?
Participant 47:	When I watched a lot of movies.
SL:	Oh movies? Any particular movies?
Participant 47:	Cloudy with a Chance of Meatballs.
SL:	Is that the name of the movie?
Participant 47:	Um hmm.
SL:	Oh! I haven't heard of that one. Okay. And there's a scientist in that movie?
Participant 47:	Um hmm.
SL:	And what is the scientist like?
Participant 47:	The move is about him making a machine that turns water into food. And he lives under the "A" in Atlantic, and it's called Swallow Falls where they only eat sardines. They fry sardines, the boil them, the make them for babies, and that's the only thing they eat. But when he got, he made the machine and he turned it into the food. But when he pressed the button, it exploded. And he had to get another power source, so he went to ... you know the little wires on the poles?
SL:	Um hmm.
Participant 47:	He went to that ... no ...
SL:	Kind of like a telephone pole?
Participant 47:	Um hmm. He went to one that's big with a lot of wires with a gate. And he went there, he connected everything and it worked, but it started, it was like a rainbow cloud that shot up from the bottom because it was so powerful. So, he had to hold on with his ... and he made, like a monkey who does the monkey sound. But when he

	put the thing on he could understand what he was saying because it's like a monkey simulator.
SL:	Um hmm.
Participant 47:	And it transformed the monkey sound into real words that they monkey was saying.
SL:	Okay.
Participant 47:	But it was like this thing went wrong when it was called Sardine Land, they were doing the grand finale and they just opened it, and the had the world's largest sardine but it was like, tiny. But they had a big fish bowl. But then they tried to make the fish jump into the fire. But he came through the grand finale with his rainbow stuff and he had to hold on and he just went and just flew. And then he let it go and it went into the sky.
SL:	Okay. I'll have to look this movie up.
Participant 47:	Um hmm.
Participant 47:	And then, he went to the lake because he made the fish bowl fall and it came all over him and his monkey. And then he put his head on it and then it cracked and then it fell, and everybody was yelling at him so he ran to the lake and that's when something fell from the sky into the lake. It was like a stand, like, what is it called? It's like on a bunk bed. A ladder. Yeah, it was ladder right there into the thing, as so he was sitting right there with his monkey and he saw something fall into the lake and it was a pickle. And then the news girl, she came and she sat down on the thing and she put her feet on the ladder and her feet went into his eyes and he was crying and then she said, I'm sorry and then she realized that he was the one who made her lose, I mean, not lose her job, but because it was her first day and he was the one who made her ruin it. And then something fell in the trash can and it was cheese and then he grabbed it and when he turned around, there was a rainbow of clouds that was coming his way and then it just started raining cheeseburgers.
SL:	So what other, that last thing is really interesting. So what other sources have you learned about scientists from?
Participant 47:	Books.
SL:	Books? Like what kind of books.
Participant 47:	Like bugs books. I don't really like bugs like that.
SL:	Are these books that you can get from the library?
Participant 47:	Uh huh.
SL:	Oh, okay. So just various books, kind of like about, okay. Anything else?
Participant 47:	No.
SL:	No? Do you all talk about scientists in school?
Participant 47:	No.

SL:	No. Okay. What about at home?
Participant 47:	Maybe at STEM, which is one of my specials, but we don't really talk about scientists.
SL:	Okay. What do you all talk about in the STEM special area?
SL:	For the STEM Expo, we made electric houses. And we didn't get to make the houses but we made, like it was a group with me and we made circuits to light up the houses.
SL:	Uh huh.
Participant 47	So, do you know how to make the circuit?
SL:	No, actually. I do not.
Participant 47:	But you need a battery and a little black piece to put the battery in and these two silver things. And then you need two wires that connect like with the [inaudible 00:19:32]. You need two of those, and you need a blue thing with a tiny light bulb in it.
SL:	Okay.
Participant 47:	So what you do is, the first wire you connect it to the silver piece on the battery and then you connect it to the silver piece on the blue thing and then you just do it all over again. And you have to make sure the light bulb touches the silver part that's on the bottom of it, and it'll light up.
SL:	Okay. And so that was what you did for your group project for the Expo? Okay. What else do you all talk about in the STEM class?
Participant 47:	We talk about how to make different things. We talk about energy and solar energy and electric energy and kinetic energy and potential energy, we just talk about energy.
SL:	Okay. And your STEM class, is that where you talk about science stuff? Or do you also talk about science in your regular class, too?
Participant 47:	Sometimes we talk about science with our science books, but we don't talk about scientists.
SL:	Oh, okay. Okay. Do you have science every day with your teacher?
Participant 47:	Mm-mm
SL:	No? Okay. So is it mostly that you just talk about science in your STEM class?
Participant 47	Mm-hmm
SL:	Alright, is there anything else ...

Interview II: Occupational Images
Participant 412

SL:	Okay. We have Dr. Steve, huh?
Participant 412:	Yeah.
SL:	Why don't you tell me about your picture?
Participant 412:	In my picture, Dr. Steve, he is trying to ... he's just ... He's trying to make something that is just like salt but is healthy.
SL:	Oh really?
Participant 412:	Yes. As they fail, when they fail he x-es them out. He keeps going. He has his tongue out like the concentration. He's concentrating. There is his vial, his beaker and he's trying to make [inaudible 00:01:01].
SL:	Okay. Tell me about his name, Dr. Steve. Why did you choose that name?
Participant 412:	I called him Dr. Steve because that's showing respect to him.
SL:	Oh okay, got it. Dr. Steve, you chose that name because you wanted to indicate that you have a lot of respect for this person.
Participant 412:	Yes.
SL:	He's trying to make salt. A healthy version of salt.
Participant 412:	Yes.
SL:	Through trial and error, he's ... he'll fail, he'll try again, he'll ... you know.
Participant 412:	Yes.
SL:	Just so he can make it just so it's right. Okay. What might you add to the picture if you had more time to draw?
Participant 412:	I would add him finally getting it right.
SL:	I'm sorry.
Participant 412:	Him finally getting it right.
SL:	Oh, okay. Okay. Because you have these x's here, so so far he's gotten it wrong.
Participant 412:	Yes.
SL:	But if you had more time you would show that he got it right. Okay. What are some other things that scientists do at work?
Participant 412:	They mix things and they get messy.
SL:	Okay. Now tell me about that. What do you mean by getting messy?
Participant 412:	It can, as I said before, it can make a mess. It can take a mess to create something that can save your whole world.
Participant 412:	To say what is better, it's better to make a mess than to have your whole world die.
SL:	What are some things that scientists mix?
Participant 412:	Like cleaning stuff to make everything clean. Not to go in food or in drinks, but like to go on walls and stuff. Edible coins and stuff

because babies, they like to eat stuff, everything. So they're gonna make a lot of edible things so then if the baby eats it, if the baby tries to eat it the baby can chew it and swallow it and not get hurt.

SL: Okay. Did you say edible ...

Participant 412: Edible items.

SL: Oh, edible items. Okay. All right. Is there anything else?

Participant 412: No.

SL: No, okay. Where do scientists work?

Participant 412: They work mostly in labs. And sometimes they work in offices like my mom.

SL: Mm-hmm (affirmative). Oh that's right, your mom's a scientist, right?

Participant 412: Yes.

SL: Mm-hmm (affirmative). Okay.

Participant 412: Yeah, that's where they work.

SL: Okay. If you could describe their environment, how would you describe it?

Participant 412: In labs, like mostly has a lot of stuff. Tables, a lot of tables. White tables, white walls. And then a lot of beakers and liquids and computers. And in an office ... I'm gonna describe my mom's. It has two computers. It's a cubicle. It has two computers and then a desk space. Space for a desk and then there's a trash can under the desk.

SL: Oh. Okay.

Participant 412: Yeah and there's cabinets, about six or four.

SL: Okay. Kind of like above-

Participant 412: Yes.

SL: ... on the cubicle. Okay, all right. What are some things that a person needs to know to be a scientist?

Participant 412: They need to be smart and they need to know math. They need to not be ashamed of their ideas and let their ideas just flow out and be a creative person.

SL: That's interesting. They need not to be ashamed of their ideas. Tell me about that.

Participant 412: Most people, when they make up an idea and it's wrong, they're ashamed of themselves because something that they made up is wrong. So they're gonna have to be the opposite of that.

SL: Okay.

Participant 412: And they're gonna have to be ... what's it called? They're gonna have to have a lot of patience because people will talk about them like they're nothing. So they don't need to be getting mad and going and hurting people. Like, they just keep doing it until they get it right. And then they bring it out and everyone who was talking about them is amazed. And they are wrong.

SL:	Mm-hmm (affirmative). Okay. So there can be a lot of criticism-
Participant 412:	Yes.
SL:	... dealing with the work of a scientist.
Participant 412:	Yes.
SL:	Okay. What can they do at school to help them prepare to be a scientist?
Participant 412:	Encourage them, write letters to them, show videos to them. Some videos of us trying to be scientists, of us being scientists. Like, doing experiments.
SL:	Do you think a person will need to go to college in order to be a scientist?
Participant 412:	No.
SL:	No? Okay, tell me about that.
Participant 412:	I don't know. I put yes or no.
SL:	Yes or no? Okay.
Participant 412:	Both. Because if you're already very creative, you don't really need college. That's just going somewhere way away from your family for four years. But I think probably yes because it could get more ... someone else can help you and teach you and boost you up more. So then once you're all the way up there and then it hits you, you can go higher.
SL:	Okay. All right. Makes sense. [inaudible 00:07:44]. Let's shift gears a little bit and let's try this page here. Okay, your scientist is working indoors.
Participant 412:	Yeah.
SL:	And it's doing experiments and crossing out his ...
Participant 412:	His ideas as they fail.
SL:	Oh, his ideas as they fail. Okay. I know it's like with the crayons, right, it's a little difficult to read. Okay. For this, you mentioned that it's very hard to learn to be a scientist.
Participant 412:	Yes.
SL:	Can you tell me about that?
Participant 412:	You do have to be smart and all of that stuff. And you have to go through criticism. You go and put yourself in danger doing all of that stuff to help your work. That's why I put very or very much 'cause it's hard to learn to do that when you know you're going to do that. It's hard to learn.
SL:	Okay. You mentioned that it's very hard to do the job of a scientist every day.
Participant 412:	Yes.
SL:	Why don't you tell me about that?
Participant 412:	It is hard because you're doing a lot of things. And if you're just a scientist by yourself, you have ... it's just worse 'cause there's more and more work for you to do. And if you have other people helping

	you, that means you can divide the work equally. You pay them, give them good things and that could lead to you having no friends too.
SL:	Okay. I know we spoke about this a little bit during our first interview, but you mentioned that scientists make little money.
Participant 412:	Yes.
SL:	Tell me about that.
Participant 412:	I looked up on ... on what was it called ... Google, the median, the average salary of a scientist and they said it was $55,000 and that's a little bit. My dad said that can't even pay our rent.
SL:	$55,000? Okay. I don't remember, what is considered a lot to you?
Participant 412:	$100,000 and over.
SL:	That's right. Okay, now I do remember. I remember that conversation. Okay. You mentioned that the job of a scientist is very important. Tell me about that.
Participant 412:	Yes. 'Cause the job of a scientist, the world is depending on them to make up new ideas. Think about Thomas Edison, he was a scientist. He's very famous now. He was a scientist and now look what we have. We have light bulbs, different types of light bulbs because he did not give up through criticism and all of that.
Participant 412:	And we have electric cars because Tesla, Nikola Tesla. He did not give up although he was treated bad by Thomas Edison. 'Cause Thomas Edison wanted his way of electricity but Tesla, he was thinking of another way. And now we have Tesla electric cars. We have light bulbs and Teslas.
SL:	Okay. How did you find out about scientists? I know you said your mom works as a scientist.
Participant 412:	Yes.
SL:	But have you ... do you all talk about scientists here at school or at home or are there other ways of [crosstalk 00:12:02].
Participant 412:	Not really.
SL:	No.
Participant 412:	I just want to be one 'cause I want to be ... I want to be a scientist like my mom 'cause she doesn't like her job as a scientist. I want to find a better ... something better to show her that there's something better than working for someone else ... to being a scientist but working for someone else. There's something better than that I want to show her.
SL:	Okay. So I'm sorry. You said you want to be a scientist?
Participant 412:	Yes.
SL:	But not work for someone else.
Participant 412:	Yes.
SL:	Okay. Okay. Got it. Okay. Because I do remember that you're starting your own business?

Participant 412:	Yes.
SL:	Yes. And you like to continue with that.
Participant 412:	Yes.
SL:	Yeah, being an entrepreneur and having your own business.
Participant 412:	Yes. And then I'll be the first one of my mom and dad's kids that ... of my mom's kids that was a scientist if I become a scientist. My sister is an artist and my brother, I don't know what he wants to be.
SL:	All right. You said that you all don't really talk about scientists in school or anything like that.
Participant 412:	No. No we don't talk about them.
SL:	But your exposure to scientists was mostly just through your mother.
Participant 412:	Yes.
SL:	Because she's one.
Participant 412:	And sometimes with my dad I watch stuff. It's not really about science but it's about ... it's like, Mafia's Greatest Hits.
SL:	What is it?
Participant 412:	Mafia's Greatest Hits. It had one episode with Thomas Edison and Tesla on there.
SL:	Oh, okay.
Participant 412:	And they showed how Thomas Edison treated him unfairly.
SL:	Okay. So that's how you know about the relationship that they had.
Participant 412:	Yes. And when Tesla became famous, Thomas Edison tried to kill him.
SL:	Oh.
Participant 412:	Mm-hmm (affirmative).
SL:	Okay.
Participant 412:	With his own type of electricity.
SL:	Is there anything else that you would like to add in terms of being a scientist, or ...
Participant 412:	Nope.

Interview II: Occupational Images
Participant 413

SL:	So I have a picture that you drew of a scientist. How do you pronounce his name? The name of your scientist.
Participant 413:	Email.
SL:	What is it? I'm sorry.
Participant 413:	Email.
SL:	Oh, okay. Why don't you tell me about your picture and what's going on in the picture.
Participant 413:	The scientist is mixing chemicals to help sick people making medicine. All of that good stuff. As you can see, the bottles are there for her to mix it. That's what I drew.
SL:	Okay. Where is the scientist?
Participant 413:	Right here.
SL:	I mean, what does the scientist's environment looks like.
Participant 413:	Oh.
Participant 413:	She is in an office like a lab doing it. She's mixing all the stuff in the lab.
SL:	In the lab. Okay. If you had additional time, what might you add to this picture?
Participant 413:	I would add fellow scientists and a computer. That's it.
SL:	What would the fellow scientists be doing if you were to add them?
Participant 413:	Researching some stuff on the computer. Putting medicine and all of that stuff online to see if anybody needs it.
SL:	Oh. Who would make the medicine?
Participant 413:	This person.
SL:	This person.
Participant 413:	Then the other one would be packaging them and sending them to people and showing the medicine up online so they can buy it and help them.
SL:	Okay. You know what? I was just gonna ask, are they putting it up so people can buy it or are they putting it up so people can get it for free? But you mentioned that they would buy it.
Participant 413:	Yeah.
SL:	Okay. What are some other things that scientists do at work?
Participant 413:	I don't know.
SL:	You don't know. Okay. Not a problem. What other kinds of things that a scientist would do?
Participant 413:	Find out why animals are extinct and help how they can ... See how they can stop the animal from becoming extinct. That's it.
SL:	Okay. Where do scientists work? What kind of environment do they work in?

Participant 413: It depends on what they're working on. If they're working on plants they would sort of be outside and testing all the different plants. If they're working on animals they would do a little bit of research inside. It depends.

SL: It just depends. It just depends on what they're doing. How would you describe their environment? If you look around what would you see?

Participant 413: Different kind of plants and chemicals all over. Stuff in test tubes. That kind of stuff.

SL: Kind of like this here with your scientist? Okay. What are some things that a person would need to know in order to be a scientist?

Participant 413: They would need to know their math and their reading because being a scientist involves around numbers and reading different kinds of things. That's it.

SL: That's it? Okay. What can they do at school, do you think, that would help them be a scientist, or prepare them to be a scientist?

Participant 413: Focus. Maybe take science class if they wanted to. Read a lot. Practice math and stuff.

SL: Okay. Do you think a person would need to go to college in order to be a scientist?

Participant 413: I don't think so.

SL: No? Okay. So tell me about that.

Participant 413: I think you can be anything without having to go to college.

SL: Okay. So tell me just a little bit about that. Elaborate on that thought just a little bit for me.

Participant 413: I have read paragraphs and stories about stuff like that. This man, he did not get to go to college, and he wanted to be a musician. He did not have a lot of money. He started to work, played music at shows. He started doing music at five and people started hearing him and wanting him to come to a lot of concerts. He became famous without going to college. So that's why I think that you don't have to go to college to become a scientist.

SL: Okay. So it sounds like he taught himself and learned how to be a musician on his own. What do you think a person would need to do if they wanted to be a scientist but not go to college? What would that look like?

Participant 413: Study a lot about life and plants. Read. Practice math and reading. That's it.

