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# ADDRESSING THE NEEDS OF GIFTED AND TALENTED STEM STUDENTS THROUGH HOLISTIC THINKING IN AN HONORS PROGRAM

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By

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A Dissertation

Submitted in Partial Fulfillment of the Requirements for the

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DISSERTATION APPROVAL

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AN ABSTRACT OF THE DISSERTATION OF

Noor Sharaf Alrajhi, for the Doctor of Philosophy degree in Curriculum and Instruction, presented on May 11, 2020, at Southern Illinois University Carbondale.

TITLE: ADDRESSING THE NEEDS OF GIFTED AND TALENTED STEM STUDENTS THROUGH HOLISTIC THINKING IN AN HONORS PROGRAM

MAJOR PROFESSOR: Dr. Grant Miller

The purpose of this study was to examine the extent to which the Honors Program at a midwestern University addresses the needs of gifted and talented STEM students and developed their holistic thinking. Pink's ideas about the holistic thinking were used to frame this study. Blending STEM gifted students' needs and Pink's senses were discussed in the literature review.

This study utilized a mixed method approach to gain a better understanding of students' perceptions about addressing their needs in Honors Program. An explanatory sequential design was employed for this study in which qualitative data were used to expand the understanding of the quantitative data. The latter was collected by a survey which was mailed to 274 STEM students who enrolled in Honors Program during the Spring 2019. Eighty three responded for a 30.29% response rate. Interviews were conducted with 9 students who response to the quantitative portion of the study. ANOVA Repeated Measures, descriptive statistics, and factor analysis and correlation were used to analyze the quantitative data. Themes and patterns were identified in the qualitative data.

The findings of the current study showed no difference between the mean of the three categories: academically challenging needs, creative-productive needs, and social-emotional needs. The data reflected that at times and with some regularity students' needs were met. Additionally, relationships among the three categories were discerned. Qualitative data

uncovered numerous meaningful perspectives to examine students' understanding of the survey categories. Even though participants indicated that they were indeed interested in being in the Honors Program, some conflicts were found in their opinions; thus the interview results confirmed and supported the survey results to examine students' perceptions about how their academically challenging needs, creative-productive needs, and social-emotional needs were addressed by the Honors Program.

The findings of this study provide implication as well as recommendations for future research related to honors education.

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## DEDICATION

This dissertation is dedicated to my parents, who have given me everything.

To my family, my husband and my children, who have supported me to achieve my dream.

And to my brothers and sisters, who have thought and prayed for me the whole time.

I love you all.

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# CHAPTER 1

## INTRODUCTION

Simply defined, creativity is the ability to connect the unknown with the known and is important because it includes the connection between two dissimilar ideas (Long & Davis, 2017). In this century, computers and the internet continue to get better at assisting workers, students, citizens, and consumers in their daily lives; thus, new workers need to master different aptitudes that rely more on creativity (Pink, 2006). In fact, creativity may eventually be the only thing that sets humans apart from artificial intelligence (Callahan, 2014). As Gardner (2006) believes, a creative mind remains at least one step ahead of even the most sophisticated computers and robots. For this reason, it seems that creativity has become an important part of the curriculum for learners at all levels. The National Science Board (2010) indicated the need for effective programs to propose for developing creative youth and thinkers so that elaborates scientific research in the United States.

The First Lego League (FLL) robotics program is a good example of adding creativity to science at a younger age. According to FLL (2018), through the program, tomorrow's innovators can practice imaginative thinking, team-building skills, and even presentation skills, as they must present their solutions with a dash of creativity to judges. Along a journey of discovery, FLL participants must design and build a robot, program it using Lego Mindstorms technology, and then compete on a table-top playing field. They also learn to apply Science, Technology, Engineering, and Mathematics concepts (STEM) to solve a real world problem. The National Education Association (NEA, 2010) indicated that the FLL robotics program not only focuses on STEM but also what they call the 4Cs: collaboration, communication skills, creativity, and critical thinking. The NEA advocated that if today's students want to compete in this global

society, they must also be proficient in these 4 Cs (NEA, 2010). This position statement adds that the Next Generation Science Standards (NGSS) lay out a vision of science education for the 21st century that connects the 4Cs to science and engineering practices. Therefore, for gifted and talented students to be creative thinkers in the Conceptual Age (c.f. Pink, 2006), they should be routinely challenged in the 4Cs. In all, it seems that creativity is the basic stepping stone for developing science innovators.

Innovations are built upon a creative mind (Catchen, 2015) and gifted students need opportunities to develop their creative minds, as they have the ability to creatively integrate insights of the sciences into their growing understanding of the world and to then apply that understanding to increase innovations in a series of complex tasks (Clark & Zubizarreta, 2008). In this research, giftedness is based on the ability to create a creative product, which is considered the main behavior of gifted students. According to Renzulli's (1978) conceptualization of the Three Ring, "gifted behavior consists of behaviors that reflect an interaction among three basic clusters of human traits - above average ability, high level of task commitment, and high levels of creativity" (as cited in Renzulli, Gubbins, McMillen, Eckert & Little, 2009, p. 325). As such, developing creativity skills can support and prepare gifted and talented students for the conceptual age and the emergence of the creative world.

Pink (2006) further described the Conceptual Age as the current state of transition into an era requiring the whole brain thinking skills. He argues since time will never go back to the Information Age, there is no longer a need for the knowledge worker; instead, the Conceptual Age demands the creator, the empathizer, and the meaning-maker. Integrating the humanities and arts in STEM education allows students to exercise another part of their brains and personalities. For example, at Yale Medical School such efforts began in 1983 with the creation

of the Program for Humanities in Medicine. The goal is not to turn physicians into artists. Rather, the school means to provide opportunities for students and physicians to explore realms beyond science and medicine and to become better physicians in an era when patients have consulted a traditional flow chart of symptoms prior to their appointment. Now, the School of Medicine at Yale has supported the creation of a symphony orchestra, a student theater group, reflective writing programs, and art classes ("Yale School Magazine," 2017). These artistic endeavors offer not just creative outlets but also relief from the stresses and challenges of medicine and opportunities to become better problem-solving physicians. At Yale, the humanities program has expanded over the past 20 years and is likely to continue doing so with the appreciation that incorporating the humanities into medical education can offer better outcomes for their students ("Yale School Magazine", 2017).

In conceptualizing the future, Maeda (2010) also argues that for invention to occur, scientists, not just physicians, must embrace the art world. Scientists need art and artists in their professional lives in order to garner the creative process required for innovation and problem solving (Piro, 2010). Particularly, in education, it is not enough to just master mathematic techniques and to memorize scientific facts from books and journal articles; however, to be a great scientist, it seems, one must also be greatly creative (Callahan, 2014). It seems that arts are crucial to build creativity through science, technology, engineering, and mathematics (Callahan, 2014). Creativity is considered the most important attribution in scientists. In all of these examples, the integration of the arts with science in education seems to have the potential to increase the creativity of STEM students and help reimagine learning at all levels, including honors programs in higher education.

The purpose of this study is to explore students' perspectives about opportunities for creativity in an honors program; and in the sections that follow, I briefly introduce the context of gifted education, higher education honors programs in the United States, and important shifts in society that have prompted a need to reconsider the ways students in honors programs can be prepared for success in the Conceptual Age.

## Gifted Education in the United States

The United States has a well-established tradition in gifted education. Russia's Sputnik launch in the 1950s caused the U.S. officials to see a need to compete globally in math and science (Shavinina, 2009). The Committee on Science, Engineering and Public Policy (2007), the U.S. Innovation (2005) as well as others called for new investments in U.S. education to create a significantly larger talent pool of students interested in STEM. In October 2007, The National Science Board (NSB) reported the educational needs of the nation's most talented and motivated students that have the potential to become high-achieving members of the U.S. workforce. Three years later, the NSB's (2010) two-year examination of the development of scientific talent made clear that the U.S. education system fails to develop its most talented and motivated students. According to Pink (2006), "The only way to survive in this century is by constantly developing new innovations, inventing new categories, and giving the world something it didn't know it was missing" (p. 81). Innovation doesn't come from equations or new kinds of chemicals; it is always linked some way, either directly or indirectly, to human experience (Maeda, 2010). Innovation relies, in part, on individuals' possessing knowledge, skills, creativity, and foresight to forge new paths (NEA, 2010). Thus, it is time to educate the brightest who would subsequently form a new generation of leaders and innovators in Science, Technology, Engineering and Mathematics, or STEM fields (NSB, 2010). STEM innovators are

defined as “those individuals who have developed the expertise to become leading STEM professionals and perhaps the creators of significant breakthrough or advance in scientific and technological understanding” (NSB, 2010, p. 8). STEM innovations continue to play an essential role in catalyzing the creation of new technologies and improving the quality of life in the United States and throughout the world.

With careful nurturing and proper education, gifted and highly motivated STEM students may make a unique contribution to their communities and change the world. According to Pink (2006), future economies and societies will be built on inventive, empathetic, and big-picture capabilities. If the U.S. education is to guarantee that the country is well prepared to advance globally, it must make every student’s education one that is broad and comprehensive, including those in gifted education or honors programs (Piro, 2010). On December 15th, 2015, President Obama signed the Every Student Succeeds Act into law in a move to achieve this goal. The law specifically states in its efforts to “help to support and grow local innovations” (U.S. Department of Education, 2015, p.1).

## Higher Education Honors Programs in the United States

Currently, universities around the world are transitioning to increase the overall quality of students by fostering the development of high potential and more creative students (Clark & Zubizarreta, 2008; Garland, 2010; Goodstein & Szarek, 2013; Seifert, Pascarella, Colangelo & Assouline, 2007; Wolfensberger, 2015). Even though higher education institutions have the responsibility to assist students in their overall growth by providing high quality education, Garland (2010) claims that more attention has been placed recently on the U.S. honors programs to support gifted and talented students. This support and how it meets the needs of gifted and talented students will be explored in the literature review. The U.S. honors program curricula in

higher education are evidence that gifted and talented students are a valuable resource. Whereas higher education programs focus on the average student, honors programs concentrate on attracting talented students at the undergraduate level who are able to be more active members than they could in a regular program (Seifert, Pascarella, Colangelo & Assouline, 2007; Wolfensberger, 2015).