SL: Okay. Thank you for that example because that really helped me to understand. Now we're going to

SL: Let me turn this page here because we're going to move to the last page. Let's see here. She's making different medicines yeah for sick people indoors. Alright. So we're going to talk about this a

	little bit. You said that it's pretty hard to be a scientist. In what ways is it pretty hard to learn to be a scientist?
Participant 413:	Because it can be frustrating at times because you don't know this and you get mad because you don't and you want to know it. That's why.
SL:	So they get a little frustrated if they don't know how to do something on a job?
Participant 413:	Yes.
SL:	Okay. You mentioned that it's a medium amount in terms of it being hard to do the job of a scientist every day. Tell me a little bit about that.
Participant 413:	Because when you're a scientist you know your work. Some of the things you're working on is easy. That's [inaudible 00:09:04].
SL:	Okay. In terms of money, you said that they'll get paid very much. You chose very much for how much they get paid. Tell me a little about that. Well, just tell me a little bit about that, yeah.
Participant 413:	They get paid a lot because they're doing stuff to help the environment, help people, and help animals and learn about other things to notify other people about it.
SL:	So when you say a lot, what number comes to mind when you say someone gets paid a lot?
Participant 413:	I don't know.
SL:	Don't know. Okay. No problem. I was just wondering if you had a number in mind. In terms if importance, you said it's pretty important, in reference to the job that a scientist does. Tell me a little bit about that.
Participant 413:	I think it is important because it's a hard job and you're helping people. You're making medicine and you have to know what to put in the medicine to help people recover. That's it.
SL:	So because they are dealing with people who would need medicine it's really important that they know what to put into it and things like that. Okay. How did you find out about scientists?
Participant 413:	I watch a lot of scientist shows and stuff that they do.
Participant 413:	I forgot the name of one that I watch.
SL:	Oh, I was just going to ask you, what show do you watch.
Participant 413:	Oh. Bill Nye the Science Guy.
SL:	Oh I know. He does the experiments and things like that.
Participant 413:	I like to watch him.
SL:	Yeah. Okay. Do you all talk about scientists in school at all?
Participant 413:	A little.
SL:	A little. Okay. Tell me about that. What are some things that you all discuss?
Participant 413:	That if you want to be a scientist that you should focus, not play around in class. Listen. Practice. That's it.

SL:	Okay. Do you talk about scientists at home?
Participant 413:	So so.
SL:	So so. Yeah, tell me about that.
Participant 413:	My mom asked me if I wanted to become a scientist. I told her maybe. I don't know yet. She told me that it's a hard job because you need to know all the things that you have to put in the medicine and take out of the medicine if it's not going to help them.
SL:	Okay. Yeah, yeah. So kind of gave you an indication of what this job would entail if you decide to become a scientist. Yeah. Okay.

Interview II: Occupational Images
Participant 51

SL:	So if you could just tell me a little bit about your picture and what's going on in the picture?
Participant 51:	That's a picture that I drew, I drew it. He's mixing potions.
SL:	Okay, he's mixing potions. Okay. And if you had a little more time to add -
Participant 51:	I did have time.
SL:	Hm?
Participant 51:	I did have time.
SL:	You did have time? Okay.
Participant 51:	I don't like, drawing, I don't know how to draw so I just did something.
SL:	Oh no it's fine. And remember I said it's not about like, I'm not looking at it like oh that's a good drawing or, I'm not looking at that. I just want to know what's in it. So this is just fine. So don't worry. Is there anything you would like to add to the drawing? No? Okay. So it's good just the way it is? Nothing? You don't want to add anything? Okay.
SL:	So tell me, what are some other things that scientists do at work besides what's going on there.
Participant 51:	They look through their microscope on little things like sometimes they look in to see how much bacteria is in something.
SL:	Okay, alright. Is there anything else that they do at work?
Participant 51:	They explore nature.
SL:	They explore nature, okay. So tell me about that. What do you mean by explore nature?
Participant 51:	Go look at different plants and animals out in the forest.
SL:	Out in the forest, okay. And you mentioned forests, what are some other places that scientists work?
Participant 51:	In a science lab.
SL:	In the science lab, okay. Is this particular scientist in a - where is this particular scientist working?
Participant 51:	Outside.
SL:	Okay, this particular scientist is working outside. Okay. I'm going to put outdoors. You said he has dreads, he looks like... oh, he looks like you in the future. Okay. And he's mixing potions. So tell me about that. Tell me about him looking like you in the future.
Participant 51:	I don't have dreads just yet.
SL:	Okay.
Participant 51:	In the future, and I'm gonna have an earring.
SL:	And you're going have -
Participant 51:	An earring.

SL:	And earring. Okay. So this is not, oh okay. So this is not you in the picture. This particular scientist just looks like you, how you would look in the future I mean. Okay. Thank you for clarifying that, I really appreciate it.
SL:	So in terms of where they work, can you kind of explain what their area looks like? Like describe it to me?
Participant 51:	In a science lab it would be like a lot of different potions, a lot of different things that scientists use like telescopes, microscopes, like um... I forgot how to say it. They said, um... oh snap, I forgot it. It's a - I forgot how to say it, the word, but like they have things where it shows like the earth's rotation around the sun and they have like a sun on a stick and have it rotating around something like the earth and all of that rotating around the sun and the why the moon is rotating around the earth and like different pictures of galaxies and stuff like that.
SL:	Okay.
Participant 51:	But outdoors it's like a lot of trees, frogs, snakes, worms, earthworms, gators, and stuff like that.
SL:	Okay. In terms of your scientist here, describe what your scientist's area looks like.
Participant 51:	He's outside in the grass where there's like, where there's only grass like where it's trees but he's far away from the trees so he can just see the plants and he's doing it so that just in case the potions do something it won't mess up the trees.
SL:	Oh okay. Got it, got it. And so what are some things that a person needs to know in order to be a scientist?
Participant 51:	You gotta know how to explore nature without being scared, you gotta know the different types of natures and different types of animals and how all the animals work.
SL:	Okay. And what could they do in school that might help them to be a scientist?
Participant 51:	Go explore nature and explore the different types of animals and mix potions and see what happens and make replicas of the earth rotating around the sun.
SL:	Okay, so make replicas. Okay, in addition to potions and things like that. Do you think a person would need to go to college in order to be a scientist?
Participant 51:	Yes.
SL:	Yes? Okay tell me about that.
Participant 51:	I think they need to go to college because sometimes if you just go be a scientist straight out of high school there might be some things that you don't know that scientists need to know.

SL:	Okay. So like what are those things, some of those things that you are referring to that they would need to know? That they may miss if they don't go to college?
Participant 51:	That how like different types of animals and how animals adapt to their wildlife.
SL:	Okay, alright. Is there anything else? No? So in what ways, let's see... we're going to look at this page here. So in what ways is it easy or hard to learn to be a scientist?
Participant 51:	About dangerous snakes. Dangerous animals like snakes and alligators, it would be hard because if you're trying to find out something about them, you're going to have to do something to the alligator and you're gonna have to go deep into your research and then go try and test it out and see if that's true and gators, they are vicious and if you try to attack them, if they think they're being attacked they're going to attack you.
SL:	Mm-hmm (affirmative). Okay.
Participant 51:	And easy, it's kinda like snails and stuff like that because they're small, they won't do nothing and they move very slow.
SL:	Okay, and they move very slow. And so that makes it kind of easy? Okay. In what ways is it easy to do the job of a scientist every day?
Participant 51:	Every day, easy, I would say -
Participant 51:	And sometimes it'll be easy by just making replicas of things like earth's rotation replicas of like doing something where you're mixing baking soda with something and trying to see, and make that and then the volcano erupts and things like that.
SL:	Okay. And in what ways is it hard to do the job of a scientist every day?
Participant 51:	When you gotta, when you're doing an experiment and you've gotta do something outdoors when things like, you see you're looking for plants but you see, when you're looking for the plants there's a snake and you don't see it, it's blending in and then it comes up and attacks you.
SL:	Okay. And you mentioned that a scientist gets paid -
Participant 51:	A lot of money.
SL:	Yeah so if you can give me a number or how much is that the scientists get paid?
Participant 51:	Like fifteen to twenty dollars an hour.
SL:	Okay. Excuse me. And in terms of the importance of being a scientist, you said that the job of being a scientist is very important. How is it important?
Participant 51:	Because sometimes scientists, the things that scientists know, they have to give that back to doctors so that the doctors would know how to cure cancer and things like that.

SL:	Oh okay, so they're kind of like passing along their knowledge.
Participant 51:	Uh-huh.
SL:	Okay that makes it very important. How did you find out about scientists?
Participant 51:	My teacher.
SL:	Your teacher? Tell me about that.
Participant 51:	He told us, like when we be doing things in class, we be doing experiments and he be telling us that scientists would be doing the same thing that we do like go explore nature and different things like that. Like my first teacher, one time we saw a trail of mud coming up out of the ground and we measured how long the trail of mud -
SL:	Oh a trail of mud, okay.
Participant 51:	It was dirt coming from under the ground and we were trying to see how long it was and everyone was looking up what kind of animal made that kind of trail.
SL:	Yeah. Okay. Did you all discuss jobs or anything like that?
Participant 51:	Mm-hmm (affirmative). Most people said sports.
SL:	Sports, okay. So you did discuss that in class? Yeah? Okay. Is there anything else that you would like to share in terms of scientists? No?

Interview II: Occupational Images
Participant 55

SL:	Tell me about that.
Participant 55:	My picture is basically, something that I can do quick, so I can get my work done. It's just something that could be based off the real world. It's something that could be based off the real world, this scientist try to figure out which ball he could kick the farthest.
SL:	Okay, okay. Tell me about, because it looks like you have two different scenes here, so tell me about the differences between these.
Participant 55:	The first scene is where he was kicking the football, and the football didn't go as long, he tested it on a flat surface, and he measured 75 meters, and the second scene he kicked it on the same surface, he measured it, he kicked the soccer ball 85 meters. He was looking to kick it the same amount of force.
SL:	Okay. So is it that the scientist is measuring how far they kick the different balls, right? Because it's the football you have here, and a soccer ball. And the scientist measured-
Participant 55:	How far it's going.
SL:	How far each ball went. Using the same amount of force.
Participant 55:	Yes.
SL:	Okay. And the name of your scientist is Tyrone?
Participant 55:	Yes.
SL:	Okay. All right. Is there anything that you would add to the picture, if you had additional time?
Participant 55:	If I had additional time, I would add a sun, and probably some more detail to the football, and some more detail to the drawing of the person.
SL:	What would you add to the person?
Participant 55:	I would add more realistic features like more legs that actually work. That actually work, and not just straight. Some realistic arms, and body. The face is just dot, dot, smiley face.
SL:	What are some other things that scientists do at work?
Participant 55:	Experiment.
SL:	Okay, tell me about that.
Participant 55:	They experiment different things to see what will happen, what will be the outcome. And they'll see if they discover anything new, to help the world.
SL:	Is your scientist conducting an experiment? What would you call that?
Participant 55:	I don't know.

SL:	Okay, no problem. I was just wondering. I was just asking. So where do scientists work?
Participant 55:	Anywhere.
SL:	Anywhere?
Participant 55:	They could work in here.
SL:	In here as in ...
Participant 55:	They could work in this cafeteria.
SL:	In the cafeteria.
Participant 55:	They could work outside, inside a building, they could work anywhere, and they could still be contributing to science.
SL:	Okay. So, anywhere, give me some examples. You mentioned here, in the cafeteria, what would a scientist do in the cafeteria?
Participant 55:	A scientist could probably test the food to see what different temperatures, what is the average temperature of food that they serve the students.
SL:	So you said anywhere, what are some other environments?
Participant 55:	Outside.
SL:	Outside, okay. So what would a scientist do outside?
Participant 55:	They could do more messy experiments, they could probably do Coke, the soda and Mentos, outside, so it wouldn't get in their house or wherever they live. They can make slime. They could make slime, so I think basically they should do stuff outside so they won't get messy inside.
SL:	Okay.
Participant 55:	Or it could be stuff they do, slime.
SL:	What does their typical work environment look like, do you think?
Participant 55:	I picture a lab with file cabinets everywhere, to keep note of what's going on, and probably some tools, like goggles, what it's called, like a lab coat, gloves, and protective eyewear.
SL:	Protective eyewear you say?
Participant 55:	Yes.
SL:	Okay. What are some things that a person needs to know in order to be a scientist?
Participant 55:	They needa' memorize some part of the Periodic Table, to see what elements make another element. They needa' memorize a lotta' things. When they make experiments, they needa' take track, and they needa' remember the steps that they took in order to do the experiment. It's just a lotta' things they have to memorize.
SL:	Yeah, a lotta' things?
Participant 55:	Yes, a lot.
SL:	So those are just some of the things that they would need to know?
Participant 55:	Yes.
SL:	Okay. What can they do at school that might help them prepare to be a scientist?

Participant 55: They could probably pay attention in science class, and make sure they're doing everything right. Thinking like a scientist, and doing things like a scientist.

SL: Okay. Do you think a person will need to go to college in order to be a scientist?

Participant 55: No.

SL: No, tell me about that?

Participant 55: Because scientists, they don't necessarily have to go to college in order to be a scientist, it's just that they need to, it's hard. I don't remember the meaning of science, I know it's like life, everything is science still. I don't know.

SL: That's okay. Go ahead, just take your time. There's no rush. Just take your time.

Participant 55: I'm a scientist. That's all I can explain, I'm a scientist.

SL: You're a scientist.

Participant 55: Yes, I am.

SL: Okay, so tell me about that.

Participant 55: I am a scientist, and I didn't go to college, because I'm still working with science, and I'm still contributing to science.

SL: Okay, okay. So because you're not in college, and you're a scientist, so you're saying a scientist doesn't have to go to college because you're doing science now?

Participant 55: Yes.

SL: What would you say?

Participant 55: Because yeah, I'm doing science now.

SL: What makes you a scientist?

Participant 55: What makes me a scientist?

SL: Mm-hmm (affirmative).

Participant 55: I don't know.

SL: You don't know? Okay, no problem. I guess what I'm getting at is, when you say, I'm a scientist, where did that come from? What are the reasons why you would consider yourself a scientist?

Participant 55: I would consider myself a scientist because I do experiments.

SL: Oh, because you do experiments. Okay, got it. Now I understand. So you're doing experiments, and scientists do experiments, so therefore you are a scientist.

Participant 55: Yes.

SL: Okay. Got it. Thank you for being so patient with me and explaining that to me. Really appreciate it.

Participant 55: In order to get it.

SL: In order to get it, yup. So thank you for that. Is there anything else that you would like to tell me about the drawing, or anything related to the drawing, before I turn the page?

Participant 55: No.

SL: No, okay. So I'm just gonna turn to this page. So you mentioned that in terms of how hard it is to learn to be a scientist, it looks like you're saying, just a little, it's just a little hard. So tell me about that?

Participant 55: It's just a little hard, because it's easy.

SL: It's easy, okay.

Participant 55: To me it's easy.

SL: It comes easy to you.

Participant 55: Yes, all the science I know that of, it's just like Biology, it's just easy to me. I don't know why.

SL: You just get it.

Participant 55: Yes, I just get it.

SL: Yeah, okay. No, not a problem. So if you find it easy, therefore, it's easy to learn to be a scientist.

Participant 55: Yes.

SL: Okay. In terms of doing the job of a scientist every day, you said it was very hard to do the job of a scientist every day. Tell me about that.

Participant 55: It's hard, because you have to wake up in the morning, go to the lab, and just analyze data a day. You staying late, and then you have to just keep the cycle going every day, until you figure out what you trying to find.

SL: You mentioned that they, in terms of the money that a scientist gets paid, you said, yeah, pretty much, in terms of the amount. I don't know, do you have a number, or something in mind when you mention that?

Participant 55: Probably $500,000.

SL: $500,000. Okay.

Participant 55: Probably half a million.

SL: Tell me about the amount of money that a scientist gets paid.

Participant 55: I don't understand the question.

SL: You said, there was like a range, so 500, to like a million, does it depend on what they're doing?

Participant 55: Oh yes, it does. If you're doing something that's contributing to the world, helping the world find a cure, that means you getting paid a lot of money to find the cure to help millions of people around the world. But if you're just somebody that just, say, a mechanical scientist, I won't say it's as important, but we still need it. I still think they get paid a little less than them. But scientists I think that don't get paid a lot are probably, teachers.

SL: So what is a mechanical scientist?

Participant 55: It's somebody that works with mechanics, and like robots, and cars, electric cars, and stuff like that.

SL: And then you mentioned a teacher. A teacher is also a scientist?

Participant 55:	A science teacher.
SL:	Okay, so a science teacher is a scientist?
Participant 55:	Yes.
SL:	Okay.
Participant 55:	Okay.
SL:	Okay, so it definitely depends on what they're doing?
Participant 55:	Mm-hmm (affirmative).
SL:	Okay. So you mentioned that the, and you kind of talked a little bit about this, you mentioned that the job of a scientist is very important.
Participant 55:	Yes.
SL:	Can you tell me just a little bit more? I know you kind of mentioned it a little bit before. Can you kind of explain that to me?
Participant 55:	It just important, because scientists are the people that come up with different things to help the world, and that could probably potentially save our world from global warning and other disasters that might occur in the future. They'll already have a plan in order for when something like that happens, and there'll just be like a back up plan, they already know what to do. Scientists are basically kind of like a savior. Not like a savior, savior, but like somebody that saves you.
SL:	Okay, okay. In terms of how you found out about scientists, can you tell me about that?
Participant 55:	How I found out about scientists?
SL:	Mm-hmm (affirmative).
Participant 55:	I can't remember. It's a long time.
SL:	A long time ago?
Participant 55:	Yes.
SL:	Was it, can you tell me where? Do you remember ...
Participant 55:	At school, I was in, I think pre-k. Either pre-k or kindergarten. We had this thing where we'd do like learning to be a scientist. I can't remember. But I would learn to do a scientist basically, like a science class for us. And then we did do like experiments and stuff. It's like where we just do experiments and stuff like that.
SL:	Okay. Do you all talk about scientists in your class? In your current science class?
Participant 55:	No.
SL:	No, okay. Do you all ever talk about jobs, not necessarily in science class, but in your homeroom class as well?
Participant 55:	Yes, in my homeroom class, we talk a lot about what-
Participant 55:	In our homeroom class, we talk about different jobs that a scientist could have, and how much they get paid, in the certain, it's blurred, I can't read it. Yes, we'll talk about it.
SL:	Okay. So, the details are kind of lost a little bit, huh?

Participant 55: Yes.

SL: But you do remember, and so that was this year, while in fifth grade?

Participant 55: Yes. It was in the beginning, like the beginning, it's beginning, and then beginning, early, middle, beginning, beginning middle, middle, middle beginning, no, this is so wrong. Okay, so what's the next question?

SL: So you all definitely talked about scientists in class, and you mentioned how much they get paid, and what else did you mention?

Participant 55: How much, like certain jobs of a scientist.

SL: Oh, certain jobs of the scientist. Okay, okay. Are there any other places where you learned about scientists?

Participant 55: At home.

SL: At home? Okay. Tell me about that.

Participant 55: My daddy teaches me, he let's us do experiments at home, because he looks up things on the internet, and he let's us do it at home, and then sometimes he teaches us about entrepreneurship, boy this has nothing to do with being a scientist.

SL: No it's okay, go ahead.

Participant 55: He just teaches us how to manage the money, and like what jobs get paid a certain amount of money.

Interview II: Occupational Images
Participant 58

SL:	Tell me about your drawing and what's going on in the drawing.
Participant 58:	My scientist name is Ms. Brown. What's going on, she's doing an experiment. She doing three experiments, one of them is fire flames, and the next one is ice cubes, and this one is raindrops coming out. She's just experiment with potions.
SL:	Okay. What might you add to the picture if you had more time to draw?
Participant 58:	I would've at least put a coat and goggles for safety, and yeah.
SL:	What are some other things that scientists do at work?
Participant 58:	Critical thinking.
SL:	Critical thinking?
Participant 58:	Yeah. They don't just do experiments. They like learn things and ...
SL:	Oh, okay. Tell me a little bit more about that.
Participant 58:	They don't just sit around and do experiments, they have to do work, too. They have to do the scientific method and things. And they have to, I don't know how to explain it.
SL:	Okay, no problem. So you mentioned the scientific method? Okay. Alright. Thank you so much for that, I appreciate it. Where is your scientist working?
Participant 58:	At school.
SL:	At school?
Participant 58:	A science teacher.
SL:	Oh, okay. Alright, tell me about that.
Participant 58:	She was helping the children and she was trying to find something to dissect the frog.
SL:	She was trying to find something to disc et the frog? Okay. And what are some other environments that a scientist may work in?
Participant 58:	They can work in history. They have to read instructions so they're doing reading. And they have to do the amount of what ingredients, that's like math. Yeah.
SL:	Okay. And so what other environments, though. If you look around where they're working, what does it look like?
Participant 58:	Its quiet, it's not rowdy. Because they have to pay attention and the teacher talks while the children are listening. It's a quiet environment.
SL:	Okay, alright.
Participant 58:	So that they will be able to pay attention to what the teacher is saying and how much put in the bottle for the potion.
SL:	And so, what objects are around? If you were to look around?
Participant 58:	Goggles, pencil and paper, a computer, a smart board, children, and that's it.

SL:	Okay.
Participant 58:	Oh, and you have to wear gloves for safety, and your goggles.
SL:	And gloves for safety and goggles. Okay. What are some things that a person needs to know in order to be a scientist?
Participant 58:	I don't know.
SL:	No? What can a person do in school that will help them be a scientist?
Participant 58:	Just listen while the teachers speaking.
SL:	Mm-hmm (affirmative). Listen while the teachers speaking. Okay, anything else? No? Okay. Does the person need to go to college in order to be a scientist?
Participant 58:	It depends.
SL:	It depends?
Participant 58:	[inaudible 00:04:43] I don't know the answer.
SL:	Oh, okay.
Participant 58:	I don't know the answer.
SL:	Oh, don't know the answer. Okay. Alright. What's your best guess, do you think?
Participant 58:	I'm in between yes and no.
SL:	Oh okay. So you are in between, so that's why it's just like, ah, not quite sure. 'Cause-
Participant 58:	I'm in between.
SL:	You're in between. Okay. Fair enough. And you mentioned that in terms of what you think it is to learn to be a scientist, you said it's a little hard, not really, not really hard to be a scientist.
Participant 58:	It's not really-
SL:	Oh, learn to be a scientist. I'm sorry.
Participant 58:	You just, all you have to do is listen, and yeah. You have to be a good listener. And you have to pay attention and learn things.
SL:	Okay, so you have to be a good listener and pay attention. Okay. And so you're saying that's not really that hard to do, right? Okay. And then in terms of doing the job of a scientist every day, you said it was just kind of medium hard.
Participant 58:	It's kind of hard, it's really not hard. Because to children it don't look hard. But for grown ups, its hard because you have to be able to measure the stuff perfectly, can't make any mistakes because it could cause a fire or something. So yeah.
SL:	So yeah, you just have to make sure you, when you're measuring, that it's right. Yeah, okay. And how much money do you think a scientist gets paid? You said a pretty much amount?
Participant 58:	Yeah because, I think it's pretty much because, I just think they get it like, enough money to get paid.
SL:	Like, just enough money, huh? If you could throw a number out there, what number would that be for just enough money?

Participant 58:	I would say they probably get 20 or 30 dollars or more, probably.
SL:	30 dollars an hour?
Participant 58:	Maybe it's probably like a thousand a year or something like that.
SL:	One thousand a year.
Participant 58:	Yeah, or either it's another estimate.
SL:	Okay. And then in terms of the job being important, the scientist job being-
Participant 58:	It's very-
SL:	You said very much, yeah. Tell me about that.
Participant 58:	Just like I said, you have to be able to know how to pay attention, and you have to know how to measure things and you have to listen in school because it's a big help to become a scientist. If you go to school and you listen, that would be able to help you. If math, they teach you how to percentage and stuff and measurements and the ounces and you have to listen to that.
SL:	Okay.
Participant 58:	To the basic, start with the basics.
SL:	To the basics, yeah. Okay. And how did you find out about scientists?
Participant 58:	Well, sometimes I read, or watch the news.
SL:	Mm-hmm (affirmative). The news.
Participant 58:	Articles, yeah. And articles.
SL:	Okay. And what do you see on the news.
Participant 58:	They talk about how scientists are making new things and stuff. And some of the articles, they tell me how important it is to be a scientist and things and yeah.
SL:	Okay. Do you all ever talk about being a scientist in school?
Participant 58:	No.
SL:	No, they don't talk about that? What about at home?
Participant 58:	I read articles, yeah.
SL:	Okay.
Participant 58:	At home, I do.
SL:	At home is reading the articles. Okay-

Interview II: Occupational Images
Participant 59

SL:	Tell me about your drawing, your picture?
Participant 59:	I drew a scientist. My scientist, she is actually working on an experiment with chemicals. And as she's doing the experiment, she's researching and taking down notes.
SL:	Oh. Okay.
Participant 59:	Yes.
SL:	Alright. And is there anything that you would add to the picture?
Participant 59:	No.
SL:	No? Okay. So what are some other things that scientists do at work besides what your scientist is doing?
Participant 59:	They investigate things.
SL:	Okay. Tell me about that.
Participant 59:	So if some ... If there's a new invention, they will try and investigate and see if it's like a good invention.
SL:	Okay. Alright. Is there anything else that they do?
Participant 59:	I don't know.
SL:	You don't know? Okay. No problem. I was just wondering if there was something else.
Participant 59:	Okay.
SL:	So where do scientists work?
Participant 59:	I would say in a lab.
SL:	In a lab? Okay. So tell me about that. What might the lab look like?
Participant 59:	A technology and wires ... Like certain areas for like if you want to do chemicals ... They'll have this certain area and technology in another area. Things like that.
SL:	And so when you say technology, what do you mean?
Participant 59:	Like computers, cellphones, smartphones, laptops, things like that.
SL:	Okay. And what else might be going on in the lab?
Participant 59:	There might be communication with different scientists saying what their opinion is about this new invention.
SL:	Okay. So what other ... Are there any other types of environments that a scientist would work in?
Participant 59:	I'm not sure.
SL:	You're not sure? Okay. So when you think of scientists, you think of labs. The chemicals and technology. What are some things a person needs to know in order to become a scientist?
Participant 59:	I'm not sure.
SL:	You're not sure? Okay. What do you think a person could do in school that would kind of help them to prepare to be a scientist?
Participant 59:	Testing things.

SL:	Okay.
Participant 59:	Like practicing what a scientist would do.
SL:	Mm-hmm (affirmative).
Participant 59:	And as you practice, you'll get better and better. And then the hard part will kind of be easier to do.
SL:	Okay. And when you say practice, what are some of the things that they're practicing?
Participant 59:	Like practicing the scientific method. Testing things, doing science projects. Yeah.
SL:	Okay. Do you think a person will need to go to college in order to be a scientist?
Participant 59:	Yes.
SL:	Yes. Okay. You smiled. You seemed pretty confident about that. Tell me about that.
Participant 59:	I think you would need to go to college because college is like the most important thing that you need to do in order to learn a thing or something. Like if I want to be a pediatrician, I would want to go to college so I could learn how to be a pediatrician and things a pediatrician [crosstalk 00:04:07].
SL:	Okay. Let me ask you something. Is a pediatrician a scientist?
Participant 59:	In some type of way. They work with machines also.
SL:	Okay. Okay. So when you mentioned ... So you mentioned the example of pediatricians. So you're saying kind of like it's pretty much the same thing for a scientist, pretty much?
Participant 59:	Yeah.
SL:	Okay. Let's see ... Is there anything else that you want to tell me about your picture?
Participant 59:	No.
SL:	No? Okay. I'll turn the page here. Let's talk about this page. So you mentioned that it's very hard to learn to be a scientist.
Participant 59:	Yes.
SL:	In what ways?
Participant 59:	It takes a lot to be a scientist because you have to go through steps and processes. And then you might not get it the first time. But it will take a quite a time just to get it. And it'll take a lot of time to learn to be a scientist.
SL:	And when you mention a lot of time, what do you mean by that?
Participant 59:	Well, I mean that it will ... You'll have to know everything in order to be a scientist. And it'll take a lot to learn it.
SL:	It'll take a lot to learn it. Okay. Do you know some of those things? When you say everything, what do you mean by that?
Participant 59:	I'm not sure.
SL:	Not sure? Okay. That's okay. I just wanted to make sure I understood. So no problem at all. And so you mentioned that it's

	very hard to do the job of a scientist every day. So tell me about that. How is it very hard to do the job of a scientist every day?
Participant 59:	Well, it is hard to do a job of a scientist every day because you have to go through different processes. And then some processes you haven't seen before and some you have. And you just have to ... It takes quite a bit to go through every process and learn it.
SL:	Okay. And so you mentioned that a scientist gets paid a lot.
Participant 59:	Yes.
SL:	Excuse me. Or very much. Tell me about that. How much do you think a scientist would get paid?
Participant 59:	I can't even count.
SL:	No? Okay. No problem.
Participant 59:	I think it's a lot of money because they're doing things that's dealing with the world. So I think they get paid a lot of money.
SL:	Okay. And what's a lot of money to you?
Participant 59:	A million dollars.
SL:	Okay. So are you saying that, and tell me if I'm wrong, if a million is a lot of money and you said that a scientist gets paid a lot, are you saying that a scientist gets paid at least that?
Participant 59:	Yes.
SL:	Okay. I understand now. And you say that the job of the scientist is very important. Tell me about that.
Participant 59:	I believe that it is very important because science is like ... Being a scientist goes through school too because when you're at school, you're working with technology such as computers.
SL:	Mm-hmm (affirmative).
Participant 59:	You're doing science projects. You're taking science tests and things like that. So I think that it is an important job of a scientist. As you are learning those things, when you get older, you may want to become a scientist. And the job is very important because you don't want to mess up anything. But it will 'cause you to make mistakes [crosstalk 00:08:26].
SL:	Okay. And how did you find out about scientists?
Participant 59:	Throughout school.
SL:	Throughout school?
SL:	Oh. So tell me about that. You said you learned about scientists in school.
Participant 59:	Well, I learn about scientists throughout school when I read a lot of books ... It mentions scientists and things about scientists.
SL:	Mm-hmm (affirmative).
Participant 59:	And I do tests about scientists and things like that.
SL:	Mm-hmm (affirmative). What do you mean by tests?
Participant 59:	Like, I take ... I read things about scientists and then I take a test on it.

SL:	Okay. Is that like found in your textbook? Or where do you get that information?
Participant 59:	In science class.
SL:	Oh. In science class. Oh. Okay. So the teacher talks to you about scientists. Not just science, but people who are doing science in class.
Participant 59:	Yes.
SL:	Oh. I see. And then you all take tests on that.
Participant 59:	Yes.
SL:	Okay. And I remember you mentioned Science Buddies as a website that you went to to kind of figure out what project to do. Are there any other websites that you go on to that gives you an idea of scientists or science?
Participant 59:	It's other ones. But I probably don't remember the names of them.
SL:	Okay. Okay. Not a problem.

Interview II: Occupational Images
Participant 514

SL:	Alright, this is the start of interview two, Occupational Images of Scientists, for participant number 514 on May 9th, and the time is 9:27AM.
SL:	Tell me about your drawing?
Participant 514:	Well, it was supposed to be a light, but then it turned out looking like spoons.
SL:	Okay, so these are lights here?
Participant 514:	Yeah, so it's like a light bulb, it's like something light, and I tried to make it look like it exploded or something, and then, down there those things right there, those are like the goggles. The hands are like kind of like this.
SL:	Okay, okay, and so, what are they doing in the picture?
Participant 514:	They, well, they was pouring I think this one pouring into this one. I don't remember.
SL:	Okay, so what were they pouring?
Participant 514:	It was like green. I think it was like a greenish-yellow thing. I thought of this all in my mind, that's kinda like what you see scientists doing. Then I just saw that and I put it on the paper.
SL:	Okay, no, that's fine. If you had additional time, is there anything that you would like to add to this picture?
Participant 514:	Yes.
SL:	Like what?
Participant 514:	I don't write all the bottles that was supposed to be up there, but I would've put the bottles laying down sideways right here, and then what's that little. What's that little tube that they be having in the house [inaudible 00:01:47] and it goes up [inaudible 00:01:48] and then [crosstalk 00:01:50].
SL:	Oh, okay. Maybe some tubing connecting like different containers?
Participant 514:	Mm-hmm (affirmative).
SL:	Okay. Okay. You said that you were going to put some bottles, you said that they would be lying on their side? Okay.
Participant 514:	Like if I fill it and put something down there and it filled.
SL:	Oh, okay like they were knocked over and okay. Okay.
Participant 514:	'Cause they exploded, and then, yeah.
SL:	Okay.
SL:	What are some other things that scientists do at work?
Participant 514:	Well, they study things. I think they make things.
SL:	What kind of things? What kind of things do they study and make?
Participant 514:	They study. I don't know like.
SL:	You don't know? Okay.
Participant 514:	Not really, no.

SL:	That's okay, but you do know that they study. Okay. They study and make things. Okay
Participant 514:	Yes. 'Cause I remember I think it was the news. No, it was at school. They said scientists found something, something, something like. I think someone told me that scientists found Pluto or something like that.
SL:	Okay. What type of work does a scientist do?
Participant 514:	What you mean? Like what they do?
SL:	Mm-hmm (affirmative). At work. Is there anything else?
Participant 514:	No.
SL:	Okay, so study and make things, basically. Okay.
Participant 514:	And test things.
SL:	And test things. Okay.
SL:	As far as those things, not quite sure, but you know, that's just what they engage in at work.
Participant 514:	Okay.
SL:	And so where do scientists work?
Participant 514:	In labs.
SL:	In labs, okay.
Participant 514:	But, I think one of the things [inaudible 00:03:44]. I've never seen a scientist work outside.
SL:	Okay. So, tell me a little more about them working in labs. Can you describe the area to me?
Participant 514:	Yeah. They have cabinets full of bottles. I think they do have a sink. They have a container of, I went to one when I was little, but I don't remember everything that was in there. I know they have chemicals on the thing. It was like this little [inaudible 00:04:31]. It says do not enter. They told us they were going to take it down when we leave, because we gotta finish. I think they were testing something. It was pretty green and blue stuff inside of this. Then it turned yellowish. Then they poured it into this bottle. They put some white stuff. What's that thing that you need [inaudible 00:04:55] it puts drops of water and stuff out of it and it's squishy. You can push it.
SL:	It's like a little bottle with, sometimes bottles have a little top, you're saying, with a little hole, and you squeeze it and a drop comes out.
Participant 514:	Yeah. I saw that was on the table, but it had a [inaudible 00:05:18] thing in it. It looked weird. It was like it was slime.
SL:	And you said this was a lab you visited at some point? Where was, or what was, the lab?
SL:	Don't remember?
SL:	Okay. Was this something that you just went to or was this a part of school?

Participant 514: It was like we was in Kindergarten. Not kindergarten. It was like a daycare. Not a daycare. I was five.

SL: Okay, so that was a while ago.

Participant 514: Mm-hmm (affirmative). I remember.

SL: Okay, so you kind of noticed a lot of different equipment around the lab. Basically, that's kind of what you, and that's what you envision a scientist lab to look at.

Participant 514: This was supposed to look like that.

SL: Oh, okay. This?

Participant 514: I didn't put the thing. I put the bulbs.

SL: Alright, okay. Thank you for that. Thank you for that clarification. Appreciate that.

SL: So, when you talk about this lab, what exactly is going on in the lab? I'm not necessarily talking about the one you visited, but in terms of what you envision up here.

Participant 514: I don't think they pour something in the bottle and then it just exploded [inaudible 00:06:56]. I think it would be like two things that look the same, but if you put one in there and it explodes, then the other you just put in the mix, and then you put the other one in, then it explodes. That's what I think.