Most U.S. colleges and universities have created honors programs to meet the educational and developmental needs of gifted and talented students (Brinkel, Rees, Ruis & Sloots, 2015; Moon, 2012; Scager, Akkerman, Keesen, Mainhard, Pilot & Wubbels, 2012). The literature explores a variety of needs for gifted and talented students and identifies three major trends: academically challenging, creative-productivity, and social and emotional needs. In chapter two, these needs are summarized to include requirements for gifted students' well being as a successful student and citizen. Furthermore, understanding these needs will help recruit as well as academically and affectively support gifted students in honors programs. In general, these programs aim to facilitate these needs. Researchers argue that honors program design should align opportunities to learn with each student's needs. Particularly, it should merge students' potential and passion with educational experiences tailored to each student's needs (Wai, Lubinski & Benbow, 2009). The National Collegiate Honors Council (NCHC) claims that the general basis for developing college or university honors programs is that gifted students benefit from a differentiated education that takes their special needs into account and supports their educational goals (NCHC, 2013). More information about honors programs is provided in the literature review chapter.

## STEM Innovators Needs

It is essential to meet the needs of STEM innovators by improving the quality of honors programs. These needs demand that educators find innovative ways of capturing the imagination of gifted and talented students and rethink the way honors classrooms are organized to develop students' creativity. Honors program researchers consider the best places for creative minds to be places that produce discrete accomplishments (Clark & Zubizarreta, 2008). In fact, the goal of honors programs is to prepare students to be productive and creative individuals by the promotion and development of students' holistic skills. Recently two interesting takes on such minds have appeared: "*Five Minds for the Future*" by Howard Gardner (2006); and "*A Whole New Mind"* by Daniel Pink (2006). These two authors think about the kind of mind that will dominate the future. Pava (2008) claims that Gardner's and Pink's books are to serve as a call for more respect and more ethics in business and politics; however, their books, at best, represent a reasoned call to reconsider current classrooms and organizations toward educating and teaching students for the future. Pava (2008) believes that although written for a different audience, Pink's (2006) main arguments resonate well with Gardner's (2006) *Five Minds for the Future* published in the same year. Pink's (2006) six senses of the whole new mind are artfully interwoven into Gardner's five minds for the future. Additional information about Gardner's and Pink's ideas are found in the literature review chapter.

Pink's (2006) and Gardner's (2006) books have a great deal on the subject of supporting whole-brain thinking for the future. Pink's (2006) *A Whole New Mind* speaks to professional success but mirrors many of higher education's purposes and can serve as a guide for honors programs by connecting students to their work and showing them how to value the creative processes that were interesting and meaningful to them (Goldberger, 2012). Furthermore, Pink

suggested that six senses for the 21st century—design, story, symphony, empathy, play, and meaning—provide a fresh perspective to discover new ways of understanding the arts and humanities and apply that understanding to increase innovative thinking (Gould, 2009). Similarity, the Gardner (2006) aims to develop aspects of each person for the balance of mind needed for the future. In his book, he contends that the Disciplined, Synthesizing, Creating, Respectful, and Ethical minds are at a premium in the world of today and will be even more so in the future. Further, producing innovators for the future revolution requires the fulfillment of gifted students' needs. Thus, more responsibilities are on education since "education is not only about empowering students but also, at its best, it might teach students about life's grandeur, mystery, and ultimate finitude" (Pava, 2008, p.19). Goldberger (2012) asked, assuming Pink's and Gardner's view about whole brain thinking are correct, can honors programs in higher education support the needs of gifted and talented STEM students and prepare them for the conceptual age?

## Statement of Problem

If the U.S. educational system is going to remain relevant in the years to come, how can it adapt to today's demands? Pink (2006) indicates that the most important educational contribution is to develop and foster creativity in learners; and several educational researchers argue that inspiring creative thinking in honors programs is an important way to transform the 21st century economy (Clark & Zubizarreta, 2008; Goldberger, 2012; Gould, 2009). However, they are concerned about the importance of transitioning honors programs in this environment. Transition requires a greater focus on whole-brain thinking. To accomplish this goal, the shift in honors programs should focus on developing the holistic thinking of gifted and talented students. Pink (2006) offers an example of Yale Medical School's transition to include the arts in medical

training is case in point. At Yale, students are taking art classes incorporated into medicine. Sarah Faulkner, who was Yale Medicine's 2016 writing intern, wrote "Levenson, a former curator of education and academic outreach at the Yale Center for British Art, directs attention back to such early scientific thinkers as Leonardo da Vinci, the painter, inventor, and mathematician. She says 'We're not making a case for something new, we're making a case to reinvigorate something that's always been there'" (Yale School Magazine, 2017, p. 17). In fact, these examples are becoming more common. For example, 10 years ago Stanford launched the Medicine & the Muse Program, which integrates the humanities into medical education and practice.

As I illustrate in my review of the literature in Chapter 2, there seems to be a lack of research examining the improvement of a holistic thinking for STEM students, especially in university honors programs. Therefore, this study was designed to explore this application of Pink's (2006) six senses and Gardner's (2006) five minds to the curriculum of an honors program. I anticipate that the application of Pink's and Gardner's ideas will provide STEM gifted and talented students with a more meaningful, holistic experience that meets their needs and students will have the opportunity to employ holistic thinking in meeting broader societal and global needs. This study seeks to add to the body of literature on gifted students in a higher education setting and, more specifically, to see to what extent honors programs address the needs of gifted and talented STEM students and develop their holistic thinking.

## Statement of Purpose

The larger focus on developing the educational practices of an honors program to meet gifted and talented students' needs was the impetus for this study. Thus, this research focuses on the degree to which honors program can address STEM gifted and talented students' needs and

develop their holistic thinking. It also examines students' perceptions about how their academic and affective needs are addressed in the honors program. Even though there is a need to understand the admission processes to honors programs, this issue will not be the focus of this research. Research time constraints required the exclusion of the admission processes to honors programs. Brief information about admission to honors program can be found in the literature review, which may help in making a holistic understanding of honors programs.

## Research Questions

1. Are there statistical differences in participating gifted and talented STEM students' opinion of the Honors College addressing their academically challenging needs, creative-productive needs, and social-emotional needs?
2. What are the relationships among the three categories: academic challenging, creative-productive, and social-emotional needs? What are the participating gifted and talented STEM students' understanding of each category?
3. To what extent do participating gifted and talented STEM students perceive the honors program as addressing their needs and developing their holistic thinking?

## Research Significance

This study contributes significantly to the body of literature about honors programs. The results of the current study provide a better understanding of the extent of holistic thinking improvement of gifted and talented STEM students in honors programs. Additionally, this serves as an opportunity to review the program's effectiveness at meeting STEM needs. Reviewing honors programs constantly is a great step to develop program quality. Austin (1986) and Campbell (2006) suggested that these programs should continually be reviewed since successful honors programs play a crucial role in supporting student success, recruiting highly capable

students, and promoting students' holistic growth. Huggett (2003) indicated that previous efforts have typically stopped short of considering an honors program quality as it relates to student learning. The information gained from this study should assist campuses in determining the benefits of placing students in an honors program.

## List of Terms

### Gifted Students

The most current federal definitions of gifted individuals come from two main resources: the Office of Educational Research and Improvement (1993), and the 1994 reauthorization of the Jacob K. Javits Gifted and Talented Students Act of 1988. The former described gifted students as follows:

> Children and youth with outstanding talent perform or show the potential for performing at remarkably high levels of accomplishment when compared with others of their age, experience, or environment. These children and youth exhibit high performance capability in intellectual, creative, and/or artistic areas, possess an unusual leadership capacity, or excel in specific academic fields. They require services or activities not ordinarily provided by the schools. Outstanding talents are present in children and youth from all cultural groups, across all economic strata, and in all areas of human endeavor (Office of Educational Research and Improvement, 1993, p. 26).

The latter states that gifted students are those "who give evidence of high performance capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who require services or activities not ordinarily provided by the school in order to fully develop such capabilities" (Clark & Zubizarreta, 2008, p. 388).

This research will adapt Renzulli's definition of giftedness because of the detailed

description of gifted characteristics, which leads to understanding their needs. The term of gifted and talented, as defined by Renzuli's Three-Ring Conception of Giftedness (1992), refers to "the interaction among three basic clusters of human traits: above average general and/or specific abilities, high levels of task commitment (motivation) and high levels of creativity" (Renzuli, 2009, p.111).

**Honors Program**

The National Collegiate Honors Council (NCHC) provides the most current definition of an honors program that is widely used by researchers. The NCHC (2013) "recognizes an honors college, program, institute, or equivalent descriptor, as the academic unit on a collegiate campus responsible for devising and delivering in-class and extracurricular academic experiences that provides a distinctive learning environment for selected students" (p. 1). Campbell's definition (2006) of an honors program states that an honors program is "an undergraduate program that provides enhanced curricular offerings, increased faculty contact, academic counseling, and support facilities (such as study lounges and computer labs) for academically talented students" (p. 6). This definition is preferred in this research due to the similarity of focus area.

## Conclusion

Chapter one presents an overview of the research that focused on examining the extent to which the Honors Program at a midwestern University addresses the needs of gifted and talented STEM students and developed their holistic thinking. Research questions were provided. The significance of understanding the extent to which an honors program improved the holistic thinking of gifted and talented STEM students was documented. List of terms were also provided.