SL: Okay. So they're kind of mixing things? Okay.

Participant 514: And putting little drops in.

SL: Very carefully, right? With the dropper.

SL: What are some things that a person needs to know in order to be a scientist?

Participant 514: I don't know, but don't you have to go to school to be a scientist?

SL: I'm sorry?

Participant 514: Don't you have to go to a type of school to be a scientist.

SL: Well what do you think?

Participant 514: I think you're supposed to go to school to be a scientist, because I remember my teacher, it was like, we were reading a story, and it was later, and he had to go to school to be a futurist, to see how stuff improved from back in the day. The other day, like 1919 and things like that.

SL: Okay. So, what kinds of things or let me kind of think. What do you think they can do at school that might help prepare them, maybe?

Participant 514: I think they got to study like how to pour the stuff in there, how to be careful, and to wash your hands, and to get stuff. Like how to use the equipment that they have. Study what all the chemicals are called. So, they can tell somebody, do you have this, and then they have that.

SL: Okay, do you think a person would need to go to college in order to be a scientist?

Participant 514: Yes, because isn't there a college to be a scientist.
SL: I don't know. What do you think?
Participant 514: I think so. I think there's college and then you go to a school for scientists, because I know my mom went to a school to know how to do hair. Well, she already knew how to do hair, but she wanted to learn how to change colors. Like, to dye hair.
SL: So, you're saying it's pretty much the same for a scientist?
Participant 514: Yeah.
SL: So, in what ways is it easy or hard to be a scientist?
Participant 514: I think the hard part is getting things right. I keep saying things [inaudible 00:10:12]. I like things exploding.
SL: You like things exploding? Okay. And, I'm sorry, that was easy or hard?
Participant 514: What?
SL: In terms of your answer?
Participant 514: I think it would be hard.
SL: Let's see. Anything else, in terms of, because you said here, you checked very or very much, that it would be hard to be a scientist. Is there anything else that you can think of that would be hard, in terms of being a scientist.
Participant 514: Let me think. If they can get.
SL: It's okay. Take your time.
Participant 514: If they could get, say if there's something. I think it would be hard to work, like when you step, if you, I think it would be like a two on this thing, a two on that thing. One would be connected and then if you just focus on this thing and you don't see it, it's just going to bubble to the top. Chemical is going to be on the floor and it might get on your skin and it might stay on there. Basically, watch your step when you walk around and see where you're going, because you might step on something.
SL: Okay. So, basically, in terms of...
Participant 514: Walking around.
SL: Being careful, you may spill chemicals, they may get on your skin, things like that. That would be pretty difficult in terms of being a scientist. Okay.
SL: Is there anything else in terms of what ways it would be hard to do the job of the scientist?
Participant 514: No.
SL: So, you mentioned.
Participant 514: Well.
SL: In terms of. Oh, go ahead.
Participant 514: Oh, I'm talking about this one. You can finish.
SL: No, go ahead.

Participant 514:	I was going to say that, if you like know what you're doing, if you've been a scientist for a long time and you know how the machines work, I think it would be pretty, pretty much, but if you just started, I think it would be hard.
SL:	So, if you've been a scientist for a while, you're saying it would be kind of easy for them, but like in the beginning, because it's kind of new, maybe it would be a little difficult.
Participant 514:	Yes.
SL:	Okay. Alright, that makes sense.
SL:	In terms of how important it is, you said, the job of a scientist is important. So, how is the job important?
Participant 514:	The job of being a scientist is important, because they find out most, they find out most of the things that we couldn't find out, because they have the tools to do it and we don't.
SL:	They, I'm sorry?
Participant 514:	They have the equipment and tools to do it and we don't.
SL:	Oh, okay. So, tell me a little more about that.
Participant 514:	Say, if we find out there's a box of tissues somewhere. Then they're saying it's more than a box of tissues, that there's something else in it. What would be more important?
SL:	Oh, I see. Forgive me for having to ask again. So, you said, in terms of you mentioned an example of a box of tissues. So, what were you saying about the tissues, because I had a hard time hearing you over the noise.
Participant 514:	So, we find out that the box of tissues, yeah, we find out, that say. Well, let me use a crystal. Say we find out the crystal. We just know that the color and how it looks, but if the scientist gets it. They see the design. They see what's inside of it, because they have like. What's that thing that you put your eye on. It's something. I think it kaleidoscope. I think. You put your eye on it and you see smaller, bigger, like you can see it more. They can see the design that's on it.
SL:	Okay. So, in what ways does that make their job important?
Participant 514:	Because, hm, that's hard. It makes their job important, because it helps us understand more about things.
SL:	Oh, okay. I think I get it. So, basically what you're saying, when you used the example of a crystal, but it can probably be anything, right? We see it and let's say this is the crystal here, my cup. When we see it, we just see this.
Participant 514:	A cup.
SL:	Yeah. We just see the cup, but a scientist will use their tools to study it, so they'll learn more about this than what we know. Basically. So, it's kind of like that discovery that makes their job important.

Participant 514: What's that channel called. I think it's called Animal Planet. I only watch it when they're out in the wild watching the animals. I like watching the animals. I watch the sea life one. I think when they was in the sea and they was looking at fish. I like animals, but I don't like, I like dogs, but my mom don't want to get one. We had two dogs, but she got rid of them, because my grandmother didn't want to let it stay at her house, because we didn't have no space at ours. Plus, they wasn't potty-trained, so they would be pooing on our carpet and it would be stinking nasty. Then we gave them to other people. Then they had, they gave them away, because they was pooping to much. Then they gave them to somebody else. Then I think they are going to give them up again, because they aren't potty-trained. So, then they came from us to another friend. I want them. I want them back.

SL: So, you really like dogs, huh?

Participant 514: Mm-hmm (affirmative).

SL: We have just one more question, okay? Well, is it one more? Yep. Is that okay.

Participant 514: Mm-hmm (affirmative).

SL: Okay. So, how did you find out about scientists?

Participant 514: Well, I don't know. I think, you know what, I think I only heard of somebody saying on the news, well in school, they said scientists have found out something, something, something.

SL: Mm-hmm (affirmative). So, you were watching the news and you kind of heard it?

Participant 514: Then, I had to type in scientist. There was a little article about them and then I read it and I read it. It was long.

SL: So, you just kind of went on the computer and?

Participant 514: Typed it in and see what it was.

SL: Searched for it?

Participant 514: Because I didn't know what it was and I was seven.

SL: Yeah, okay. Do you know anyone who is a scientist?

Participant 514: Nope. I only know Albert Einstein.

SL: You what? I'm sorry.

Participant 514: I only know one person. He was a real focused scientist.

SL: He was a scientist?

Participant 514: Yep.

SL: What did he do? Not sure?

Participant 514: I don't know.

SL: Was it? Who was this person?

Participant 514: A lot of people know him. It's Albert Einstein.

SL: Oh, okay. It's Albert Einstein.

SL: Do you all discuss scientists in school?

Participant 514: We only did this so far in class.

SL:	Oh, okay. Just basically this? Was there a discussion after you completed this? No, okay. Alright.
Participant 514:	He just [inaudible 00:20:08] what was our picture about and then that's it.
SL:	Do you, have you all talked about jobs or anything like that in school?
Participant 514:	Me and my mom have, but not in school though.
SL:	Okay. So, you and your mom have. What sorts of things do you talk about in terms of jobs?
Participant 514:	I said I wanted to work where she worked at.
SL:	Mm-hmm (affirmative)
Participant 514:	Cause, it seems, it seems like it would be interesting for me.
Participant 514:	Sometimes, I don't like calling her, because she, when I call her, her phone be by her keyboard and all I hear is typing and it hurts my ears. I have to put it on speakers.
SL:	Oh, yeah. You can tell she's working on the computer when you call her.
Participant 514:	She used to work at a hotel and she was one those people that they would call and she'll be typing it. I remember one time I didn't go to school, because I was sick, and my eye, I had the pink eye, so I had to put an eye patch on it. Then I went there. My grandma and mom worked at the same place, but she doesn't work there no more. She only worked there on weekends.
SL:	So what kinds of things do you talk to mom about in terms of jobs?
Participant 514:	She said if I'm going to make it in any sports, then I gotta find a good, good, job. I said that milk place, remember I was talking about a milk place.
SL:	Yeah, I remember. Was it TJ Lee?
Participant 514:	Yeah. I was talking about that place or I want to like, I want to be like, I want to work at, what's the place called. It's like, I think it's like IKEA. I want to be a manager of IKEA, because I heard they make a lot of money.
SL:	Yeah, okay.
Participant 514:	And it's a big, big, store.
SL:	IKEA is huge. You're right.
SL:	Okay, is there anything else that you would like to share with me in terms of scientists?
Participant 514:	No.
SL:	About your picture or this? No, okay.
Participant 514:	Oh, yeah. About this. Not this one, but this one.
SL:	Okay, about how much money do you think scientists get paid?
Participant 514:	I think they get paid a lot.
SL:	So, what's a lot? How much do you think they get paid?

Participant 514:	Something like 3.4 million to up is a lot, but I think 3.4 million is a lot, lot. But, I think a thousand is a lot, to me, but you gotta pay bills.
SL:	So, if you could choose a number, how much do you think they get paid.
Participant 514:	3.2, 1.4 million. No, 1.4 million, 4.5 million. That's a lot of money.
Participant 514:	That I want.
SL:	That you want? Is there anything else that you would like to share about scientists?
Participant 514:	I have a weird addiction.
SL:	You have a what? I'm sorry.
Participant 514:	A weird addiction.
SL:	What's that?
Participant 514:	Do you want to know what it is? Money.
SL:	Money. Okay. So money is very important to you? Yeah.
SL:	In terms of choosing a job or a career, is money something you consider. Like, okay, they make a lot of money. I want that job.
Participant 514:	Yeah. Not really, but it depends on if it's interesting.
SL:	Oh, okay. The job has got to be interesting.
Participant 514:	I don't want one of those jobs where you get paid two dollars an hour.
SL:	Alright. Thank you so very much. I appreciate it.

APPENDIX S
INTERVIEW III: GENDER-BASED GROUP TRANSCRIPTIONS

Interview III: Gender-based Group
Female

SL:	Again, I kind of want to revisit this particular question in terms of what do you want to be when you grow up? If you all can kind of just talk about that for me.
Female 1:	What I want to be when I get older, I want to be a pediatrician because I like working with children.
SL:	You want to be a pediatrician because, yes, I remember you said you're really interested in working with children. Yeah, I do remember that.
Female 1:	Mm-hmm (affirmative)-
SL:	Yeah. You look like you wanted to say something.
Female 2:	Yeah, I also wanted to be a pediatrician. I also love children. Yeah, I love them so much. If I see a baby I will want to hold it. That's how I am. I get like... I don't know. I get antsy when I see a baby.
SL:	And what about you two?
Female 3:	A lawyer.
SL:	A lawyer, okay.
Female 4:	I don't know yet.
SL:	Don't know yet? And you know what, that's okay because you have awhile, right? What are some reasons that you all want to be these things, a lawyer and pediatricians?
Female 1:	I just want to help children because I just want to help them grow better and not just be sick because... yeah.
SL:	Yeah.
Female 2:	I don't want the children to feel bad because I love them so much and if they feel bad then that's going to hurt me so much and then I'll have to make them get better.
SL:	Yeah, you kind of feel like [inaudible 00:01:50] kind of empathy for a child that's not really feeling well. You really want to help them. That's like your motivation for being a pediatrician?
SL:	What about you in terms of being a lawyer?
Female 3:	Because I want to help people and get them to win cases and stuff.
SL:	Is there any particular... When you think about being a lawyer is there any particular cause that you're passionate about or have you thought about that yet?
Female 3:	Mm-no
SL:	No, okay. But you just know that you want to get up there and win some cases, right?
Female 3:	Yeah.
SL:	Okay, okay. Then for you Female 4, you mentioned that you're not quite sure. What are some things that you've thought about in the past? You know, what are some things that are at least somewhat interesting to you?
Female 4:	Being an athlete.

SL: Being an athlete? Okay, yeah. What kind of athlete?
Female 4: A runner.
SL: A runner, okay. Probably got some practice in during the race today? Okay. Alright, so do you want to go to college? Do you all want to go to college?
Female 2: Yes.
Female 1: Yes.
Female 3: Yes.
Female 4: Yes.
SL: Okay, every one of you were like yes, yes, yes. Alright, tell me about that because some of you really looked excited when I asked that.
Female 2: I want to go to college so that I can get my degree and I want to graduate. Also, I want to learn about pediatrician in college.
SL: Okay.
Female 1: I want to be a... I want to go to college because I want to be a role model to my two sisters so that if I don't go to college then they wouldn't try to follow me and not go to college. Then, say if like, just an example, say if they see me go on the streets then that's what they're going to do because they see their older sister doing that so I want to be a role model to my sisters.
SL: Okay, yeah. You want to be someone that your sisters look up to and if you make good decisions or certain decisions, let's say, then they may make those decisions as well, right, because they're kind of looking up to you.
Female 1: Mm-hmm (affirmative).
SL: And what about you two?
Female 3: I want to go to college because I don't want to do something and then don't know what I'm doing because I didn't go to college.
SL: Okay, so your reasoning is like, you don't want to go out there, get a job, be a lawyer and then you're not sure what you're doing? You want to feel kind of knowledgeable about that. Yeah, go ahead. You were you going to say? Okay. And what about you?
Female 4: Be smarter. Make my parents happy.
SL: Be smarter, make your parents happy. Is college really important to your parents?
Female 4: Yes.
SL: Yeah, yeah. What about you all? Do your parents...
Female 2: Of course school is...
Female 1: It's education.
Female 2: It's what my mom wants because she wasn't able to go to college So she expects me to go to college.
Female 1: It's important and that's how my mom is too.

Female 2: To my mom, cause... well she's just now going to college and she doesn't want me to be like that. She wants me to just go to college and not wait more time to go to college.

Female 1: They always say make a... like represent them in a better way and don't copy what they did, make it better. Some people, they say do what your parents did, but really my mom says make it better than what she did and don't just do what she did because what she did, it's not all of it that was good so she says make better choices.

SL: Make better choices, okay.

Female 2: My mom said that she wants me to be better than her so that I'm going to be the one finding the right choices that she did but she just now went to college and she don't want to have that she wants me to be better.

SL: Female 3 were you going to say something?

Female 3: My mom she went to college but, like, she went late and she said she wants me to go to college like as soon as possible.

SL: Oh, okay. Would you like to add anything else?

Female 4: My mom didn't go to college. That's why she wants me to go.

SL: Okay, so she wants you to choose a different path maybe in terms of college? Okay.

SL: What do you think that you all would like about college?

Female 2: I think what I would like about college is that I would get to learn more and be a better person.

SL: Mm-hmm (affirmative)

Female 2: And make my passion or my dream come true.

SL: Okay, kind of similar to what Female 4 was saying in terms of you say you just want to be smarter, yeah, in going to college. Okay.

Female 1: I want to write, get to know my professors and get to know new things that I didn't know about being a pediatrician and just like she said, things like be able to be smarter.

SL: Mm-hmm (affirmative). Be smarter. Anything that you would like to add?

Female 3: No.

SL: No?

Female 4: No.

SL: Okay. What are some things that you think you will dislike about college? Let's start with you Female 3.

Female 3: You don't know anywhere or anyone. It's scary.

SL: Yeah, kind of like an unknown, right.

Female 4: You'll get lost.

SL: Oh, you're like no. I can see it in you're body language you're like thinking oh, no. Yeah.

Female 2: Maybe like sharing a room with a person that you don't know.

SL: Is it kind of like being roommates?

Female 2: [crosstalk 00:08:08]

SL: Oh, dorm rooms?

Female 2: Yeah.
SL: Oh, okay, I'm sorry. I didn't hear.
Female 1: That's scary, but it might be one professor that I might not like that's like really strict and stuff and just like she said, having a roommate that I really don't know.
SL: Mm-hmm (affirmative)
Female 1: Yeah because its kind of scary having a roommate that you don't know because sometimes they can get [inaudible 00:08:34] your stuff.
SL: Oh, okay. Kind of like an invasion of privacy?
Female 1: Yeah.
SL: Okay.
Female 2: Yeah, I just take all my stuff and put it in my purse and carry my purse with me.
SL: I know you mentioned some things related to class, but you're also thinking about just college life in general.
Female 2: And [inaudible 00:09:00]
SL: I'm sorry, I didn't hear you.
Female 2: In puberty they taught us about privacy. They said, on video they said, if you just started your period and you didn't know it was in school and your friend had already started her period you could go ask for her extra in case you get a pad or something and so that nobody knows and one lady on the thing she had one in her pocket and we didn't even know that she had one. So you have to have privacy.
SL: Yeah, so privacy is important. Okay. In terms of scientists, would you all like to be a scientist when you grow up? I hear a no over here from Female 3.
Female 4: I don't know.
SL: Female 4, you don't know.
Female 2: No to me.
SL: I'm sorry what did you just say?
Female 2: No.
SL: No? Oh, okay. I just wanted to know. And yes.
Female 1: I would like to work with technology.
SL: Oh, that's-
Female 1: And create more inventions and check out other inventions and stuff.
SL: And what do you mean by adventures?
Female 1: Inventions.
SL: Oh, inventions. Okay, okay. Got it, okay. We have one yes and then-
Female 2: Two no and one I don't know.
SL: Yeah. Why don't you all tell me about that in terms of-
Female 1: I do not want to be a scien ... Well, I'm going to have to go science for pediatrician, but I still don't want to be a scientist because I just don't know why I don't like it.
SL: You don't like it?

Female 1: No, its kind of boring.
SL: Its kind of boring?
Female 1: But it is kind of fun and boring, in-between.
SL: Somethings are interesting and fun and some things are like ugh. You're kind of shaking your head Female 3. What are you thinking?
Female 3: Because sometimes you don't have anything to do, but then you just have to make stuff and its boring.
SL: Its boring to ...
Female 3: To like sit around and wait for someone to tell you what to do.
SL: Oh, I see, okay.
Female 4: The experiments are fun, but you have to research. It's not-
Female 2: Its kind of hard.
SL: Experiments are fun, but when you have to research then not so much, huh Female 4? You're making a noise over there. What do you thinking? What are you thinking Female 1?
Female 1: I like it because I want to be a pediatrician. Its like a lot of machines that you have to work with and stuff like that so I want to be a scientist so I can learn about the machines.
Female 2: That's true, I do.
Female 1: Because mostly when you're working as a pediatrician we use machines and things like that because you're not just using your hands, you're using like machines, technology, and all of those things.
SL: Female 2, you were kind of, what were you saying? Were you agreeing with Female 1?
Female 2: When she said that you have to use technology and for being a doctor or pediatrician so I'm still in-between but I agree with her.
SL: What do you all think, is being a doctor also being a scientist?
Female 2: Yes.
Female 1: Yes, because you're also working with machines.
Female 2: Yeah you're working with like ...
SL: Female 4 you're saying yes?
Female 4: Yeah.
SL: What are you thinking in terms of that?
Female 4: I don't know.
SL: Yeah, okay. Female 3?
Female 3: I don't know.
SL: You don't know. Female 2?
Female 2: What was the question?
SL: Well, just kind of like what are you thinking in terms of ... because a lot of you ... Well, some of you were like yes, being a doctor is being a scientist.
Female 2: Because you're not just sitting all day like just checking on ... like you know what [inaudible 00:13:01] have any machines? Well, nowadays machines are checking your body and stuff. You have to use a machine for everything.

Female 4: You mean like doing that checks your blood pressure?
Female 2: Yeah. They used to have one that you blow up, but now they have a machine.
SL: Okay. So, Female 4, you mentioned a machine to check your blood pressure. If someone uses those machines, that means that they're a scientist? Is that what I'm hearing or no?
Female 1: [crosstalk 00:13:35] Not necessarily. It's just dealing with scientific stuff.
SL: Okay, okay. Alright, what do you think that for those of you who said that you're ... Well, for you you said that you're interested in being a scientist. What do you think that you'd like about being a scientist?
Female 1: Trying down new inventions and seeing different things I can do.
SL: Okay, and Female 4 I thought I ...
Female 4: The experiments, making a mess.
SL: Okay, yeah. What about you two? Anything that ... I know you said that you're not interested in being a scientist, but do you think there is at least anything about being a scientist that you would like?
Female 2: Yes, I'll be able to do experiments, make new things like if you don't want to like check your mail or something you can have somebody ... you could like press a button and it opens to you and delivers to your room. I want to be able to like make new inventions.
SL: What would you all dislike about being a scientist? Whether you want to be a scientist or not what would you all dislike? Female 1?
Female 1: Getting hurt.
SL: Getting hurt? Oh, tell me about that. Also, who was it ...
Female 3: Me.
SL: Okay, Female 3 we'll come back to you.
Female 3: Getting shocked by wires and stuff like that.
SL: Getting shocked by wires?
Female 3: Yeah, not knowing what you're doing and you just make a mistake and get hurt and stuff like that.
SL: Oh okay, what are you ... Is this a part of your job as a scientist or like what's the situation in terms of dealing with wires?
Female 1: Like you just turned the stuff on?
Female 3: I don't know. I just watch a lot of animated movies so on one movie they tried to turn it on, turn something on and they accidentally put two broken wires together and they got shocked.
SL: They got shocked..
Female 1: What movie?
Female 3: I forgot what its called. [inaudible 00:16:25]
SL: Can't remember the name Female 3?
Female 3: Its just like that movie, the meatball movie.
SL: The one you were explaining, yeah.
Female 2: Cloudy with a Chance of Meatballs?
Female 3: Yeah, that. When he hooked the thing to the city connection.

Female 2: Oh yeah and he got shocked.
SL: Yeah.
Female 2: That's a good movie. [inaudible 00:16:47].
Female 4: [inaudible 00:16:55]
SL: I'm sorry?
Female 2: [inaudible 00:16:56] model. I want to be a model if I don't be a pediatrician.
Female 1: A model-
Female 1: My backup plan is a psychologist.
SL: A psychologist?
Female 4: What's that?
Female 1: It's like, I don't know how to explain it. Its like helping children when they like have a lot of problems in their mind like anger problems and things. I don't know how to explain it.
Female 2: Oh sort of like people with disabilities like that? Sort of?
Female 1: Yeah but like an anger instability.
Female 3: My back up plan was to be a dancer. A professional dancer.
Female 2: A what? A dancer?
Female 3: Mm-hmm (affirmative)
Female 1: I don't want to be no dancer. I don't have any rhythm so ... I'm good at dancing up a storm.
Female 1: I said I'm good at dancing up a storm.
Female 3: Or a teacher.
SL: Or a teacher?
Female 3: Yeah.
SL: Again, that theme of working with kids, right?
SL: What are some other things that you all dislike about being a scientist? I know we focused on that example. Are there any other things?
Female 2: [Baking 00:18:02] with sticks, but sometimes when you make too many you get frustrated.
Female 1: The fire from my face. I got asthma and I just choked and I [fallout 00:18:16], fallout because the fire poof and then I pass out and then I have to go to the hospital and I'm so [ticked 00:18:25]. I'm scared of the hospital. I never want to use the bathroom there because I think those wires things, it feels like it's going to shock me and that would be scary.
Female 2: It says don't pull up.
Female 1: I try to pull it and I just don't go to the bathroom at the hospital. No [inaudible 00:18:48].
Female 2: My sister, she's at the lower campus and I said don't pull the red thing and she just kept looking at it like I'll try it.
Female 1: My sister tried to pull it.
SL: This example of making mistakes and being shocked and things like that, are these from your experiences in class?
Female 1: No.

Female 2: No.
Female 3: No.
Female 4: No.
SL: Okay. I was wondering because you all mentioned some of the same examples. I was like where ... Where is this coming from in terms of making mistakes as a scientist because each of you in some way have communicated that. Where is that coming from? What have you seen-
Female 4: Because usually when I'm at home and I'm trying to make something, I make so many mistakes and I just mad and then I calm down and then I'm like I can do this again and then really I can't do it so I just go and look it up on the Internet or go ask my mom.
Female 2: Just like when I make slime at home, I put too much activator in it and it gets too watery and I get mad and I throw it away and then I try to make it again. My sister is a slime expert so she helped me.
Female 1: I don't know how to make slime, I just look it up on YouTube, but sometime YouTube don't work.
SL: What about you too in terms of-
Female 4: The slime?
SL: I mean in terms of where does this idea of making mistakes as a scientist come from?
Female 4: Connected with what you've done.
SL: That kind of summarizes what they were saying, personal experiences. What about you Female 3?
Female 3: If just like slime, if you mix two things or if you put too much of something then it will mess up.
Female 2: It will be water.
Female 3: It will be water and stuff.
Female 2: Then it's just like, oh, and if you don't knead it right, it's going to be sticky and stuff.
SL: In terms of this idea about making mistakes, was that kind of relate to other jobs too or is it just in terms of what you think you may not like in terms of being a scientist?
Female 2: I think some other jobs like restaurants, stuff like that.
Female 1: If you put too much ... Say if somebody wants like at a pizza, [inaudible 00:21:24] white sauce and if they make the pizza and they put a lot of sauce and then you missed up and then they call the manager and that's a complaint for you and then the manager comes to you and says, "Why are you not making people things they want."
Female 2: Being a scientist, you have to know what amount to put in it, measurements.
Female 1: Yeah, measurements.
SL: You have to know the amount. Okay. You have to have that knowledge of just how much of something to add to something else.

Female 1: It's like all subjects in science. It's math, it's measurement. Reading is researching up things. Wait, wait. I forget. My mind just went completely blank. Hold on.
SL: We can come back to it.
Female 1: I forgot.
SL: What are some other things that scientists do at work?
Female 3: Blow stuff up.
SL: I'm sorry?
Female 3: Blow stuff up.
SL: Blow stuff up? Okay.
Female 4: [inaudible 00:22:35]
SL: Shock [inaudible 00:22:40]. Okay.
Female 2: One time I was watching this movie, it was a science movie, and this man and he sat ... he made a fire potion and then sat in it. His pants had a big hole in it.
SL: Do you remember which movie it was?
Female 2: No. It was like ... and then he blew up. It was an Eddy Murphy movie.
SL: A Eddy Murphy movie?
Female 2: Yeah and he blew up. His pants got a hole in it.
Female 1: I remember that movie.
SL: What are some other things that a scientist they do at work?
Female 4: Chemicals.
SL: Okay.
Female 4: Use a whole bunch of chemicals.
SL: Using a whole bunch of chemicals?
Female 2: You make them break out of the [inaudible 00:23:24]. That's why I can't do it precise.
Female 1: I have a lot of allergies.
SL: Okay. Do you think a person would need to go to college in order to be a scientist?
Female 1: Mm-hmm (affirmative)-
Female 2: Yeah.
Female 3: Yeah.
Female 4: No.
Female 3: It takes a lot-
SL: I didn't catch all the responses here. We have a Female 4 no.
Female 4: Yes.
SL: Female 3 yes. Female 2 yes.
Female 2: Yes. It will take a lot to be a scientist. I believe that it [inaudible 00:23:49] college to learn about a scientist and ... My cousin, she wants to be a firefighter so she says ... She's different than my cousins to learn about firefighter and she wanted to be a firefighter because at summer camp they'd be coming, like once ... Not once, but they come twice during the summer camp and then it would be police with [inaudible 00:24:13] and

fire trucks and my cousin, she just wanted to be a fire fighter because the things that they were showing her.

SL: Female 4, you said no. What are your thoughts on that?

Female 4: I don't know. I think you can be anything without having to go to college.

SL: Okay. College is not ... You believe that college isn't necessary to go into a particular job?

Female 4: Sort of.

SL: Sort of, sort of. Kind of depends?

Female 2: I respectfully disagree with her because say if you want to be an entrepreneur. If you want to be an entrepreneur you have to go to school for it. That's what my mom is going to school for and if you want to have a hair salon and somebody comes, like the state comes, and then they see that the owner doesn't have a license, they can go to jail for that. They didn't go to college, get their license and stuff.

SL: In what ways do you think ... Well, first of all let me ask you this question in terms of learning to be a scientist, do you think it's easy or hard to learn to be a scientist?

Female 2: I think it's hard.

SL: You think it's hard. Female 2 says it's hard. Okay, wait. Hold on Female 2. I'm going to come back to you, okay. Female 2 is saying hard. Female 4 says hard.

Female 4: Hard.

SL: Female 3, hard. Female 1?

Female 1: Yes, it's hard.

SL: Okay and we will talk about that. Female 2, go ahead.

Female 2: It's hard because you have to have a real big responsibility and some people are not responsible. Sometimes it's hard for those people. It's not really hard for me because I ... It's just you have to have responsibility and you've got to be able to know how to ... your math and you don't know you just [inaudible 00:26:29].

Female 1: I agree with her, but if you're in school right now at this age and you're doing science experiments or stuff, it's kind of in you. It will get a little easier for you, but as you go it will get harder and harder for you because right now what you're doing is easy. It's not like using actual chemicals and things. You're just making experiments now. Like doing actual inventions.

SL: What about you Female 3 or Female 4? What do you all have to say about it?

Female 3: I don't know.

SL: You don't know?

Female 3: I just feel like it's hard.

SL: Yeah. Just hard to learn?

Female 3: Mm-hmm (affirmative)-

Female 4: You have to have a lot of talent.

SL: I'm sorry?
Female 4: You have to have a lot of talent.
SL: A lot of talent? Okay. What do you mean by that?
Female 4: I don't know. [inaudible 00:27:24] talent.
SL: You just kind of know it, right, when you hear it or see it?
Female 2: Sometimes you have to have the confidence in yourself because some people, they have anxiety and then they don't have confidence in themselves and then they just missed a whole experiment and then they [inaudible 00:27:40].
SL: Okay. Let me ask you this, in terms of working or doing the job of a scientist every day, do you think it's easy or hard?
Female 4: Hard.
Female 2: Hard.
SL: Female 4 said hard really, really fast. What about you Female 1?
Female 1: I think it's hard because you're not doing the same thing over and over again. Every day it will get harder as you do it because you are doing different things. One day it will be [inaudible 00:28:14], next day it will be technology, stuff like that, but you're just trying different things and when you try different things it's like you've got to learn it first and then it will get easier.
SL: Okay. Hard at first and then as you do it will become easier.
Female 1: And then you repeat again and then it will become more easier.
SL: Okay. Female 2?
Female 2: I think it would be [easy 00:28:39], but I kind of don't. It's hard to be a scientist because sometimes you learn new things every day and what's the job. You're doing new things every day. Once you get used to it, it won't be really hard. It's like hard and easy at the same time.
Female 3: I think it's in the middle because sometimes you have easy experiments and then sometimes you don't and then sometimes you don't get something and then sometimes you do.
SL: Okay. It just really depends on what you're doing?
Female 3: Yeah.
SL: Female 4, you were the first person that was like, "Hard." What were you thinking when you said that?
Female 4: You've got to be ready for what things that they give you to look up and all of that. You have to do it constantly.
SL: Yeah. Okay. In terms of being a scientist, is the job important or not important?
Female 4: It's important.
Female 2: Important.
Female 1: If it wasn't important there would be no reason to be a scientist. It would be just wasting a little bit of time and you could be home watching Netflix.

SL: Okay. I see what you're saying. You're saying if it wasn't important, really what would be the point of doing the job?

Female 1: Yeah. Just watch Netflix at your house.

SL: Just watch Netflix, right. Okay. Female 3, you were kind of nodding your head there.

Female 3: Because what's the point of doing something if it's not important.

SL: Are there any jobs that are not important that exists?

Female 3: Maybe McDonald's.

Female 4: Yes. That's what I was about to say.

Female 2: Or fast food restaurants.

Female 4: For people who just ... Wendy's and McDonald's are just people who just came back from college and stuff.

Female 2: Teenagers.

SL: Okay. It can kind of be a starting point to move on to something else?

Female 1: Yeah.

Female 2: Sometimes I see older people working at McDonald's. My math teacher, he told us you have to do good in school so that you won't be at McDonald's [inaudible 00:31:07].

SL: So then what ... I'm sorry Female 1. Go ahead.

Female 1: Doing car wash because it's [inaudible 00:31:13] car washing.

Female 2: There's a machine for car washing. You don't-

Female 1: At the [inaudible 00:31:21] you can do or car wash place that you can do. A lot of people they just wash cars [inaudible 00:31:28].

Female 2: I guess you can wash it with your hands and get all the dirt, like the in-between spots that the machine won't get.

Female 1: There is a washing place and I don't know why people work there, but I'm pretty sure people shouldn't work ... They just sit there and talk because one time we went there to get our car wash when we usually wash our car, but we went there to get our car washed and they have a machine that says pay and then you go in and then it turns red and then you go and it says, "Drive slowly." There's no reason to have anybody there.

SL: Okay. If there are jobs that exist that aren't important and you said that being a scientist is important because it exists. Is there something else about being a scientist that makes it important to you all?

Female 1: I just think it's important.

Female 2: It's your passion to be a scientist maybe.

SL: Okay. If you as a person, if you're passionate about being a scientist then that would make the job important?

Female 2: Sort of do, it will be interesting to you, but some people don't think it is.

SL: For the person who is going into it, it might be important to them, but for some other people it might not be important?

Female 2: Okay. It's important to me.

SL: You all are saying it's important to you?

Female 2: Yeah.

SL: Okay. How did you all find out about scientists and where did you all-
Female 2: Movies.
SL: You said science class?
Female 2: It really is science class I think.
Female 1: I like to walk around, do stuff on the internet and I see it.
SL: Okay. Internet, movies.
Female 1: I do some funny searches, but in science class we don't really do anything because everybody don't listen to the teacher. We don't really [crosstalk 00:33:43].
Female 2: I had to learn from STEM.
SL: What is that?
Female 2: STEM is science, technology, engineering, art and I forgot the last ... math.
SL: Is that a class?
Female 2: No. I just [inaudible 00:34:00] use what the words sound like.
Female 1: It's like [kindergarten 00:34:04] before.
SL: What do you mean like you learned from that? Where do you go to get it?
Female 1: You do a whole lot of experiments. It's a specials class over at the lower campus.
Female 2: Yeah, it's called ... they have art. They have PE and STEM. They have different classes. [crosstalk 00:34:31]
SL: That was the building that we were in when you did the drawing, right? Is that where you all take your ... Okay. You remember what it was like to be in that class is what you're saying?
Female 2: Yeah and [inaudible 00:34:45].
Female 1: [inaudible 00:34:46] was fun.
SL: Where else did you learn about scientists?
Female 2: From my old science teacher.
SL: Your old science teacher?
Female 2: I learned some stuff from second grade. One of the second grade teachers, she was a STEM teacher.
Female 1: I learned something last year.
SL: What class is that?
Female 2: It was STEM.
Female 1: That was a STEM class.
SL: That was STEM class?
Female 2: We did a lot of experiments using technology.
Female 1: I learned last year.
Female 2: We actually learned something because we were doing things, big.
Female 1: I learned [inaudible 00:35:22] from because-
SL: What class is that?
Female 1: Math at the other school.
SL: Okay. From that.
Female 1: [inaudible 00:35:33] She's at the lower campus. I learned stuff from her.