# CHAPTER 2

# LITERATURE REVIEW

The purpose of this chapter is to provide an overview of prior research findings relevant to the current study. The body of the review is divided into four major sections: (1) Honors programs; (2) Gifted and talented students; (3) STEM and STEAM education, and (4) Honors programs and the needs of gifted STEM students. This latter section is an examination of the literature that describes the topic of this study, particularly the needs of STEM gifted students and how honor programs address these needs.

## Honors Programs

The underlying philosophy of gifted undergraduate programs, or honors programs as most researchers refer to them, is similar to those programs at the K-12 level—academically talented and gifted students require modifications to the usual classroom experience to fully actualize their potential (Hebert & Mcbee, 2007). The National Collegiate Honors Council (NCHC) established "Basic Characteristics of a Fully Developed Honors Program" (adopted in 1994 and revised in 2017), and among the characteristics in both versions are the expectation that "the program provides a locus of visible and highly reputed standards and models of excellence for students and faculty across the campus" (NCHC, 2017, p. 1). To articulate these characteristics, honors programs offer creative experiences that can draw gifted and talented students toward greater capability. In this controlled setting, information can be made visible and compelling; at the same time, this knowledge can be put to use as students make the challenging transition from a college campus environment to the complex and ever-changing world beyond (Clark & Zubizarreta, 2008; Shushok, 2003).

Honors programs' goals are to offer a variety of learning experiences and to develop

holistic students prepared for their future endeavors (Garland, 2010). Even though colleges and universities offer a variety of honors programs that are different in their features and functions, they are generally similar in their aim to provide small classes, an enriched curriculum, a more stimulating learning environment, greater academic challenge, and increased faculty contact (Campbell, 2006; Cosgrove, 2004). From a programmatic perspective, honors courses are interdisciplinary and experiential, and they connect academic study to community involvement with the goal of fostering higher order thinking skills and creativity (Hafsyan, 2015; Goodstein, 2013; Wolfensberger, Drayer & Volker, 2014; Wood-Nartker, Hinck & Hullender, 2016). Besides that, honors programs provide advanced academic and social supports to gifted and talented students that differ from typical college offerings (Hafsyan, 2015).

**Honors Programs Versus Gifted Programs**

In the United States the topic of gifted students is one that has received substantial attention since the 1920s and 30s; however, it is primarily focused on elementary, middle, and high school students, not at collegate levels (NAGC, 2019). "The overwhelming weight of the literature on 'gifted learners' deals with the K-12 years; little attention is given to postsecondary efforts" (Hartleroad, 2005, p.111). Studies provide a wealth of information on gifted and talented students in the K-12 context, including the characteristics of K-12 gifted students and how to identify and support them (e.g., Hafsyan, 2015; Hartleroad, 2005; Hebert & Mcbee, 2007; Huggett, 2003). In contrast, there is relatively little mention of programs concerning gifted and talented students in higher education with even less sufficient information about the characteristics of gifted undergraduates, their unique needs, and how educators support them (Hafsyan, 2015; Hartleroad, 2005; Hebert & Mcbee, 2007; Huggett, 2003). As Hafsyan (2015) argues "much of the research literature about gifted education […] is focused on students who

are in K-12. Not as much attention is paid to the characteristics of gifted undergraduate, graduate, and professional students, their unique challenges, and the ways that educators can best support them" (p. 23). Similarly, Huggett (2003) wrote that some critics argue that resources for undergraduate honors education are allocated to a small number of students because these students are already advantaged by higher education systems. However, a significant source for honors program publications is the National Collegiate Honors Council and the numerous monographs designed for practitioners that address topics related to program design, delivery, and evaluation (Huggett, 2003).

**Honors Program Origins and Its Different Forms**

The concern to meet the needs of gifted and talented students in the U.S. colleges and universities goes back to the nineteenth century when Frank Aydelotte established the innovative pass/honors approach at Swarthmore College in 1922. During the same period Sidney L. Pressy published articles stressing acceleration for superior students and from these early beginnings each institution of higher education developed its own approach to honors education (Friedman & Jenkins-Friedman, 1986). Later in the 1950s, the need to foster talent increased as a result of the Sputnik launch. Joseph W. Cohen, who developed an honors program at the University of Colorado in 1928, founded the Interuniversity Committee on the Superior Student (ICSS) to promote an interest in honors programs across the nation. In 1966, the ICSS was superseded by the National Collegiate Honors Council (NCHC), which continues to provide services to honors programs at colleges and universities (Cosgrove, 2004; Friedman & Jenkins-Friedman, 1986). Generally, post-secondary honors programs take one of two forms: university-wide honors or department-based honors programs (Cosgrove, 2004; Hafsyan, 2015). The essential difference between the two types is that university-wide honors programs support and encourage honors

students in all areas of education and do not focus on any one content area specifically; whereas department-based honors programs focus on the development of honors skills in their specific subject. For example, an English department-based honors program would focus on developing English skills and talents for those gifted in English (Hafsyan, 2015). Overall, most research has been conducted on university-based honors programs rather than department and content-based programs (Chancey, 2013; Cosgrove, 2004; Rinn, 2008). Since the focus of this research is on STEM students, and not all STEM departments at the university where data was collected have their own honors program, studying department programs is not as relevant. Thus, a university-based honors program is the current research setting.

**Honors Program Practices**

Although the trend in U.S. education is toward quality education for all, it is not assumed that each student will advance equally in all areas, even if they are given equal opportunities (Sternberg & Davidson, 2005). Students are considerably varied in their strengths and weaknesses. Some students can be strong in one area but not in another (e.g., strong in math but weak in science). Special conditions and opportunities must exist that contribute to the intellectual tone of an undergraduate college for these students to perform to the extent of their ability. Thus, the National Collegiate Honors Council (NCHC) has identified 17 basic characteristics that honors programs need in order to be developed fully. These characteristics identify various guidelines for the way collegiate honors programs should be designed and implemented for increased student and faculty involvement and for the use of multiple types of learning styles as appropriate for the differences in learning style of each student (NCHC, 2014). Thus, honors program researchers stress the development of challenging programmatic options that help facilitate students' demonstrable talents (Goldberger, 2012; Gould, 2009).

What seems most successful for helping students is what stays closest to the classroom environment. If classrooms are to be successful, there must be intentional differentiation of instruction and methods from the regular class. According to Wolfensberger, Drayer and Volker (2014), interviews with American teachers show that teachers' assumption that honors students think at higher levels is paramount for productive honors classes. Honors classes have the potential to cultivate innovative talents by encouraging students to question and reflect, guiding them to innovation-oriented issues, and offering opportunity for self-discovery through learning tasks such as playing, drawing, or generating stories which help to improve their intellectual skills (Long & Davis, 2017; Shavinina, 2009).

Not only should honors class activities and learning tasks stimulate higher thinking but other interventions should also be recognized to support STEM talents. Graham, Frederick, Byars-Winston, Hunter and Handelsman (2013) state that successful program commonly use three interventions for inspiring STEM students: early research experience, active learning in introductory courses, and membership in STEM learning communities. According to Angle, Davis and Redmond-Sanogo (2016), interventions have been conducted nationwide by providing undergraduate STEM students with mentors, academic support, and providing undergraduate research experience. For example, AP (Academic Placement) courses lead to higher success in STEM improvement skills (Angle, Davis & Redmond-Sanogo, 2016). CUREs (Course-Based Undergraduate Research Experience) is an example of a program that allows students to engage in doing science research early in undergraduate level (Crowin, Dolan & Graham, 2015).

**Admission to Honors Programs**

Identifying students for honors programs has been facilitated through different measurements. Most honors programs utilize quantitative measures as determinants of

admission. Admission is usually based upon several factors such as high school grade point average and standardized tests scores, such as the ACT/SAT (Wolfensberger, Drayer & Volker, 2014). A premise of honors programs is that higher achieving students will enhance the general intellectual environment and improve students' success (Wolfensberger, Drayer & Volker, 2014). Some honors programs require letters of recommendation, extracurricular activities, essays, interviews, college GPA, or other application information (Hafsyan, 2015; Hebert & Mcbee, 2007; Hill, 2005; Long, 2002). According to Hill (2005), these criteria are widely used as the primary basis for admitting students to honors programs.

**Benefits of Honors Programs**

Supporters of honors programs believe they benefit the university and students. Researches have shown many positive effects for students participating in honors programs. Recent studies have focused on the benefits of participating in honors programs by comparing honors and non-honors students. Results show that honors students differ significantly from their non-honors peers in implementing good educational practices; also, honors students had more potential for excellence in their professional lives (Brimeyer, Schueths & Smith, 2014; Scager, Akkerman, Keesen, Mainhard, Pilot, & Wubbels, 2012; Seifert, Pascarella, Colangelo, & Assouline, 2007). For example, quantitative studies found that honors programs yield many benefits to honors students including increased academic achievement, emotional intelligence, and cognitive development (Castro-Johnson &Wang, 2003; Hartleroad, 2005; Rinn, 2008; Seifert, Pascarella, Colangelo & Assouline, 2007; Shushok, 2003). Additionally, some studies found that participating in honors programs contributed to higher benefits to institutions including higher institutional ranking and improved retention and graduation rates (Buckner, Shores, Sloane, Dantzler, Shields, Shader & Newcomer, 2016; Campbell, 2006; Cosgrove, 2004;

Kampfe, Chasek & Falconer, 2016; Keller & Lacy, 2013; Nichols, Ailts & Chang, 2016; Slavin, Coladarci & Pratt, 2008; Wolfensberger, 2014). Other qualitative studies found that honors classes developed significant psychosocial growth of honors students (Hebert & Mcbee, 2007), and made the voices of top students clearly heard (Hill, 2005). Huggett (2003) developed a theory of high quality undergraduate honors programs. Other researchers recognized that assessment and evaluation are essential and powerful tools to develop honors education (Driscoll, 2011; Lanier, 2008; Wood-Nartker, Hinck & Hullender, 2016). Others found the positive effect of the honors program on both career and educational aspirations (Hafsyan, 2015) and on successful community building (Brinkel, Rees, Ruis & Sloots, 2015). Brimeyer, Schueths and Smith (2014) found high benefits to the entire educational system in the university. Other studies have been focused on the benefit of classroom practices on students' academic growth. For example, a study by Moon (2012) focused on the impact of involvement in honors programs on the prediction of academic efficacy, critical thinking skills and academic goals. Another study focused on how teaching critical thinking in honors classrooms accomplishes important pedagogical goals (Cargas, 2016).

## Gifted and Talented Students

### Gifted and Talented Definition

Understanding the meaning of gifted is important because it influences an honors program's admission processes, programming, and assessment. Most of the reviewed studies used the terms gifted and talented interchangeably, suggesting that they are conceptually equivalent. Some writers accept to the use of the terms interchangeably since there is no definition of gifted or talented that is universally accepted. For example, Davis and Rimm (2004) illustrated that it is acceptable to describe the same person as either a "gifted artist" or a "talented artist". Alternatively,

some researchers in the field of gifted education have differentiated between the terms and argue that they are different constructs. According to Gagne (2009), gifted refers to natural abilities, whereas talent refers to systematically developed abilities. Gagne (2009) identified the basic connection between gifted and talented: "talent development corresponds to the transformation of outstanding natural abilities (giftedness) into the skills characteristic of a specific occupational field" (p. 177). From this it is understood that the relationship between the two concepts leads to a new orientation, that talent is a developmental construct, which indicates one cannot become talented without first being gifted. Davis and Rimm (2004) called this a continuum definition. Related to this, many institutions include in their honors programs students who barely meet the established criteria alongside others who are gifted or talented in a particular area.

Although the definitions of gifted vary among states and even in the same state between institutions, until 2006 there were three important definitions of gifted. The first as defined by the U. S. Department of Education in 1993, stated that,

> Children and youth with outstanding talent perform or show the potential for performing at remarkably high levels of accomplishment when compared with others of their age, experience, or environment. These children and youth exhibit high performance capacity in intellectual, creative, and/or artistic acts, and unusual leadership capacity, or excel in specific academic fields. They require services or activities not ordinarily provided by the schools (Office of Educational Research and Improvement, 1993, p. 26).

Second, some institutions adopted the Javits Act (1988) definition, which states: "the term gifted and talented students means children and youth who give evidence of higher performance capability in such areas as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who require services or activities not ordinarily provided by the

schools in order to develop such capabilities fully" (Clark & Zubizarreta, 2008, p.388). Finally, some states adopted the National Association for Gifted Children's (NAGC) definition of giftedness, which states that gifted learners are "students, children, or youth who give evidence of high achievement capability in areas such as intellectual, creative, artistic, or leadership capacity, or in specific academic fields, and who need services and activities not ordinarily provided by the school in order to fully develop these capabilities" (NAGC, 2019, p.1). After the new movement of describing giftedness as a gifted behavior, most gifted programs adopted the definition of Renzulli's Three Ring (1978) wherein "gifted behavior consists of behaviors that reflect an interaction among three basic clusters of human traits - above average ability, high level of task commitment, and high levels of creativity" (Renzulli, Gubbins, McMillen, Eckert & Little, 2009, p. 325).

As a final comment on the challenge to define these terms, the definitional issues regarding gifted and talented become more complicated since the definition of giftedness is constantly evolving along with the selection of students and the types of programs that support them (Davis & Rimm, 2004). Based on the various definitions above, it becomes necessary for each honors program to examine their definition of giftedness to ensure best practices in regular classrooms that help in improving giftedness.

**The Trend Toward Talented Development and Gifted Behavior**

The new orientation of gifted and talented has become broader. Educators therefore tend to recognize giftedness as a talent that can be developed (Gagne, 2009), which indicates that the ability to learn can be found in each person. In a sense, talent development supports the movement to provide quality education for all students. Davis and Rimm (2004) argue that gifted education leaders (e.g. Renzulli & Ries, 1997; VanTassel-Baska & Stambaugh, 2005)

recommended that the term gifted be replaced with talent development, as it implies broader identification and programming for all students. Currently, a new shift has taken place in gifted education, which identifies giftedness as gifted behaviors rather than a gifted individual. This shift occurred after longitudinal research on giftedness (Renzulli, Gubbins, McMillen, Eckert & Little, 2009). For more than 30 years, Renzulli and his colleagues concluded, "a shift should occur from an emphasis on the traditional concept of being gifted to a concern about the development of gifted and creative behaviors in students who have high potential for benefiting from special educational opportunities" (Renzulli, Gubbins, McMillen, Eckert & Little, 2009, p. 326). This shift has impacted the programming in honors education creating a place for talent development for all students. Looking to improve talent and gifted behavior encourages all educators to increase opportunities to nourish and support the potential of all students (Renzulli, Gubbins, McMillen, Eckert & Little, 2009).

## STEM and STEAM Education

Currently, STEM education is experiencing many changes in elementary, middle, and high school levels in an attempt to sustain the involvement of science prone students in these fields (Van Tassel-Baska & Stambaugh, 2006). The concern, it seems, is that most students can lose interest in the sciences, or even scientific inquiry skills, by the time they reach the college level (NSB, 2010). As a 2012 report by the President's Council of Advisors on Science and Technology (PCAST) stated, "while building a deeper, broader talent pool, more top STEM students switch to a non-STEM field before graduation"; and it predicted that "less than half of the three million students who enter the U.S colleges yearly intending to major in STEM field persist in STEM until graduation" (Graham, Frederick, Byars-Winston, Hunter & Handelsman, 2013, p.1455).Yet, there have been attempts to foster STEM talents for the 21st century. First, the

Greater Expectations Panel assembled by the Association of American Colleges and Universities (AAC&U) spent two years exploring what it means to be well educated. In 2002, the panel issued a report calling for a fresh approach to liberal education that would produce graduates who are prepared for life and work in the 21st century (Clark & Zubizarreta, 2008). Second, the National Science Board (NSB) recommended early actions to encourage teachers to integrate learning processes and creativity to science talent development (NSB, 2010). Third, the Every Students Succeeds Act (ESSA) promoted "integrating […] arts into STEM programs to increase participation in STEM, improve attainment of STEM-related skills, and promote well-rounded education" (U.S. Department of Education, 2015, p.1). Additionally, integrating the arts into STEM learning programs qualified more programs for new grants. From these three examples, it is clear that arts integration in any classroom and its use to support student creativity and innovation is a key strategy to develop talents (Long & Davis, 2017). In STEM classes, using art can improve students' designs and presentations of their material, and increase the effectiveness of their planning (Catchen, 2015; Long & Davis, 2017). Further, students' exposure to arts integration with science affected their learning and creative ability by providing better engagement in subject matter and fostering emotional involvement in the learning process (Hardiman, Magsamen, McKhann, & Eilber, 2009; Long & Davis, 2017). Gardner (2006) believed that science, math, history, and art forms are "gateways" and, therefore, underpinnings of a good undergraduate general education.

Within recent years, the global trend toward teaching STEM integrated with arts education has led to the creation of innovative products and propelled the economy forward (Maeda, 2010). STEAM, which stands for Science, Technology, Engineering, Art, and Mathematics, is the answer to encompass the creativity, collaboration, critical thinking, and

communication that our country needs (Long & Davis, 2017; Miller, 2014). Gardner's (2006) view that concepts and modes of thinking in one discipline enrich students' understanding in another discipline. This view explains how students make connections between disparate aspects of their educational experience. Gardner (2006) believed that by bringing these disparate aspects of the students' experiences to the forefront, the curriculum was inspired by the notion of STEAM, which emphasizes the need for STEM professionals to develop creative and problem solving skills in interdisciplinary settings.

STEAM is a great opportunity to create innovations that involve science, math, technology, and even art content (Maeda, 2010). Turning STEM into STEAM has been a logical way to learn because it guarantees matching creativity with technical skill, which yields innovative results (Catchen, 2015). For example, Albert Einstein's reputation undoubtedly rests on his scientific contributions; however, a lesser-known fact about him was his estimable musical ability. This great physicist, theoretician, and STEM-exemplar was known for revering Bach and Mozart, and to have once said: "I know that the most joy in my life has come to me from my violin" (quoted in Piro, 2010, p. 29). Piro concluded that "If creativity, collaboration, communication, and critical thinking—all touted as hallmark skills for 21st-century success—are to be cultivated, we need to ensure that STEM subjects are drawn closer to the arts" (p. 1). To this point, it is important to understand hemispheric dominance of the human brain.

**The Whole Mind and Future Minds**

Gould (2009) wrote that Roger Sperry, who won the 1981 Nobel Prize in Physiology for his discoveries "concerning the functional specialization of the cerebral hemispheres," claims that "there appear to be two modes of thinking, verbal and nonverbal, and that our education system, as well as science in general, tends to neglect the nonverbal form of intellect" (p.7).

Similarly, Pink (2006) wrote, “Japan, whose students lead the world in math and science scores, is remaking its education system to foster creativity and artistry encouraging what it calls ‘education of the heart’” (p.53). In both cases, it is clear that learning that generates creative thinking is learning that links mind to heart. Clearly, the kind of learning that 21st century life will demand occurs only when heart and mind are both active; when intellectual, emotional, and social developments are considered together; and when the boundaries of the disciplines and the boundaries of university and community life are easily crossed (Clark & Zubizarreta, 2008). The future economy will come from bringing the artists and scientists together because high tech and scientific people can execute things and get them done, while artists and designers can expand the horizon of possibilities (Maeda, 2010).