SL: What class did she teach?
Female 1: She taught STEM in the special area.
SL: The STEM specialist because I'm not familiar with the teachers.
Female 2: The other STEM teach we had, besides Mr. [inaudible 00:35:47].
Female 2: Yes, she was nice.
SL: It sounds like you all learned about science. Did you all learn about scientists like doing the job of being a scientist?
Female 2: Yes.
Female 1: Yes.
SL: Yeah, okay.
Female 2: [inaudible 00:36:05]
Female 1: I did.
SL: What did you all learn about being a scientist?
Female 2: He told us it's not easy. It's not just like doing-
Female 1: Random things.
Female 2: Not doing experiments all day. It's not really easy because you have to research. You have to find reasonable answers.
SL: Were you going to say something Female 1?
Female 1: No.
SL: No. What about you Female 3 and Female 4 in terms of do you all talk about being a scientist at all?
Female 3: No.
SL: Okay. I know a couple of you mentioned movies so being a scientist.
Female 4: We watched a lot of movies with scientists.
Female 2: I used to. I just watch Eddy Murphy movies [inaudible 00:37:02].
SL: Okay. Just that one movie. Then I know you mentioned, Female 1, you mentioned some websites as well.
Female 1: [inaudible 00:37:12]
SL: Articles. Is there anything else you all would like to quickly mention about being scientists?
Female 2: No.

Interview II: Gender-based Group
Males

SL:	Alright, so what do you all want to be when you grow up? Okay, go. We'll just go around.
Male 4:	Alright, I want to play football and design shoes.
SL:	Design shoes, play football. Male 3?
Male 3:	I wanna be an engineer. I wanna make robots.
SL:	You want to make robots? Okay?
Male 2:	A football player.
SL:	And I forgot, which position?
Male 2:	D Line
Male 4:	D End?
Male 2:	Yeah.
Male 4:	You wanna play D End? You gotta get your speed up to get past the the box.
Male 3:	He is fast.
Male 1:	Running wide receiver.
SL:	Okay. Male 1?
Male 1:	Just a sports player.
Male 4:	You gotta know what you gonna play?
SL:	What sport do you want to play?
Male 3:	Football.
Male 1:	Football.
SL:	Are you just saying that 'cause he said that?
Male 1:	No.
Male 3:	No, he wanted to play football.
SL:	Oh so you just knew him.
Male 3:	I saw him at the park.
Male 4:	You a quarterback or a running back?
Male 3:	I saw him at the park playing football.
Male 4:	Quarterback?
Male 1:	Quarterback.
Male 4:	Running back? I'm running back.
SL:	So what are your reasons for choosing those jobs?
Male 4:	I play sports at a young age. I started when I was about five or six and I want to design shoes because there is a lot of people that don't have shoes and I wanna make them to where people can get shoes.
SL:	Okay.
Male 3:	I want to be an engineer, because I like building things and I have my own bag of legos at home and I just build things. Like my mind takes control of my body and then I just build something random.
SL:	You just like getting into it, huh?
Male 3:	Yeah, I build stuff randomly and then it looks good at the end.

Male 4:	What y'all be doing at [crosstalk 00:02:35].
Male 2:	Homework and tests.
Male 4:	Oh.
SL:	Male 1. I saw you.
Male 1:	I also want to be in gymnastics, because...
Male 4:	Oh, oh.
Male 1:	'Cause I taught myself how to do a back flip so I think I could...
Male 2:	Oh, could you teach me how?
SL:	And what about you 2?
Male 4:	Just say something. I know how to play.
SL:	It's okay.
Male 4:	I wanna play, 'cause I know how.
SL:	It's okay. What's your reason for wanting to be a football player?
Male 2:	So I can get the money and help the homeless people in my family.
Male 4:	Help homeless people.
SL:	But do you want to help homeless people and you like how much they get paid right? Yeah? And when you have money you can, you can do [crosstalk 00:03:36]. Do you all want to go to college?
Male 4:	Mm-hmm (affirmative).
Male 3:	No. Wait that depends?
Male 4:	You said, she asked do you want to go to college?
Male 3:	That depends.
Male 4:	You want admission and then.
Male 3:	If I have my own business, then I might, but if I don't have my own business [inaudible 00:03:55].
SL:	Okay. So, if you don't have your business, you're going to college. I mean, if you do have your business.
Male 3:	I might go to college.
SL:	You might go to college. You're not quite sure. What do you think Male 2, because you're like…
Male 2:	I'm going to do it online.
Male 3:	No, there are actually online colleges and yeah, you know what, actually at UCF they have whole programs online. Did you know that?
Male 4:	You start early.
SL:	And what about you two?
Male 4:	I said, cause I know how, I started at an early age.
Male 3:	You said do you want...
SL:	Do you want to go to. We're Male 1 about college.
Male 4:	Oh, college. Oh, you first. Oh.
Male 2:	I'm a no.
SL:	Because you already have your mindset where you're going. Okay and what about you? Yes? Thumbs up Male 1? Okay.
Male 4:	He going to Florida State.
Male 1:	Florida State.

Male 4: Everybody going to Florida State, except…

SL: So, what do you all, what do you all think you would like about going to college?

Male 4: I would like to make friends.

SL: Make friends.

Male 4: See family.

SL: See family.

Male 3: Eat food.

SL: What do you mean by see family?

Male 4: Seeing people that I grew up with.

SL: Oh, because it's possible you all will go to the same college.

Male 4: Mm-hmm (affirmative).

Male 2: [crosstalk 00:05:23]. Going to go to college, but I don't want to be like.

Male 4: Wait you said you want to be play football?

Male 2: Yeah.

Male 4: So, I hope you know, if you play football, you have to go to college.

Male 3: Yeah.

Male 4: 'Cause you gotta be on the team for them to recruit you.

Male 3: Yeah, to go to NFL.

Male 2: Nuh-uh.

Male 3: They be Male 1 at Florida State, so you better go to Florida State.

Male 4: Yeah, that's where...

Male 2: I'm going to go to UCF.

SL: Okay, so for certain things you all are saying you have to go to college if you want to do that. And what about you Male 1?

Male 1: Me. I might not go [crosstalk 00:06:31]. I'm going to go into like a team that's not that good, so I can be good on the team I go to.

SL: What would you say Male 1?

Male 4: Go to Texas A&M cause they got Jimbo Fisher.

SL: What do you think you would like about college?

Male 4: I would like sports. The cute girls.

Male 4: I like the food, sports, and the girls.

SL: Okay, a little- what about you?

Male 2: My education.

SL: Your education?

Male 3: What do you call teachers at college?

SL: [crosstalk 00:07:41] Professors.

Male 3: The professors, the sports, the food, and the cute girls.

Male 3: [crosstalk 00:07:52]

Male 2: Look, this is what's gonna happen. I'm gonna go to school, I'm gonna get my grades up, I don't have a girlfriend, so that way if I get my grades then I start and then get a girlfriend and then my grades start flipping, so I wanna get a girlfriend first and then make sure my grades are on point still and then start playing football so I won't get kicked off the team by my grades or my attitude.

SL: Okay, so what are some things you think you would dislike about college?

Male 2: People get killed at college, like that girl who got put in a freezer at college at a party.

Male 2: Studying. People are gonna be having parties at night while you're trying to study. Your grades are gonna slip just like theirs because you cannot study because they're loud.

SL: What are some other things that you all would dislike? We're gonna go around and then come back here.

Male 2: I don't like doing the little group thingies-

Male 1: Games!

Male 2: Fraternities, is that what it's called?

SL: Is that what you mean? So, you're saying you do want to join or you don't?

Male 2: I don't.

SL: You don't want to join. So you're saying like-

Male 1: It's depending on what it is. If it's like a good-

Male 2: It's like the wooden thing-

Male 1: A club? A bat?

SL: Oh you mean like hazing, when they paddle? So you're saying no to that. Male 1, what were you saying? What would you dislike about college?

Male 1: Getting up early part.

Male 3: You don't have to.

SL: What were you saying Male 3? You don't have to get up early?

Male 3: If you don't get up early your grades might slip, but if your grades are up and you study all night, you could sleep in a little bit. But in classes you have to get up early.

Male 1: Yeah cause you can go to school Monday, Wednesday, Friday, and then you can have fun, you can have your free days on the rest of the days you don't have class.

SL: So what would you dislike about college?

Male 1: I would dislike, y'all really want to know what I would dislike about college? All the fine girls fighting over me. That's it, all the cute girls fighting over me.

SL: Alright, I guess we'll have to take it. Would you all like to be a scientist when you grow up? Let's start with you this time Male 2, you're saying no. Tell me about that. He's like, no, you look like you really mean it. What would you dislike about being a scientist?

Male 2: I don't want to touch no cockroaches, no worms.

Male 1: He said cockroaches.

Male 2: I don't wanna touch no roaches, worms, all that stuff outside. I don't know where it's been.

Male 4: You don't like exploring nature cause you don't know where it's been.

SL: Okay, Male 1?

Male 1: I would like to be a scientist, but like-

Male 3: I would like to be a scientist because I would like to investigate things and look where things are and I'm a very curious person.

Male 4: And I'm in the middle cause I hate nature because I don't know where them animals been and I don't wanna touch them.

Male 3: You made all the dirt.

Male 4: I don't care, and I don't wanna touch no frogs, cause you gonna be like it's moistened and that's gonna be pee not moisture. And then I would like it because the experiments. I would like to do experiments about food and if I don't run out I would get to eat the rest of the food that's left.

SL: So what are some things that scientists do at work? Let's start with you Male 1.

Male 1: Experiments.

SL: What kind of experiments?

Male 1: With chemicals. Chemical changes.

Male 4: They do models of earth rotating around the sun and the moon rotating around earth, and showing how solar eclipse happen, like when it's rotating around and then the moon be facing the sun.

Male 2: They hypothesize.

SL: What does that mean?

Male 2: They ask questions about something and see if it's right.

SL: How do they see if it's right?

Male 2: They do the experiment like Male 1 said, so the hypothesis is the question.

SL: And Male 4, what are some other things that scientists do at work?

Male 4: Do they eat anything?

Male 1: Yeah. Taste testing. Like what I said, experiments.

Male 2: They take different kinds of food and drinks.

SL: So what do you all mean by tasting things?

Male 4: Sometimes in my head I be thinking about quitting when I get old and retire from football, I wanna go back to school and go around the world and eat food and get paid for eating food.

SL: Scientists-

Male 4: Like Man Versus Food.

SL: Do scientists do that?

Male 4: No, scientists- some scientists do that. We read a passage on it in class where scientists is something, they did something, they went to school for something, I forgot what it was called.

Male 1: Oh yeah, they go to school and get paid for eating. Like futuristic, people study something, like say this water bottle, that's how it was in 1996 and this is how it was in 2017.

Male 3: This is not plastic, it's real metal.

Male 2: My mom said next year she was gonna go back to school and she was gonna get more money, something like that. Something to do with digital-

Male 3: She said I'm gonna get that money.

SL: Do you think a person would need to go to college in order to be a scientist?
Male 4: Yes.
Male 2: Not all the time.
Male 2: It depends on what type of scientist you wanna be because some scientists they wanna be engineers. Some people call engineers scientists and crap like that so you gotta go to school for mechanical engineers, chemical engineering and like that.
Male 3: I disagree with him, I say that they do not have to go to college. They do not have to go to college.
SL: That's okay, different opinions, go ahead.
Male 3: Because engineers are scientists. Everything, even mathematicians are scientists because everything is part of science. This table, it's math because of how much around a table that's math and that's science because math is science.
SL: What do you think?
Male 2: No.
SL: Don't have to go to college? So you're saying yes you have to go to college in order to be a scientist?
Male 4: Yes.
SL: And what do you think Male 1?
Male 1: Yes because I think you gotta study the chemicals that you use and the tools that you use.
SL: So what ways, let me ask this, do you think it's easy or hard to be a scientist?
Male 4: Hard. Very very very very, infinity times hard. Because you have to do all of this stuff.
Male 2: You gotta write. I don't like writing.
Male 1: I think it's hard to be a scientist because sometimes when you do experiments it takes like a couple of weeks at least.
SL: So it takes time to do experiments? And what do you all?
Male 3: You got to do all of this stuff and you just want some free time but you have to do experiments. And all the scientific work while getting criticized.
SL: Criticized? You mean at work?
Male 3: Yes, by getting criticized by the whole world. People talk about you but you're saving the world.
SL: And what do you think Male 2? You said it was hard. In what way?
Male 2: Very very hard because they got to do all the writing. For me, I don't like writing at all.
SL: You don't like writing, so you're saying since they have to write it's probably going be hard. What about, do you think it's easy or hard to learn to be a scientist?
Male 3: Hard. Infinity [inaudible 00:19:04] hard.

SL:	Hard okay. What do you say Male 1?
Male 1:	Hard.
SL:	Male 2?
Male 2:	Hard.
SL:	So, tell me about that.
Male 2:	Medium.
SL:	Medium? Okay, so tell me about that. What do you mean by that Male 2?
Male 4:	Because learning about scientists, some stuff you already know at school about scientists, so when you probably be a scientists it's only gonna be probably about like a few things that you need to know more about scientists. That's it.
SL:	What would you say Male 1?
Male 1:	I think it's medium, but hard hard hard because to be a scientist is hard, so if you have to learn how to be a scientist, and being a scientist is hard, then it'd be hard to learn how to be a scientist. It be hard learning, but then you get it and you know how. Male 3?
SL:	What do you think? Is it easy or hard to learn to be a scientist?
Male 3:	It is not easy or hard because, I would say it ain't hard because all you gotta do is, say here's an experiment, get the materials, do what it said to do, and then you go to nature.
Male 1:	If you a scientist, there's no question-
Male 2:	It's easy. I say easy.
SL:	Is the job of a scientist important or not important?
Male 4:	Yes, I say important.
SL:	And what do you say Male 2? Do you think it's important or not important?
Male 2:	Yes.
SL:	Let's start with you-
Male 3:	Male 3.
SL:	You said it is important, how?
Male 3:	It is important because it's saving the world. Something could be like, there could be a disease or something and then the scientists they could find a cure.
Male 3:	Just like on the news they say scientists are finding out a cure, scientists are looking for a cure.
Male 1:	That's what I said.
Male 3:	Scientists. So scientists are looking for something that can prevent people from dying. That can help prevent people from dying.
SL:	And that makes it important?
Male 3:	Yes.
Male 4:	I wanna add on to what Male 3 said. Scientists they are important. People are getting diseases and then they look for how to cure. If you don't have a scientist, if there were no scientists, then no one would be able to know how to find a cure for diseases, and then the people at hospitals and nurses

and doctors, they won't be able to cure people with the type of antidote they need.

SL: What would you say Male 1?

Male 1: I think it's important because if you don't have scientists, we wouldn't know about most of the things in the world.

SL: So if it wasn't for scientists, then we wouldn't know about what?

Male 1: Me.

SL: What do you mean by you?

Male 1: We wouldn't know how to take out a baby. Maybe, since I was a baby, we wouldn't know about most of the animals.

SL: What would you like to add?

Male 4: What's the question?

SL: What makes being a scientist important because you also said that, so what makes being a scientist important?

Male 4: Because you have to-

Male 4: It's important to be a scientist because you gotta do things that help other people.

SL: Last question. Where did you all find out about scientists?

Male 2: My mom.

SL: Your mom?

Male 4: That teacher.

Male 1: Internet.

SL: From where? Where on the internet?

Male 1: Google.

SL: From Google?

Male 1: You type in stuff.

SL: So when you're kind of like looking up things. What would you look up to find out about scientists?

Male 1: What are scientists priorities?

Male 2: What is scientist priority.

Male 2: A scientist's priorities.

Male 3: What is a scientist's priority?

Male 2: What is a priority?

Male 1: Like what they do.

Male 2: Like the object. Hold on.

Male 4: [crosstalk 00:25:12] The purpose. [crosstalk 00:25:17]

SL: One at a time. The purpose, and then what were you saying?

Male 1: Purpose.

Male 4: The equipment.

SL: The equipment, okay. Do you all talk about the job of scientists in school?

Male 4: Yeah, no, yes.

SL: Yes, no?

Male 1: My teacher

SL: No names.

Male 4: My teacher
SL: Nope. What about at home? Do you all talk about being a scientist at home?
Male 2: No.
Male 4: Yes ma'am.
SL: Like what?
Male 4: I talk about, because my dad, he loves to do science, so we always talking about science. So when I have a science project I do it with him, not my mom. My momma is either reading or math, one of them.
Male 4: My sister she has an eight point oh reading level.
SL: So what about you Male 1? What do you all talk about in terms of being a scientist or scientists? What do you all talk about?
Male 1: Would you like to be a scientist? Where did you grew up? Do you like studying science or- do you know what they do?
SL: Who asks you that?
Male 1: My own dad.
SL: Your dad?
Male 1: My dad loves-
SL: He loves science? Is he in science?
Male 1: No.
SL: No, okay. Male 2, what about you?
Male 2: We don't talk about science at home. We talk about dogs.
SL: You have a parent who works as a scientist.
Male 3: But not this week because I have not been at home this week. I'm with my auntie.
Male 2: His dad's a mathematician, not a scientist.
Male 3: She's talking about my momma.
Male 2: What she work for?
Male 1: [inaudible 00:27:09] food that we need in the house.
SL: Is there anything else that you all would like to add about being a scientist?
Male 4: No ma'am.