In fact, understanding the brain science behind learning reveals ways to prepare thinkers for the future; however, it presents new challenges in education. Howard Gardner, in his book, *Five Minds for the Future* (2006), described his theory of the mental proclivities that schools and parents should be helping students develop. The five qualities that need to be considered if a truly global perspective is to be achieved are the following: (1) The Disciplined Mind, (2) The Synthesizing Mind, (3) The Creating Mind, (4) The Respectful Mind, and (5) The Ethical Mind. Gardner in his book draws relatively tight boundaries around education; he offers both a constructive critique of current educational practices and an alternative vision for the future of education. According to Pava (2008), “Gardner, best known for his seminal work on multiple intelligences, grounds his major conclusions primarily on the results of his impressive, decade-long, and massive Good Works Project” (p.285).

There is much to be commended in Gardner’s (2006) future minds. The disciplined, synthesizing, creating, respectful, and ethical minds need to be balanced with yet one more type

of mind – the joyful mind. This mind is a rare accomplishment (Pava, 2008). He thinks "the failure to recognize love, play, acceptance, dialog, spirituality, and other human pursuits in the curriculum is a failure to formally recognize these as valuable human experiences worthy of improving and passing along to the next generation" (p.291). Students must learn how to control their environments and to appreciate and accept life's inevitable difficulties and limits. To accomplish all of this, it is required to develop students' holistic thinking. Thus, I adopted Gardner's (2006) and Pink's (2006) ideas about future minds.

Another important point is that Gardner's idea revealed his positive psychology movement; while Pink's ideas describe social roles (Pava, 2008). The current research focuses on how academic, creative, and social aspects play a more central role in education and is remarkably consistent with the Gardner's and Pink's new mind.

### Honor Programs and the Needs of Gifted STEM Students

Knowing what students need is an important component of an honors program. Further, studying and understanding the connections between gifted students' needs, holistic thinking development, and learning environment is essential to the attributes to the success of these programs (Huggett, 2003). While the body of literature on honors education is still expanding, the issue of developing holistic thinking and meeting the needs of honors students through these programs is receiving less research attention than the impact of honors on overall university retention and graduation rates (Cargas, 2016; Gould, 2009; Moon, 2012). This research will add to the literature an important topic in higher education. In particular, my study will focus on whether or not honors programs meets gifted STEM students' varied needs and support their holistic thinking.

**Blending Gifted Students' Needs and Renzulli's Three Rings**

As I presented in the previous sections, researchers assert that giving students educational opportunities that align with their needs benefits their holistic growth (e.g. Gould, 2009). My review of the literature shows that there are a variety of these needs. However, based on the definition of Renzulli's (1978) Three Ring and his emphasis on the development of gifted and creative behaviors (Renzulli, 2009) coupled with Pink's (2006) ideas about a whole new mind, my synthesis of the literature in the sections that follow is divided into three major parts: (1) academically challenging needs, (2) creative-productive needs, and (3) social and emotional needs. Further, in order to work toward meeting gifted students' needs, I connect these three categories to Renzulli's Three Rings and Pink's (2006) six senses: design, story, symphony, empathy, play, and meaning. One of the higher purposes of connecting gifted students' needs to Pink's senses is to develop the whole-brain thinking of gifted and talented students, as Gould (2009) argues. Further, Pink's six senses are a way to show the interdependency of the gifted students' needs. In this research, I intend to blend these two because Pink is absent, though relevant (c.f. Gould, 2009), in the literature, and his ideas can contribute to a deeper understanding of gifted students' varied needs in an honors program. The table below outlines a framework for blending gifted students' needs with Renzulli's ideas, Gardner's five minds and Pink's six senses.

*Table 2.1: Framework for Blending Gifted Students' Needs with Renzulli's Ideas, Gardner's Five Minds, and Pink's Six Senses*

| Gifted students' needs | Pink's (2006) six senses |
|---|---|
| academically challenging needs<br>(Renzulli & Ries, 1997, Gardner, 2006) | symphony |
| creative-productive needs<br>(Renzulli, 2009, Gardner, 2006) | design and story |
| Social-emotional needs<br>(Pink, 2006, Gardner, 2006) | empathy, play, and meaning |

### *Academically Challenging Needs*

Academically supporting a gifted and talented student is a challenge; however, providing the best environment to ensure that person will get the education she or he needs is more challenging. Historically, researchers (e.g. Renzulli, 1978) have thought that students with exceptional talents and learning potential tend to have higher levels of intrinsic motivation. More recently, it appears that "above average ability [and] high level of task commitment" are the main characteristics of gifted students (Renzulli, Gubbins, McMillen, Eckert & Little, 2009, p. 325). Thus, these students are able to engage with challenging knowledge in a more advanced curriculum and learning environment to produce high quality work (Clark & Zubizarreta, 2008; Davis & Rimm, 2004; Renzulli, 2009; Renzulli & Ries, 1997; Van Tassel-Baska & Stambaugh, 2005).

According to Davis and Rimm (2004), Renzulli (2009), and Moon (2012), challenging tasks include higher-order thinking, or the skills of analyzing, evaluating, and creating in Bloom's (2001) Taxonomy (as cited in Anderson & Krathwohl, 2001). Yet, Moon (2012) found that most gifted students struggle to fit within a normal educational environment because of the lack of challenge in the work they are assigned. Even though it is critical for teachers to offer activities of an appropriate developmental level and projects that meet gifted students' academic needs, researchers found that those teachers working with a population that had mental resources available to learn well, such as gifted and talented students, were able to place a premium on delivery over content (Hong, Greene, & Higgins, 2006; Jones, 2015; Van Tassel-Baska & Stambaugh, 2005). The instruction that stimulates higher-order thinking plays a central role in talent development and success in various domains, including STEM (Camci-Erdogan, 2015). It is important for faculty to consider ways they can differentiate their delivery of content when

determining instructional methods to facilitate the academic needs of gifted students.

Recent studies stress the positive impact of using complex thinking strategies such as critical thinking and problem-based learning as key approaches in gifted and talented classrooms (Van Tassel-Baska & Stambaugh, 2005). Cargas (2016) and Moon (2012) reported that critical thinking is the phrase most used in honors program mission statements. Cargas (2016) also stated that "honors colleges [are] moving away from being defined by specific problems or disciplinary approaches and heading instead towards missions that convey flexible problem-solving skills" (p. 125). It is clear from both mission statements that honor program tends to apply critical thinking and problem solving. Cargas (2016) pointed out that people often use both terms interchangeably. However, authors define each term as follows: Facione (1990) defined critical thinking as "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based" (p. 9). Long and Davis (2017) defined problem solving as the processes used to obtain a best answer to an unknown problem. Despite this clarification of what critical thinking might mean, the challenge still remains that researchers need to provide examples to further define and assess this concept.

Facione (1990) and Moon (2012) highlighted that the American Philosophical Association's panel of experts recognized the need to identify central or core critical thinking skills. The experts identified the cognitive skills of analysis, evaluation, inference, interpretation, explanation, and self-regulation as key abilities. Beyond these important cognitive skills, the experts agreed that certain affective qualities play a role in good critical thinking. These include "characteristics such as inquisitiveness, open-mindedness, honesty in facing biases, flexibility, fair-mindedness, and diligence" (Moon, 2012, p. 32).

After understanding what critical thinking skills are, the next step is to examine how students proficiently use critical thinking skills. The challenge, though, is how to measure this growth. Some published tests are available to assess critical thinking; these often consist of multiple-choice questions and a reliance on students' self reporting their growth. Tsui (1999) claims that a multiple-choice test exerted a negative effect on self-reported growth in critical thinking. Although studies provide examples of direct measures, Moon (2012) and Tsui (1999) argue that using self-reported growth in critical thinking provided a basic assessment by asking students to judge their growth in the ability to think critically. These measures are explained by Moon (2012) as, "self-reports of college graduates regarding their own abilities and current behaviors [that] can be collected as indicative of actual underlying student abilities" (p. 34). In contrast, Moon (2012) argues that an effective method of critical thinking assessment is "when instructors make their own tests with open-ended responses, multiple choice questions with the inclusion of student justification of their answers, essays, or performance assessment, which makes use of direct observation" (p. 33). These kinds of techniques require the construction of thoughts and answers rather than simple recognition or luckily selecting correct answers (Tsui, 1999).

Without examples of higher-order, or critical thinking tasks in the literature for higher education honors courses, misperceptions about what these challenging tasks look like go unchecked. Stedman and Adams (2012) stated, "Although teachers have positive attitudes and aspirations to teach at higher, critically thinking levels, they may not actually be doing so. One reason behind this incongruence is that teachers may not understand how to teach at higher levels or even what strategies teaching at a higher level may include" (p. 10).

Some honors programs locate specific classes to teach critical thinking; as does the

honors program to which I choose to apply the current research. In fact, Tsui (1999) argues that there is no need to design courses specifically to teach critical thinking. Instead, honors educators can employ Pink's senses to realign and adjust instructional delivery to meet the critical thinking and problem-solving abilities of gifted students. For instance, the Symphony sense of Pink can be applied in honors classes. Pink called the synthesis of elements Symphony. He described Symphony skills as the ability to synthesize information, to take individual, disparate pieces of information and bring them together to see a new big picture, perhaps crossing boundaries from one discipline to another to see connections and patterns. Through Symphony skills, students can think broadly and then link unconnected elements to create something new. For example, Gould (2009) indicated that instructors can exercise this skill by bringing examples from all styles and genres of the topic encounters and leading a class discussion on the similarities and differences. She stated, "The concept of Symphony requires drawing parallels in subjects that would not otherwise be linked" (p. 23). Since Symphony is the ability to see relationships between unrelated fields, drawing expands the capacity for symphony. Pink's view is that "drawing is about seeing relationships and then integrating those relationships into a whole" (p. 151). In honors classes, teachers can train students to use drawing to see the big picture, diagram interactions and relationships amongst concepts, and illustrate potential solutions to real-world problems. Through drawing, students uncover hidden connections, make leaps of imagination, and come up with creative products.

In what Pink (2006) refers to as the sense of Symphony and Gardner (2006) refers to as the Synthesizing Mind, students can understand and evaluate information to elicit inspired ideas, multiple options, and blended solutions. Tsui (1999) agreed that instructional techniques have positive effects on critical thinking when they include group projects, essay exams, and class

presentations. Students' application of the Symphony sense aligns with the cognitive skills of "analysis, evaluation, inference, interpretation, explanation, and self-regulation as key abilities" as well as critical thinking "characteristics such as inquisitiveness, open-mindedness, honesty in facing biases, flexibility, fair-mindedness, and diligence" (Moon, 2012, p. 32). Students would benefit from instructional techniques that address both cognitive and critical thinking abilities.

Honors programs can be an effective place for developing these approaches to critical thinking. Tsui (1999) found students who took interdisciplinary courses and attended institutions with a strong humanities orientation were more apt to report greater growth in critical thinking. Current research will apply Pink's symphony sense to honors classroom practices to meet the academically challenging needs of gifted students; however, his framework for senses needed in the 21st century can also be applied to honors students' other needs. In the sections that follow, I present how these creative-productive and social-emotional needs can be addressed in honors programs using Pink's (2006) conceptualizations of Design, Story, Symphony, Empathy, Play, and Meaning and Gardner's (2006) Five Minds for the Future.

***Creative-Productive Needs***

As stated earlier in the definitions of giftedness, gifted education educators agreed that creativity is the main characteristic to be fostered in students, as exhibited in Renzulli's (1978) Three Ring Model. The rise of creativity is considered a fundamental economic driver in the Conceptual Age of the 21st century since creative individuals drive innovation in the American economy (Pink, 2006). Examining the creative needs of gifted students leads to the quandary of how educators can give these needs proper attention and cultivate innovative thinking.

There is no single way to improve creative thinking in all students. Hong, Hartzell and Greene (2011) recommended that teachers create classroom environments to meet individual

students' interests and needs, design curriculum to ensure open-ended activities, and utilize real-life contexts for assessing and reporting learning outcomes. They see giftedness, as determined by test scores and good grades, as only weakly associated with creativity in adult learners (e.g. Hong, Hartzell & Greene, 2011). To help adult creative thinkers realize creative-thinking ability, they must be given opportunities to use it. Honors class teachers can implement a creative teaching method to develop whole brain thinking through Pink's Design and Story senses.

Pink (2006) advocated making design a priority because of the current abundance of material things in the 21st century, which is similar to Gardner's (2006) Creating Mind. According to Gardner (2006) the creating mind puts new ideas that makes the creations to find acceptance among knowledgeable consumers. In the future, the design of objects rather than their function will differentiate them, with well-designed products being more valued. Renzulli, Gubbins, McMillen, Eckert and Little (2009) described "creative productive giftedness as those aspects of human activity and involvement where a premium is placed on the development of original material and products that are purposefully designed to have an impact on one or more target audiences" (pp. 423-425).

Creative students need a flexible program that teaches to their strengths and interests, yet provides enough structure to help students learn to be creative and independent thinkers (Austin, 2011; Renzulli, 2009). Honors programs are an appropriate working prototype where all students should experience productive, responsible, and creative lives (Clark & Zubizarreta, 2008). Doris (2002) argues that through honors classes, students had the opportunity to "engage in the discussion of open-ended questions with the '6 Ws' (Why, What, Where, Who, When and How), [and] students were encouraged to provide creative, flexible answers. Answering these questions provided opportunities for students to think deeply, and it also trained students to solve real

world problems" (p. 168).

In fact, with the force of the Conceptual Age, the field of gifted education requires extra efforts to increase the power of creative STEM minds by becoming more reliant on art and design. There is a direct connection between Gardner's five minds, Pink's six senses and the thought and work that designers do every day (Pava, 2008). He stated that design experiences are not only help increase retention of discrete information beyond rote memorization and mastery of basic concepts, but they also nurture the development of the whole mind. Thus, it is important to not becoming temporary repositories of taught information, students begin to realize the power of education to unleash their potential as thinkers (Pava, 2008).

According to Pink (2006), design allows honors students to cultivate artistic sensibility. He argues that when someone can channel her/his special skills through the grid of the arts, design, and perceptions, then s/he has the opportunity to maximize creative products and services. His argument about the success of a secondary school's program is clear: "[E]qually important, the school marries design to math, science, English, social studies, and other subjects" (p. 72). Kawasaki and Toyofuku (2013) illustrate that in the science-art collaborative, teachers can distribute art pieces to transform scientific knowledge into a personal, emotional, and social experience, leading to creative ways to disseminate science information. For example, students in the class can create a documentary film on any topic. Through creating the film, students have a space to design and be creative agents. They can pull together the perspectives of multiple disciplines and question, respond, synthesize, and critique the notions of science to form distinct individual opinions and positions.

Story is another sense required for the Conceptual Age. Story is a fundamental instrument of thought and it incorporates the whole brain thinking. In Pink's (2006) sense of Story, learners

have high touch and high concept abilities. Pink defined the former as the ability to understand human interaction in pursuit of meaning; the latter was defined as the ability to create emotion-rich content and relay the information in a more effective and memorable manner. Gould (2009) stated, "Story is about contextualization" (p. 22). Most people's experience, knowledge, and thinking are organized as stories. What matters more in the academic setting are the teachers' and students' abilities to place facts in context and to present them with an emotional impact. Teachers and students can use different kinds of activities to craft stories. In a group activity, students can use words, pictures, or digital tools to tell stories from their minds and hearts. "Story does not replace analytical thinking; however, it supplements it by enabling us to imagine new perspectives and new worlds" (Pink, 2006, p. 108).

These kinds of creative products require a type of learning that emphasizes the application of information (content) and thinking skills in an integrated and problem-oriented manner (Renzulli, Gubbins, McMillen, Eckert & Little, 2009). Gifted students across a wide age range demonstrate abilities in real-life problem solving in various domains (e.g., leadership skills, mathematics, sales, management) as indicated by their ability to produce original and divergent solutions to problems posed to them (Hong, Greene & Hartzell, 2011). In STEM classes particularly, teachers utilize Design and Story skills when solving a scientific problem. To look for a great solution, teachers encourage students not to focus on coming up with a single, well-established answer to the problem. Rather, they expect performance informed by embracing innovative and alternate views or diversified solutions that may be required to effectively address complex issues in science (Kawasaki & Toyofuku, 2013). Indeed, in order to inspire students' creativity, educators must enliven students' performances with the whole-brain thinking. In fact, not only Design and Story work well but also other ideas of Pink and Gardner work perfectly to

meet gifted students' needs. In the following section, I present how honors programs use Pink's (2006) conceptualizations of Empathy, Play, and Meaning to address the social and emotional needs of gifted students and Garner's (2006) Respectful and Ethical Minds.

***Social Emotional Needs***

Present efforts to develop giftedness show more attention has been paid to address the correlation between gifted academic progress and social and emotional growth. Current studies show that social and emotional needs are closely connected to academic performance (Jones, 2015; Pritchard & Wilson, 2003; Van Tassel- Baska & Stambaugh, 2006). Pritchard and Wilson (2003) found that students who are emotionally and socially healthy are more likely to succeed in college. However, according to the literature, parents and teachers of gifted students indicated the students were prone to developing social and emotional problems. For example, Jones (2015) and Needham (2012) contended that some gifted students who do not receive opportunities that meet their emotional needs possess a level of emotional sensitivity and intensity that sets them apart from others. These students with emotional and social restrains might have difficulty reaching their academic potential, especially in the Conceptual Age.

Research clearly shows that teachers or classroom instructors play an influential role in the educational experience by providing the appropriate environment and promoting challenging learning opportunities for students' holistic growth (Hong, Greene & Higgins, 2006; Needham, 2012). Thus, the NAGC and the Council for Exceptional Children (CEC) have created teacher preparation standards, including one focused on developing a learning environment that helps gifted individuals become effective learners and develops social and emotional well-being (NAGC, 2013). Studies show increased attention to gifted students' social and emotional needs in the K-12 years. For instance, most schools now work toward partnering with families to

discuss issues related to social-emotional development (Jones, 2015; Needham, 2012). Today, many teachers facilitate a learning environment that promotes the social-emotional needs of each gifted child. They adapt comprehensive approaches that include teaching social skills, applying affective classroom practices, and facilitating children's emotional development, which leads students to be successful in school and life (Jones, 2015; Long & Davis, 2017; Needham, 2012). Less attention has been paid to develop the individual's personal and social interactions in higher education. There are limited studies focused on addressing social and emotional development of college students (Pritchard & Wilson, 2003), even though they found positive correlation between emotional and social factors and the prediction of student success in college. Long and Davis (2017) claim that one of the problems that college students face is a lack of socially-emotionally satisfying interaction with their learning environment. Developing the social and emotional needs of gifted students can be connected to Pink's Empathy, Play, and Meaning senses.

Using Pink's (2006) sense of Empathy and Gardner's (2006) ideas about Respectful Mind, learners are able to understand their own feelings, and hence, better understand and read others' feelings. Logic alone is no longer sufficient; people should understand other's feelings to excel in this new era. Shavinina (2009) stated, "The capacity for empathy as part of gifted student's intellectual makeup is something that deserves more attention" (p. 443). In a world that is now more connected than ever before, the qualities of empathy and moral imagination are more important than ever (Clark & Zubizarreta, 2008). Pink (2006) claims that in the Conceptual Age, "the one aptitude that's proven impossible for computers to reproduce, and very difficult for faraway workers connected by electrons to match, is empathy" (p. 161). Emotionally gifted students have deep empathy and respond to the needs [...] of others" (Shavinina, 2009, p. 445).