APPENDIX T
PREDETERMINED CODES/CODEBOOK

Predetermined Codes/Codebook

Code	Description
Lab Coat	Scientist wearing or described as wearing lab coat
Eyeglasses	Scientist wearing or described as wearing eyeglasses
Facial Hair	Scientist wearing or described as wearing a beard, mustache, long sideburns
Smiling	Scientist smiling or described as smiling
Symbols of Research	Scientist using or described as using lab equipment or instruments, or the presence of equipment/instruments
Symbols of Knowledge	Scientist using or described as using books, clipboards, pens in shirt pocket, filing cabinets, or the presence of symbols
Technology	Scientist using or described as using computers, mobile communication, tv, missiles, or the presence of such technology
Male Scientist	Scientist is described as male
Female Scientist	Scientist is described as female
Black Scientist	Scientist is described as Black
White Scientist	Scientist is described as White
Indications of Danger	Scientist and/or work tasks are associated with explosions, chemicals, or other health hazards
Mythic Stereotypes	Scientist is described as a character or creature, such as Frankenstein
Indoors	Scientist working indoors
Outdoors	Scientist working outdoors
Laboratory	Scientist working in a laboratory
Computer and Mathematical Scientists	Scientist described and/or work tasks are consistent with computer mathematical scientists
Life Scientists	Scientist described and/or work tasks are consistent with life scientists
Physical Scientists	Scientist described and/or work tasks are consistent with physical scientists
Social Scientists	Scientist described and/or work tasks are consistent with social scientists
Science Postsecondary Teachers and Researchers	Scientist described and/or work tasks are consistent with science postsecondary teachers and researchers

Science Occupational Aspiration	Aspiration classified as science occupation as per SOC
Engineering Occupational Aspiration	Aspiration classified as engineering occupation as per SOC
S&E-related Occupational Aspiration	Aspiration classified as S&E-related occupation as per SOC
Non-S&E Occupational Aspiration	Aspiration classified as neither science or engineering as per SOC
College Educational Aspiration	Aspiration to apply, attend, and/or enroll in college or university
Preparation Requirement – College	Scientists are described as needing to attend college or postsecondary institution
Preparation Requirement – None	Scientists are described as not needing to attend college or postsecondary institution
Work Tasks – Research	Scientists are engaged or described as engaging in research, experiments, discovery/exploration or investigations
Work Tasks - Teaching	Scientists are engaged or described as engaging in teaching activities
Work Tasks – Collaboration	Scientists are engaged or described as engaging in collaboration with other scientists and/or colleagues.
Study Skills	Individuals are described as needing to study, listen, focus, take notes in class, and/or completing assignments.
Exposure of Scientists	Seeing and/or meeting scientists in person or through media consumption
Core Academic Subjects	Academic courses such as math, science, and/or reading
Important	Scientist job and/or work tasks described as valued, such as saving lives, curing diseases
Earning Potential	Scientist is described as earning a salary or wage
Difficulty to Learn	Learning to be a scientist is described as complex, and/or participant expresses frustration with science, math, or technology
Difficulty to Do	Scientist’s job and/or work tasks are described as complex

LIST OF REFERENCES

ACT. (2008). *The forgotten middle: Improving readiness for high school*. *Issues in College Readiness*. Iowa City, IA. Retrieved from http://search.proquest.com/docview/61964088?accountid=12768

Akos, P., Lambie, G. W., Milsom, A., & Gilbert, K. (2007). Early Adolescents ' Aspirations and Academic Tracking : An Exploratory Investigation, *11*(1), 57–64.

American School Counselor Association. (2003). *The ASCA national model: A framework for school counseling programs.* Alexandria, VA: Author.

American School Counselor Association. (2005). *The ASCA national model: A framework for school counseling programs* (2nd ed.). Alexandria, VA: Author.

American School Counselor Association. (2012). *The ASCA national model: A framework for school counseling programs* (3rd ed.). Alexandria, VA: Author.

Archer, L., Dewitt, J., & Osborne, J. (2015). Is science for us? Black students' and parents' views of science and science careers. *Science Education*, *99*(2), 199–237. http://doi.org/10.1002/sce.21146

Ashcraft, C., & Blithe, S. (2010). Women in IT: The Facts, 52. Retrieved from www.ncwit.org/thefacts%5Cnhttp://www.ncwit.org/sites/default/files/legacy/pdf/NCWIT_TheFacts_rev2010.pdf

Auger, R. W., Blackhurst, A. E., & Wahl, K. H. (2005). The Development of Elementary-Aged Children's Career Aspirations and Expectations. *Professional School Counseling*, *8*(4), 322–329. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=16892532&authtype=sso&custid=s8993828&site=eds-live&scope=site

Babco, E. L. (2004). Skills for the Innovation Economy : What the 21st Century Workforce. *Science*, (202).

Barba, R. H. (1990). Assessing children's attitudes towards computers: The Draw-A-Computer User Test. *Journal of Computing in Childhood Education*, *2*(1), 5–17.

Barba, R. H. (1991). Assessing American children's attitudes towards computer technology. *International Journal of Mathematical Education in Science and Technology*, *22*(5), 731–737. http://doi.org/10.1080/0020739910220504

Barker, L. J., & Aspray, W. (2008). The State of Research on Girls and IT. In J. M. Cohoon & W. Aspray (Eds.), *Women and information technology: Research on underrepresentation* (pp. 3–54). Cambridge, MA: The MIT Press. http://doi.org/10.7551/mitpress/9780262033459.003.0001

Barman, C. R. (1999). Students' views about scfientists and school science: engaging K-8 teachers in a national study. *Journal of Science Teachers Education*.

Berzin, S. C. (2010). Educational aspirations among low-income youths: Examining multiple conceptual models. *Children & Schools*, *32*(2), 112–124. http://doi.org/10.1093/cs/32.2.112

Bigler, R. S., Averhart, C. J., & Liben, L. S. (2003). Race and the workforce: occupational status, aspirations, and stereotyping among African American children. *Developmental Psychology*, *39*(3), 572–580. http://doi.org/10.1037/0012-1649.39.3.572

Blackhurst, A. E., & Auger, R. W. (2008). Precursors to the gender gap in college enrollment: Children's aspirations and expectations for their futures. *Professional*

School Counseling, *11*(3), 149–158. http://doi.org/10.5330/PSC.n.2010-11.149

Blackhurst, A. E., Auger, R. W., & Wahl, K. H. (2003). Children's perceptions of vocational preparation requirements. *Professional School Counseling*, *7*(2), 58–67.

Blau, P. M., & Duncan, O. D. (1967). *The American occupational structure*. New York, NY: Wiley.

Blerk, L. van. (2006). Working with Children in Development. In V. Desai & R. B. Potter (Eds.), *Doing Development Research* (pp. 52–62). London: Sage Publications Ltd. http://doi.org/http://dx.doi.org/10.4135/9781849208925.n6

Bobo, M., Hildreth, B. L., & Durodoye, B. (1998). Changing patterns in career choices among African-American, Hispanic, and Anglo children. *Professional School Counseling*, *1*(4), 37–42. http://doi.org/10.1016/i.bandc.2008.07.009

Boxer, P., Goldstein, S. E., DeLorenzo, T., Savoy, S., & Mercado, I. (2011). Educational aspiration-expectation discrepancies: Relation to socioeconomic and academic risk-related factors. *Journal of Adolescence*, *34*(4), 609–617. http://doi.org/10.1016/j.adolescence.2010.10.002

Bryman, A. (2006). Integrating quantitative and qualitative research: How is it done? *Qualitative Research*, *6*(1), 97–113. http://doi.org/10.1177/1468794106058877

Bureau of Labor Statistics. (2010). *Occupational Outlook Handbook*. Washington, DC: U.S. Department of Labor.

Bureau of Labor Statistics. (2015). *Occupational Outlook Handbook* (2016th–2017th ed.). Washington, DC: U.S. Department of Labor.

Carnevale, A. P., Smith, N., & Strohl, J. (2010). *Help wanted Projections of jobs and* *education requirements through 2018*. Retrieved from https://cew.georgetown.edu/cew-reports/help-wanted/

Centers for Disease Control and Prevention. (2017). Zika virus: Overview. Retrieved from https://www.cdc.gov/zika/about/overview.html

Chambers, D. W. (1983). Stereotypic images of the scientist: the draw-a-scientist test. *Science Education*, *67*(2), 255–265. http://doi.org/10.1002/sce.3730670213

Committee on STEM Education, & National Science and Technology Council. (2013). *Federal science, technology, engineering, and mathematics (STEM) education: 5-Year strategic plan*. Retrieved from https://www.whitehouse.gov/sites/whitehouse.gov/files/ostp/Federal_STEM_Strategic_Plan.pdf

Cook, T. D., Church, M. B., Ajanaku, S., Shadish, W. R., Kim, J. R., & Cohen, R. (1996). The development of occupational aspirations and expectations among inner-city boys. *Child Development*, *67*, 3368–3385. http://doi.org/10.2307/1131783

Creswell, J. (2013). *Qualitative inquiry and research design: Choosing among five approaches*. Thousand Oaks, CA: Sage Publications, Inc.

Creswell, J., & Plano Clark, V. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Dauber, S. L., Alexander, K. L., & Entwisle, D. R. (1996). Tracking and transitions through the middle grades : Channeling educational trajectories. *Sociology of Education*, *69*(4), 290–307.

Davis, A. (2013). Pediatrician or professional athlete? Gender, ethnicity, and occupational aspirations of urban adolescents. *Journal of Education for Students Placed at Risk*, *18*(2), 141–152. http://doi.org/10.1080/10824669.2013.797883

Dennis, W. (1966). *Group values through children's drawings*. New York, NY: John Wiley & Sons, Inc.

DeWitt, J., & Archer, L. (2015). Who aspires to a science career? A comparison of survey responses from primary and secondary school students. *International Journal of Science Education*, *37*(13), 2170–2192. http://doi.org/10.1080/09500693.2015.1071899

DeWitt, J., Archer, L., & Osborne, J. (2013). Nerdy, brainy and normal: Children's and parents' constructions of those who Are highly engaged with science. *Research in Science Education*, *43*, 1455–1476. http://doi.org/10.1007/s11165-012-9315-0

Dewitt, J., Archer, L., Osborne, J., Dillon, J., Willis, B., & Wong, B. (2011). High aspirations but low progression: The science aspirations-careers paradox amongst minority ethnic students. *International Journal of Science and Mathematics Education*, *9*, 243–271. http://doi.org/10.1007/s10763-010-9245-0

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The Tailored Design Method* (4th ed.). Hoboken, New Jersey: John Wiley & Sons, Inc.

Farland-Smith, D. (2012). Development and Field Test of the Modified Draw-a-Scientist Test and the Draw-a-Scientist Rubric. *School Science and Mathematics*, *112*(2), 109–116. http://doi.org/10.1111/j.1949-8594.2011.00124.x

Ferrari, L., Ginevra, M. C., Santilli, S., Nota, L., Sgaramella, T. M., & Soresi, S. (2015).

Career exploration and occupational knowledge in Italian children. *International Journal for Educational and Vocational Guidance*, *15*(2), 113–130. http://doi.org/10.1007/s10775-015-9299-1

Finson, K. D. (2002). Drawing a Scientist: What We Do and Do Not Know After Fifty Years of Drawings. *School Science and Mathematics*, *102*(7), 335–345. http://doi.org/10.1111/j.1949-8594.2002.tb18217.x

Finson, K. D., Beaver, J. B., & Cramond, B. L. (1995). Development and field test of a checklist for the Draw-a-Scientist Test. *School Science and Mathematics*, *95*(4), 195–205.

Florida Department of Education. (2017). Charter schools: Frequently asked questions. Retrieved August 8, 2017, from http://www.fldoe.org/schools/school-choice/charter-schools/charter-school-faqs.stml

Gallagher, M. (2009). *Researching with children and young people: Research design, methods and analysis*. (K. Tisdall, J. M. Davis, & M. Gallagher, Eds.). London: Sage Publications Ltd. http://doi.org/10.4135/9781446268315

Ganesh, T. G. (2011). Children-produced drawings: An interpretive and analytic tool for researchers. In E. Margolis & L. Pauwels (Eds.), *The SAGE handbook of visual research methods* (pp. 214–240). London: SAGE Publications Ltd. http://doi.org/10.4135/9781446268278.n12

Gardner, H. (1980). *Artful Scribbles: The significance of children's drawings*. New York, NY: Basic Books.

Gottfredson, L. S. (1981). Circumscription and compromise: A developmental theory of occupational aspirations. *Journal of Counseling Psychology*, *28*(6), 545–579. http://doi.org/10.1037/0022-0167.28.6.545

Gottfredson, L. S. (1996). Gottfredson's Theory of Circumscription and Compromise. In D. Brown & L. Brooks (Eds.), *Career Choice and Development* (3rd ed., pp. 179–232). San Franscisco, California: Jossey-Bass Publishers.

Gottfredson, L. S. (2005). Applying Gottfredson's Theory of Circumscription and Compromise in career guidance and counseling. In S. D. Brown & R. W. Lent (Eds.), *Career development and counseling: Putting theory and research to work* (pp. 71–100). Hoboken, New Jersey: John Wiley & Sons, Inc.

Greene, S., & Hill, M. (2005). Researching children's experience : Methods and methodological issues. In S. Greene & D. Hogan (Eds.), *Researching children's experience: Approaches and methods* (pp. 2–21). London: Sage Publications Ltd. http://doi.org/http://dx.doi.org/10.4135/9781849209823.n1

Groundwater-Smith, S., Dockett, S., & Bottrell, D. (2015). *Participatory Research with Children and Young People*. London: Sage Publications Ltd.

Hallinan, M. T. (1994). School differences in tracking effects on achievement. *Social Forces*, *72*(3), 799–820. http://doi.org/10.2307/2579781

Hartung, P. J., Porfeli, E. J., & Vondracek, F. W. (2005). Child vocational development: A review and reconsideration. *Journal of Vocational Behavior*, *66*(3), 385–419. http://doi.org/10.1016/j.jvb.2004.05.006

Helwig, A. (2008). From childhood to adulthood: A 15-year longitudinal career development study. *The Career Development Quarterly*, *57*, 38–51.

Helwig, A. A. (1998a). Gender-role stereotyping : Testing theory with a longitudinal sample. *Sex Roles*, *38*(5/6), 403–423. http://doi.org/10.1023/A:1018757821850

Helwig, A. A. (1998b). Occupational aspirations of a longitudinal sample from second to sixth grade. *Journal of Career Development*, *24*(4), 247–265.

Helwig, A. A. (2001). A test of Gottfredson's Theory using a ten-year longitudinal study. *Journal of Career Development*, *28*(2), 77–95.

Helwig, A. A. (2004). A ten-year longitudinal study of the career development of students: Summary findings. *Journal of Counseling & Development*, *82*, 49–57.

Hill, M. (2005). Ethical considerations in researching children's experiences. In S. Greene & D. Hogan (Eds.), *Researching children's experience: Approaches and methods*. London: Sage Publications Ltd.

Hill, M. (2006). Children's voices on ways of having a voice: Children's and young people's perspectives on methods used in research and consultation. *Childhood*, *13*(1), 69–89. http://doi.org/10.1177/0907568206059972

Hillman, S. J., Bloodsworth, K. H., Tilburg, C. E., Zeeman, S. I., & List, H. E. (2014). K-12 Students' Perceptions of Scientists: Finding a valid measurement and exploring whether exposure to scientists makes an impact. *International Journal of Science Education*, *36*(15), 2580–2595. http://doi.org/10.1080/09500693.2014.908264

Howard, K. A. S., Carlstrom, A. H., Katz, A. D., Chew, A. Y., Ray, G. C., Laine, L., & Caulum, D. (2011). Career aspirations of youth: Untangling race/ethnicity, SES, and gender. *Journal of Vocational Behavior*, *79*, 98–109. http://doi.org/10.1016/j.jvb.2010.12.002

Howard, K. A. S., & Walsh, M. E. (2010). Conceptions of career choice and attainment: Developmental levels in how children think about careers. *Journal of Vocational Behavior*, *76*, 143–152. http://doi.org/10.1016/j.jvb.2009.10.010

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*, 1277–1288. http://doi.org/10.1177/1049732305276687

Ing, M., Aschbacher, P. R., & Tsai, S. M. (2014). Gender differences in the consistency of middle school students' interest in engineering and science careers. *Journal of Pre-College Engineering Education Research*, *4*(2), 1–10.

International Labour Organization. (1988). *International standard classification of occupations*. Geneva, Switzerland.

Johnson, R. B., & Onwuegbuzie, A. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, *33*(7), 14–26. http://doi.org/10.3102/0013189X033007014

Johnson, R. B., Onwuegbuzie, A. J., & Turner, L. A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, *1*(2), 112–133. http://doi.org/10.1177/1558689806298224

Kirk, C. M., Lewis, R. K., Scott, A., Wren, D., Nilsen, C., & Colvin, D. Q. (2012). Exploring the educational aspirations–expectations gap in eighth grade students: Implications for educational interventions and school reform. *Educational Studies*, *38*(5), 507–519. http://doi.org/10.1080/03055698.2011.643114

Krajkovich, J. G., & Smith, J. K. (1982). The development of the Image of Science and

Scientists Scale. *Journal of Research in Science Teaching*, *19*(1), 39–44.

Krueger, R. A., & Casey, M. A. (2009). *Focus groups: A practical guide for applied research* (4th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Kvale, S. (2007). *Qualitative research kit: Doing interviews*. London: Sage Publications Ltd. http://doi.org/10.4135/9781849208963

Langdon, D., McKittrick, G., Beede, D., Khan, B., & Doms, M. (2011). STEM: Good jobs now and for the future. *Economics and Statistitcs Administration Issue Brief*, *3*(11), 1–10.

Lee, J. O., Hill, K. G., & Hawkins, J. D. (2012). The role of educational aspirations and expectations in the disontinuity of intergenerational low-income status. *Social Work Research*, 141–152.

Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying cognitive theory of carere and academic interest, choice, and performance. *Journal of Vocational Behavior*, *45*, 79–122.