Gardner (2006) believes that the human mind is more than the construction of knowledge. His idea posits a pathway that carries thinkers from reflecting and conceptualizing to understanding how one might conceive and understand knowledge. Thus, he added human Respectful Mind and challenges educators to include a humane dimension in the pursuit of understanding.

In colleges and universities, educators should train honors students to be open-minded and empathetic. Such openness can view with empathy the lives of other people and be concerned about their well-being. Practicing empathy allows students to understand facial expression, intention, and body language which helps to make accurate comments about other's feelings. Gardner (2006) urges faculty to be models of the empathic: "The task for educators becomes clear: if we are to fashion persons who respect differences, we need to provide models and offer lessons that encourage such a sympathetic stance" (p. 26).

Volunteering can be a great way to sharpen one's empathic powers. Teachers can encourage students to volunteer somewhere in the campus or community (Brinkel, Rees, Ruis & Sloots, 2015). As stated earlier, honors courses are interdisciplinary and experiential, and they connect academic study to community involvement. Long and Davis (2017) encouraged student and community engagement because learning occurs through the accumulation and collaboration of knowledge between people, community, and organizations. For instance, students' exposure to community problems has the potential to affect their ability to learn, observe, collaborate, communicate, and create problem-solving skills (Long & Davis, 2017).

Play is important because there is evidence that playfulness and humor, as emotional aptitudes, benefit health and career (Pink, 2006). He provided an example of using video games in medical fields: "Therapists are treating phobias and other anxiety disorders with video games that simulate driving, flying, heights, tight spaces, and other fear-inducting situations" (p. 194).

In honors classes, instructors can use games that enhance whole brain thinking to solve campus and community problems. Further, playing games in a group enhances social interaction. Brinkel, Rees, Ruis and Sloots (2015) wrote that one of the standard goals of honors programs is to give students' academic and social support, increase their motivation, and provide them a social context in which they feel less isolated. Honors programs can organize a number of social activities to stimulate community building. Activities such as study trips, small projects, workshops, or informal conferences enhance contact between students. A study trip, for example, can be used to overcome the isolation between college students and the community around them. It is a good strategy to enhance the interaction between students and their environment and to get students to know each other (Brinkel, Rees, Ruis & Sloots, 2015). While students are working together, they can practice emotional attitudes. They laugh, trade jokes, share stories, … etc. Laugh helps reduce students' stress and increase their sense of humor (Pink, 2006). High humor is correlated to high motivation and reinforcement.

In Pink's (2006) concept of Meaning, finding purpose in one's life is critical to happiness and to creating a sense of peace. In the field of business, Pink (2006) claims, "More happiness causes more productivity and higher income" (p. 226). Similarly, in education, Gardner posits that an Ethical Mind pounders the nature of one's work and the needs of the society. Thus, educational field courses should include teaching mindfulness, or at least be aligned with class goals. These connections may be effective at increasing awareness of students' inert knowledge as well as increasing communication amongst students, which helps in changing self-perception as new knowledge and skills are acquired that change students' perceptions about each other (Long & Davis, 2017). From a scientific view, social and emotional interaction depend on the activity of the nervous system, which creates a simulation of the actions and the emotions of

others within oneself (Shavinina, 2009). Peer collaboration is often viewed as a catalyst in the learning process in honors programs. Gifted education specialists argue the importance of placing gifted and talented students with their intellectual peers since social/emotional interaction co-occur with their educational development (Wai, Lubinski & Benbow, 2009). Adjusting a learning environment to enhance peer collaboration requires providing meaningful activities.

In a world connected in new and intimate ways, the qualities of empathy, joyfulness, and finding life's meaning are more important than ever. Gardner (2006) believe that nowadays people can no longer remain within their shell or on their home territory, instead they try to understand and work effectively with each other. The current efforts, as Clark and Zubizarreta (2008) state, are to expand the international dimensions of the campus community and the scope of our international programs to reflect our commitment to preparing our students and ourselves for the conceptual age. Therefore, this study has begun to fill the gap regarding the importance of providing an affective environment to develop skills in the social and emotional domains including empathy, play, and meaning skills.

If gifted students have opportunities to employ holistic thinking at the college level and they apply it to their education and performance practices, they will have the opportunity to develop a new generation of whole minds (Gould, 2009). Thus, current research focused on honors classrooms that help in meeting the holistic needs of gifted students. Using Pink's (2006) Six Senses and Gardner's (2006) Five Minds in an honors program curriculum allows educators to create innovative activities, events, and services to meet gifted students' needs. Their ideas helped in identifying and creating more items to measure students' needs. For example, through Symphony sense and Synthesizing Mind, as stated earlier in academically challenging needs,

students have an opportunity in honors classes to synthesize information, see relationships, and bring different ideas together to see a new big picture. In the following chapter, I present the method to measure gifted students' needs and develop their holistic thinking through honors programs using Pink's conceptualizations of Design, Story, Symphony, Empathy, Play, and Meaning and Gardner's Five Minds for the Future.

## Conclusion

The purpose of this chapter is to discuss the blending of STEM gifted students' needs and Renzulli's (1978) Three Rings. Pink's (2006) and Gardner's (2006) ideas about the future mind and holistic thinking were used to frame this study. Additionally, the chapter provided a basic background about Honors programs, gifted and talented students, STEM and STEAM education, and Honors programs and the needs of gifted STEM students.

# CHAPTER 3

# METHODOLOGY

The purpose of this chapter is to explain the methods used to conduct this study. The research questions are listed first. Then, the design of the study is introduced. Researcher positionality is presented. The subjects are described as well as the institutional context for the study. The instruments are explained, including descriptions of the survey validity and the interview trustworthiness. A data collection and analysis for the study are discussed.

## Research Questions

The following questions were developed to guide the study:

1. Are there statistical differences in participating gifted and talented STEM students' opinion of the Honors College addressing their academically challenging needs, creative-productive needs, and social-emotional needs?
2. What are the relationships among the three categories: academic challenging, creative-productive, and social-emotional needs? What are the participating gifted and talented STEM students' understanding of each category?
3. To what extent do participating gifted and talented STEM students perceive the honors program as addressing their needs and developing their holistic thinking?

## Research Design

The design of this research is mixed method in nature. "Mixed method involves combining or integration of qualitative and quantitative research and data in a research study" (Creswell, 2014, p. 14). In particular, an explanatory sequential mixed method was used. The intention of this design is to collect quantitative data first followed by qualitative data (Creswell, 2014; Teddie & Tashakkori, 2009). According to this design, the study follows two phases in

data collection. The first phase begins with a broad survey in order to generalize results to a population. Then, in the second phase, qualitative data is collected using semi-structured interviews to gather detailed views from participants to help explain the initial results from the quantitative survey. After a close review of research methods, it appears that mixed method is the best for the purpose of this study. Through this design, I was able to investigate whether the honors program meets gifted students needs or not. Despite the researcher's curiosity about the phenomenon of honors programs attempting to meet gifted needs, this issue is complex and urgent in gifted education as a whole (Goldberger, 2012; Gould, 2009; Huggett, 2003). Thus, according to Teddie and Tashakkori (2009), a full understanding of a complex phenomenon can be a reason to choose mixed method design.

## Researcher Positionality

As an instructor who has served more than 10 years in a higher education program that prepares teachers in Saudi Arabia, I have been part of a team of faculty members who have developed new courses and created new standards for student teacher evaluation. As an active member in gifted and talented organization in Saudi Arabia for many years and now a member in the National Association for Gifted Children, NAGC, I bring a set of experiences and knowledge that impacts thinking about gifted education. I noted a real need for gifted education programs to face future challenges after researching teacher training methods meant to identify, teach, and support gifted students.

The reflections and revelations that emanate from the literature are a testament to the positive and negative impact educational settings can have on gifted students. The literature recommendations concentrate the importance of meeting the needs of scientific talents. I have concluded that the value of human inventiveness, and the most important attribute in science and

technology areas, is the rising of creativity. Thus, honors programs are a good place to transform the 21st century economy by inspiring creative thinkers. To accomplish this, honors programs are tasked with developing the holistic thinking of gifted and talented STEM students by meeting their needs. This research represents an attempt to add to the body of literature on gifted students in a university setting. To assist the research process in collecting data, I was positioned as a participant interviewer. Honors students were interviewed to understand to what extent the honors program addresses gifted and talented students' needs and develops their holistic thinking.

## Population and Sample

To select an appropriate sample, I distinguished the target population. According to Gliner, Morgan, and Leech (2009), the target population "includes all of the participants of theoretical interest to the researchers and to which he or she would like to generalize" (p.117). The target population of the study are those studying in an honors program at a local university in the United States Midwest. Studying all students allows the researcher to make a meaningful examination of the impact of honors involvement on meeting honors students' needs (Moon, 2012). All participants had to meet the admission criteria of program eligibility plus meeting the following criteria. First, only STEM students were included in the research since the primary focus of the research was to obtain results that informs how this particular program integrates different majors into the humanities and arts to address the needs of STEM students. Second, the sample consisted of students who were active in the honors program during the spring 2019 semester and were willing to participate in the current study. Third, all students who enrolled in the honors program from 2015–2019 were included in the research population. According to Moon's (2012) study, "the population includes those who participate in the institution's honors

program upon their admission to the university in the 5-year period" (p. 42). This period was chosen to ensure the inclusion of all classifications of students (freshman, sophomore, junior, and senior). More information about the selection of people interviewed and how I interviewed them can be found in Data Collection and Analysis.

Student demographic information was collected including gender, race and ethnicity, university major, student classification year, first year of participation in the Honors Program, Pell Grant recipient, and has conducted research. Based on the program eligibility and Renzulli's definition of giftedness (1978), I added to the research participation a requirement that one must have a conducted research, completed a project, or developed creative products. Demographic and educational information in the current survey cover this (see appendix E).