Lent, R. W., Brown, S. D., & Hackett, G. (1996). Career development from a social cognitive perspective. In D. Brown, L. Brooks, & Associates (Eds.), *Career choice and development* (3rd ed., pp. 423–475). San Franscisco, California: Jossey-Bass.

Liben, L. S., Bigler, R. S., & Krogh, H. R. (2001). Pink and blue collar jobs: Children's judgments of job status and job aspirations in relation to sex of worker. *Journal of Experimental Child Psychology*, *79*(4), 346–363. http://doi.org/10.1006/jecp.2000.2611

Looft, W. (1971). Sex differences in the expression of vocational aspirations by elementary school children. *Developmental Psychology*, *5*(2), 366. Retrieved from http://psycnet.apa.org/journals/dev/5/2/366/

Losh, S. C., Wilke, R., & Pop, M. (2008). Some Methodological Issues with “Draw a Scientist Tests” among Young Children. *International Journal of Science Education*, *30*(6), 773–792. http://doi.org/10.1080/09500690701250452

Ludwig, J. (1999). Information and inner city educational attainment. *Economics of Education Review*, *18*, 17–30. http://doi.org/10.1016/S0272-7757(97)00054-X

Maoldomhnaigh, M. Ó., & Hunt, Á. (1988). Some Factors Affecting the Image of the Scientist Drawn by Older Primary School Pupils. *Research in Science & Technological Education*, *6*(2), 159–166. http://doi.org/10.1080/0263514880060206

Martin, C. D. (2004). Draw a computer scientist. *Inroads: The SIGCSE Bullentin*, *36*(4), 11. http://doi.org/10.1145/1044550.1041628

Mason, C. L., Butler, K. J., & Gardner, A. L. (1991). Draw a Scientist Test: Future implications. *School Science and Mathematics*, *91*(5), 193–198.

Mau, W.-C., & Bikos, L. H. (2000). Educational and vocational aspirations of minority and female students: A longitudinal study. *Journal of Counseling & Development*, *78*, 186–194.

Maxwell, J. A. (2005). *Qualitative research design: An interactive approach* (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc.

McDevitt, T. M., Hess, C. a., Leesatayakun, M., Sheehan, E. P., & Kaufeld, K. a. (2012). A cross-sectional study of career aspirations in Thai children in an international school in Bangkok. *Journal of Career Development*, *40*(6), 531–550.

http://doi.org/10.1177/0894845312470025

McGrath, D. J., & Kuriloff, P. J. (1999). The perils of parent involvement: Tracking curriculum and resource distortions in a middle school mathematics program. *Research in Middle Level Education Quarterly*, *22*(3), 59–83.

McLeod, J. (2010). *Case study research in counselling and psychotherapy*. London: Sage Publications Ltd.

Mead, M., & Me'traux, R. (1957). Image of the scientist among high school students: A pilot study. *Science*, *126*(3270), 384–390.

Mello, Z. R. (2008). Gender variation in developmental trajectories of educational and occupational expectations and attainment from adolescence to adulthood. *Developmental Psychology*, *44*(4), 1069–1080. http://doi.org/10.1037/0012-1649.44.4.1069

Mello, Z. R. (2009). Racial/ethnic group and socioeconomic status variation in educational and occupational expectations from adolescence to adulthood. *Journal of Applied Developmental Psychology*, *30*, 494–504. http://doi.org/10.1016/j.appdev.2008.12.029

Merriam, S. B. (1998). *Case study research in education: A qualitative approach*. San Franscisco, California: Jossey-Bass Inc.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). San Franscisco, California: John Wiley & Sons, Inc.

Merriman, B., & Guerin, S. (2007). Exploring the aspirations of Kolkatan (Calcuttan) street children living on and off the streets using drawings. *International Journal of*

Psychology and Psychological Therapy, *7*(2), 269–283.

Mertens, D. M. (2009). *Transformative research and evaluation*. New York, NY: The Guilford Press.

Miles, M. B., & Huberman, A. M. (1994). *Qualiative data analysis: An expanded handbook* (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Miller, M. J., & Stanford, J. T. (1987). Early occupational restriction: An examination of elementary school children's expression of vocational preferences. *Journal of Employment Counseling*, *24*(3), 115–121.

Miller, M. J., & Stanford, T. J. (1986). Sex differences in occupational choices of second-grade Black children. *Psychological Report*, *59*, 273–274.

Monhardt, R. M. (2003). The Image of the Scientist Through the Eyes of Navajo Children. *Journal of American Indian Education*, *42*(3), 25–39.

National Academy of Sciences. (1971). *Dictionary of occupational titles, Part I*. Washington, DC. Retrieved from http://www.occupationalinfo.org

National Center for Education Statistics. (1996). National educational longitudinal study: 1988-1994 files and electronic codebook system. Washington, DC: U.S. Department of Education.

National Science Board. (2014). *Science and engineering indicators 2014*. Arlington. Retrieved from https://www.nsf.gov/statistics/seind14/

National Science Board. (2015). *Revisiting the STEM workforce: A companion to science* *and engineering indicators 2014*. Arlington. Retrieved from https://www.nsf.gov/nsb/publications/2015/nsb201510.pdf

National Science Board. (2016). *Science & engineering indicators*. Retrieved from https://www.nsf.gov/statistics/2016/nsb20161/#/

Nicholson, J., Warren, S. T., Oppenheimer, B., Goodman, M., Codling, J., Robinson, T., & Chung, J. Y. (2013). STEM Research: What the Pictures Tell Us. *The International Journal of Science in Society*, *4*, 1–14.

Oakes, J., Gamoran, A., & Page, R. (1992). Curriculum differentiation: Opportunities, outcomes, and meanings. In P. Jackson (Ed.), *Handbook of research on curriculum* (pp. 570–608). New York, NY: MacMillian.

Oleson, A. K., Hora, M. T., & Benbow, R. J. (2014). STEM : How a Poorly Defined Acronym Is Shaping Education and Workforce Development Policy in the United States.

Onwuegbuzie, A. J., & Johnson, R. B. (2006). The validity issue in mixed research. *Research in the Schools*, *13*(1), 48–63. http://doi.org/10.1016/j.jsis.2005.08.002

Onwuegbuzie, A. J., Johnson, R. B., & Collins, K. M. (2009). Call for mixed analysis: A philosophical framework for combing qualitative and quantitative approaches. *International Journal of Multiple Research Approaches*, *3*(2), 114–139. http://doi.org/10.5172/mra.3.2.114

Onwuegbuzie, A. J., & Teddlie, C. (2003). A framework for analyzing data in mixed methods research. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social & behavioral research* (pp. 351–383). Thousand Oaks, CA: Sage

Publications, Inc.

Osborne, J., Simon, S., & Collins, S. (2003). Attitudes towards science: a review of the literature and its implications. *International Journal of Science Education*, *25*(9), 1049–1079. http://doi.org/10.1080/0950069032000032199

Page, S. E. (2008). *The difference: How the power of diversity creates better groups, firms, schools, and societies*. Princeton University.

Palladino Schultheiss, D. E. (2008). Current Status and Future Agenda for the Theory, Research, and Practice of Childhood Career Development. *The Career Development Quarterly*, *57*(1), 7–24. http://doi.org/10.1002/j.2161-0045.2008.tb00162.x

Parsons, E. C. (1997). Black high school females' images of the scientist: Expression of culture. *Journal of Research in Science Teaching*, *34*(7), 745–768. http://doi.org/10.1002/(SICI)1098-2736(199709)34:7<745::AID-TEA5>3.0.CO;2-M

Patton, M. Q. (2015). *Qualitative research and evaluation methods: Integrating theory and practice* (4th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Patton, W., & McMahon, M. (1999). *Career development and systems theory : A new relationship*. Pacific Grove, CA: Brooks/Cole Publishing Company.

Patton, W., & McMahon, M. (2014). *Career development and systems theory* (3rd ed.). Rotterdam, The Netherlands: Sense Publishers.

Perry, B. L., Link, T., Boelter, C., & Leukefeld, C. (2012). Blinded to science: Gender differences in the effects of race, ethnicity, and socioeconomic status on academic and science attitudes among sixth graders. *Gender and Education*, *24*(7), 725–743.

http://doi.org/10.1080/09540253.2012.685702

Perry, J. C., Przybysz, J., & Al-Sheikh, M. (2009). Reconsidering the “aspiration-expectation gap” and assumed gender differences among urban youth. *Journal of Vocational Behavior*, *74*, 349–354. http://doi.org/10.1016/j.jvb.2009.02.006

Phipps, B. J. (1995). Career dreams of preadolescent students. *Journal of Career Development*, *22*(1), 19–32. http://doi.org/10.1007/BF02247893

Plata, M., Masten, W. G., & Trusty, J. (1999). Teachers’ perception and nomination of fifth-grade Hispanic and Anglo students. *Journal of Research and Development in Education*, *32*(2), 113–123.

Porfeli, E. J., Hartung, P. J., & Vondracek, F. W. (2008). Children’s Vocational Development: A Research Rationale. *The Career Development Quarterly*, *57*(1), 25–37. http://doi.org/10.1002/j.2161-0045.2008.tb00163.x

Potvin, P., & Hasni, A. (2014). Interest, motivation and attitude towards science and technology at K-12 levels: a systematic review of 12 years of educational research. *Studies in Science Education*, *50*(August 2016), 85–129. http://doi.org/10.1080/03057267.2014.881626

President’s Council of Advisors on Science and Technology. (2012). *Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics*. *Report to the President*. Retrieved from http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-v11.pdf

Prosser, J., & Burke, C. (2008). Image-based educational research: Child-like perspectives. In J. G. Knowles & A. L. Cole (Eds.), *Handbook of the arts in qualitative research: Perspectives, methodologies, examples, and issues* (pp. 407–421). Thousand Oaks, CA: Sage Publications, Inc.

Rojewski, J. (2007). Occupational and educational aspirations. In V. Skorikov & W. Patton (Eds.), *Career development in childhood and adolescence* (pp. 87–104). Rotterdam, The Netherlands: Sense Publishers.

Rojewski, J. W. (2005). Occupational aspirations: Constructs, meanings, and application. In S. D. Brown & R. W. Lent (Eds.), *Career development and counseling: Putting theory and research to work* (pp. 131–154). Hoboken, New Jersey: John Wiley & Sons, Inc.

Rojewski, J. W., & Yang, B. (1997). Longitudinal analysis of select influences on adolescents' occupational aspirations. *Journal of Vocational Behavior*, *51*, 375–410. http://doi.org/10.1006/jvbe.1996.1561

Rothwell, J. (2014). *Still searching: Job vacancies and STEM skills*.

Sandberg, D. E., Ehrhardt, A. A., Ince, S. E., & Meyer-Bahlburg, H. F. L. (1991). Gender differences in children's and adolescents' career aspirations. *Journal of Adolescent Research*, *6*(3), 371–386. http://doi.org/0803973233

Saywitz, K. J., & Camparo, L. B. (2014). Interviewing children: A primer. In G. B. Melton, A. Ben-Arieh, J. Cashmore, G. S. Goodman, & N. K. Worley (Eds.), *The Sage handbook of child research* (pp. 371–390). London: Sage Publications Ltd. http://doi.org/10.4135/9781446294758

Schibeci, R., & Sorensen, I. (1983). Elementary school children's perceptions of scientists. *School Science and Mathematics*, *83*(1), 14–20.

Schmidt, C. D., Hardinge, G. B., & Rokutani, L. J. (2012). Expanding the school counselor repertoire through STEM-focused career development. *The Career Development Quarterly, 60*, 25-35.

Schmitt-Wilson, S., & Welsh, M. C. (2012). Vocational knowledge in rural children: A study of individual differences and predictors of occupational aspirations and expectations. *Learning and Individual Differences*, *22*, 862–867. http://doi.org/10.1016/j.lindif.2012.06.003

Sechrest, L., & Sidana, S. (1995). Quantitative and qualitative methods: Is there an alternative? *Evaluation and Program Planning*, *18*, 77–87.

Sewell, W. H., Haller, A. O., & Ohlendorf, G. W. (1970). The educational and early occupational status attainment process. Replication and revision. *American Sociological Review*, *35*, 1014–1027.

Sikora, J., & Pokropek, A. (2012). Gender segregation of adolescent science career plans in 50 countries. *Science Education*, *96*(2), 234–264. http://doi.org/10.1002/sce.20479

Soffer, M., & Ben-Arieh, A. (2014). School-aged children as sources of information about their lives. In G. B. Melton, A. Ben-Arieh, J. Cashmore, G. S. Goodman, & N. K. Worley (Eds.), *The SAGE handbook of child research* (pp. 555–574). London: SAGE Publications Ltd. http://doi.org/10.4135/9781446294758.n28

Song, J., & Kim, K.-S. (1999). How Korean students see scientists: the images of the scientist. *International Journal of Science Education*, *21*(9), 957–977.

http://doi.org/10.1080/095006999290255

Standard Occupational Classification Policy Committe. (2009). *2010 Standard Occupational Classification*.

Stockard, J., & McGee, J. (1990). Children's occupational preferences: The influence of sex and perceptions of occupational characteristics.

Strayhorn, T. L. (2009). Different folks, different hopes:The educational aspirations of Black males in urban, suburban, and rural high schools. *Urban Education*, *44*(6), 710–731.

Sumrall, W. J. (1995). Reasons for the perceived images of scientists by race and gender of students in grades 1 - 7. *School Science and Mathematics*, *95*(2), 83–90.

Super, D. E. (1990). A life-span, life-space approach to career development. In D. Brown, L. Brooks, & Associates (Eds.), *Career choice and development: Applying contemporary theories to practice* (2nd ed., pp. 197–261). San Franscisco, California: Jossey-Bass.

Symington, D., & Spurling, H. (1990). The "Draw a Scientist Test": Interpreting the data. *Research in Science & Technological Education*, *8*(1), 75. http://doi.org/10.1080/0263514900080108

Tatlow-Golden, M., & Guerin, S. (2010). "My favourite things to do" and "my favourite people": Exploring salient aspects of children's self-concept. *Childhood*, *17*(4), 545–562. http://doi.org/10.1177/0907568210364667

Teig, S., & Susskind, J. E. (2008). Truck driver or nurse? The impact of gender roles and occupational status on children's occupational preferences. *Sex Roles*, *58*, 848–863.

http://doi.org/10.1007/s11199-008-9410-x

Türkmen, H. (2008). Turkish primary students' perceptions about scientist and what factors affecting the image of the scientists. *Eurasia Journal of Mathematics, Science and Technology Education*, *4*(1), 55–61.

Turner, J. D. (2016). Career dream drawings: Children's visions of professions in future workscapes. *Language Arts*, *93*(3), 168–184.

Valadez, J. R. (1988). Applying to college: Race, class, and gender differences. *Professional School Counseling*, *1*(5), 14–20. http://doi.org/10.1080/07351698809533738

Veale, A. (2005). Creative methodologies in participatory research with children. In S. Greene & D. Hogan (Eds.), *Researching children's experience* (pp. 254–272). London: Sage Publications Ltd.

Walls, L. (2012). Third grade African American students' views of the nature of science. *Journal of Research in Science Teaching*, *49*(1), 1–37. http://doi.org/10.1002/tea.20450

Walls, R. T. (2000). Vocational cognition: Accuracy of 3rd-, 6th-, 9th-, and 12th-grade students. *Journal of Vocational Behavior*, *56*(1), 137–144. http://doi.org/10.1006/jvbe.1999.1716

Watson, M., & McMahon, M. (2005). Children's career development: A research review from a learning perspective. *Journal of Vocational Behavior*, *67*(2), 119–132. http://doi.org/10.1016/j.jvb.2004.08.011

Weber, L. (1998). A conceptual framework for understanding race, class, gender, and sexuality. *Psychology of Women*, *22*(1), 13–32. http://doi.org/10.1111/j.1471-6402.1998.tb00139.x

Weller, D., Hobbs, S. D., & Goodman, G. S. (2014). Challenges and innovations in research on childhood. In G. B. Melton, A. Ben-Arieh, U. Cashmore, G. S. Goodman, & N. K. Worley (Eds.), *The Sage handbook of child research* (pp. 363–371). London: Sage Publications Ltd. http://doi.org/http://dx.doi.org/10.4135/9781446294758.n20

Wilson, P. M., & Wilson, J. R. (1992). Environmental influences on adolescent educational aspirations: A logistic transform model. *Youth & Society*, *24*(1), 52–70.

Wood, D., Kaplan, R., & McLoyd, V. C. (2007). Gender differences in the educational expectations of urban, low-income African American youth: The role of parents and the school. *Journal of Youth and Adolescence*, *36*, 417–427. http://doi.org/10.1007/s10964-007-9186-2

Xu, M., Lee, E. M., Wen, Z., Cheng, Y., Huang, W.-K., Qian, X., … Tang, H. (2016). Identification of small-molecule inhibitors of Zika virus infection and induced neural cell death via a drug repurposing screen. *Nature Medicine*, *22*, 1101–1107. http://doi.org/10.1038/nm.4184

Xue, Y., & Larson, R. C. (2015, May). STEM crisis or STEM surplus? Yes and yes. *Monthly Labor Review*.

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage Publications, Inc.

Zarrett, N., Malanchuk, O., Davis-Kean, P. E., & Eccles, J. (2006). Examining the gender gap in IT by race: Young adults' decisions to pursue an IT career. In J. M. Cohoon & W. Aspray (Eds.), *Women and information technology: Research on underrepresentation* (pp. 55–88). Cambridge, MA: The MIT Press.

Zhang, L., & Barnett, M. (2015). How high school students envision their STEM career pathways. *Cultural Studies of Science Education*, *10*(3), 637–656. http://doi.org/10.1007/s11422-013-9557-9