For qualitative data, purposive sampling was applied. This is a common strategy for choosing the qualitative approach sample since this approach does not aim for generalization (Teddie & Tashakkori, 2009). The interview groups were composed of the subjects described above and based on the researcher's analysis of the quantitative survey. Specific strategies were employed to select the participants groups. Three groups were formed based on students' experience at honors program (positive, moderate, poor). More information about selection strategies and interviews groups are found in the findings chapter.

## An Institutional Context

The research setting is limited to an Honors Program at a university in the Midwestern United States. This program has been recognized regionally and nationally as being a gifted education program and meets the current research criteria because it goes beyond the classroom to serve the community, models the excitement of a small liberal arts college within a research university, and serves the whole student population from different majors at the university. I

obtained permission from the Human Subjects Committee to use this site to collect the research data. The Institutional Consent form can be found in appendix (D). The Honors Program required all students to meet the following program eligibility: new freshman students qualify for the admission on the basic of the ACT composite score, high-school GPA, leadership, and services; continuing and transfer students qualify for the admission if they complete 12 credit hours with a cumulative GPA 3.3 or higher. All students should complete the application for further review.

## Research Instruments

The focus of this research is to understand the extent to which an honors program can address gifted and talented students' needs and develop their holistic thinking. Two instruments, survey and interview, were applied to answer the research questions. The following sections provide detailed information about each instrument.

### Survey

For this study, a Survey of Gifted Students' Needs was created to examine the extent that the honors program addresses the needs of gifted and talented students. The primary quantitative data was the information obtained from the Survey of Gifted Students' Needs. The survey has 33 items measuring three constructs that focus on students' needs. As discussed in chapter two, the current research concentrates on three main needs: academically challenging needs (11 items), creative-productive needs (10 items), and social and emotional needs (12 items). The survey was organized into these three needs.

The survey protocol begins with a brief instruction on using the survey. The survey includes a general stem ("In my honors classes, I have opportunities to") followed by a series of closed questions developed for each item. As discussed earlier, examples of items are as follows:

"solve problems that have more than one answer" (academically challenging needs), "produce divergent solutions not a single answer to the problem" (creative-productive needs), and "volunteer on the campus and community" (social and emotional needs). The survey consisted predominantly of statements with Likert-scale responses (Lanier, 2008; Moon, 2012). Participants were asked to rate on a five-point scale to what extent they recognize honors classes for addressing their needs. Participants responded to each item by rating their opinion on the following 5-point scale: *(1) Not at all, (2) At times, (3) Regularly, (4) Very often beyond all my expectations, (5) N/A*. More information about the survey protocol and survey items can be found in Appendix E.

The online survey of students enrolled in the honors program at the university was conducted using surveymonkey.com. This kind of survey ensures the participants' anonymity. Survey participation required the completion of all survey items. To encourage survey completion, a raffle of 10 Amazon gift cards was applied. Only the participants who completed the survey entered into the raffle and had a chance to win $50 Amazon gift cards.

**Survey Validity**

**Content validity.** The validity of the survey is established through content-related validity. The survey begins with a brief introduction about the survey purpose, specific strategies and instructions for participants, then demographic and educational information of the participants. The validity of the survey was established through content-related validity. Reviewing the current literature allowed the researcher to select the skills that best fit the study's purpose. Each of the survey item measured a specific skill. The survey was composed of items from Moon's survey (2012), Lanier's survey (2008), Pink's (2006) Six Senses, and Gardner's (2006) Five Minds. Items selected from Moon's and Lanier's surveys were combined and

adapted for use in this research. Items from Pink's and Gardner's ideas (2006) were slightly rephrased for the purposes of the Survey of Gifted Students' Needs in order to reflect their use in the collegiate environment. I organized, analyzed, and synthesized survey items as a whole into three needs. The following table is a description of the skills within each need:

*Table 3.1: A Description of the Skills within Gifted Students' Needs*

| Gifted Students' Needs | Skills |
|---|---|
| Academically challenging needs | Cognitive thinking skills (Moon, 2012)<br>Critical thinking skills (Lanier, 2008; Moon, 2012)<br>Symphony senses skills (Moon, 2012; Pink, 2006, Gardner, 2006) |
| Creative productive needs | Creative thinking skills (Lanier, 2008; Moon, 2012; Pink, 2006)<br>Design sense skills (Pink, 2006, Gardner, 2006)<br>Story senses skills (Moon, 2012; Pink, 2006) |
| Social and emotional needs | Empathy sense skills (Pink, 2006, Gardner, 2006)<br>Play senses skills (Pink, 2006)<br>Meaning senses skills (Moon, 2012; Pink, 2006, Gardner, 2006) |

In order to test the validity of the survey information, considerable attention was given in the survey design to provide items with clear wording about activities and involvement with which students have personal experience in the honors program. The literature review and an expert panel provided opinions that guided the development of the subject matter (Gliner, Morgan, & Leech, 2009). Evidence can substantiate the suitability of tools to determine whether they actually measure what is to be measured. The survey was reviewed by the research chair advisor. The first version of the survey had 36 items that focus on three main needs: academically challenging needs (13 items), creative-productive needs (11 items), and social and emotional needs (12 items). (See Appendix E for a first version of the survey instrument). As the content validity of this instrument was an important indicator of the validity of the results, the survey was emailed to the Honors Program director to have feedback about the survey wording. Two professors in Honors Program were chosen by the director for recommendations on

wording and relevance of items. A week later, I received the feedback from the Honors Program experts. Then, based on their comments some items were deleted and others were reworded and adjusted. (The complete version of the survey can be found in Appendix E).

**External validity.** According to Gliner, Morgan and Leech (2009), "external validity deals with generalizability that is, the extent to which samples, setting, treatment variables, and measurement variables can be generalized beyond the study" (p. 128). The study's sample consisted of STEM students who enrolled in the Honors Program and met the program eligibility. This made the research limited to the current population. It is difficult to be generalized to other populations who have the same setting as this research.

**Reliability.** Instrument reliability ensures that an instrument used for measuring yields the same results every time the measurement is repeated. Contributors to the reliability of measures include their stability, consistency of the instruments and the reliability of the rater's scoring. For this study internal consistency was established using Alpha Cronbach. It is a popular method determine reliability when working with Likert Scale (Gliner, Morgan & Leech, 2009). The result confirmed the internal consistency between the data using Cronbach's alpha coefficient is (0.951). This indicated high reliability. The scale had been found to be reasonably stable over time, and to have good internal consistency.

**Interview**

Based on the data collected from the survey, I interviewed three groups of gifted students. The first group is comprised of students who acknowledge the program fully meets their needs as fully (positive experience). The second group consisted of students who said their needs did not get met (poor experience). The third group included students who had low responses in one or two of the three categories (moderate group). The aim of the interview is to understand the

participants' perspectives about if and how honors classes develop their holistic thinking. The interview questions were created based on the findings of the survey. Open-ended questions were used to avoid "yes" or "no" responses and to encourage more detailed responses. Students were asked a variety of questions about their experiences and opinions using questions about their feelings and suggestions (Merriam, 2009). Semi-structured interviews were conducted with each student in order to obtain information about their perceptions of the honors program. A semi-structured interview allows for more flexible questions, giving a degree of freedom and adaptability (Merriam, 2009). The students had some freedom to focus on certain elements and they were given the opportunity to ask questions when they did not understand a question fully. The semi-structured interview was designed to be flexible and to offer participants opportunities to raise matters they considered to be important. Each interview was scheduled between 35-45 minutes upon the participant's availability and held in a time of their convenience. The interviews were conducted over the phone since most of the participants were out of the town during the summer 2019. The semi-structured interview protocol provided an opportunity for the participants to address their views about the honors program's approaches to meeting the needs of gifted and talented students. A $10 Amazon gift cards was provided for each participant. Additional information about the interview protocol and interview questions can be found in Appendix F.

**The Interview Trustworthiness**

Triangulation and transferability are strategies that are used to establish trustworthiness of qualitative data (Merriam, 2009).

**Triangulation.** Triangulated data requires providing detailed, in depth data, and rich information in context (Merriam, 2009). To ensure triangulation in this study, I grouped students

based on their experience in the Honors Program into three groups. I interviewed each student in each group to gain their perspectives on the honors program. I then looked across these groups to substantiate the themes found in the data. The interview transcripts were used to support the analyses of the quantitative data that examine the impact of the Honors Program on addressing students' needs.

**Transferability.** Transferability refers to the degree to which the findings of a qualitative research question can be applied to other situations (Merriam, 2009). Providing a detailed description of the participants, setting, and findings, including direct quotations from many participant responses in interviews, increases the degree of transferability.

## Data Collection and Analysis

Based on a sequential explanatory mixed methods study, all research questions were answered by the analysis of the survey that then was followed up with the creation of interview groups and questions for these students to further explain the research findings (Teddie & Tashakkori, 2009). Thus, current research was applied in two phases. In the following sections, each phase is presented separately.

### Phase I

After obtaining research approval from the Human Subjects Committee to distribute the Survey of Gifted Students' Needs, I walked-into the honors program to obtained permission to use honors students as subjects. Then, the Honors Program recruited participants who were from STEM majors and active in honors classes during the spring 2019 semester. The participants then were contacted by e-mail to notify them that they had been identified as part of a select group of gifted students and their help was needed for a research study (see appendix A). The e-mail contained complete instructions for accessing the online survey and a survey consent form

(see Appendix B for the survey consent form). Two reminder e-mails were sent to encourage completion and improve the response rate. The timing of emails and reminders was purposeful to increase total response rate. The following steps were used for survey distribution: E-mail was sent with instructions and link to web-based survey, first reminder e-mail was sent, second reminder e-mailed one week later, and the survey was closed after a three-week period.

Data then was analyzed to examine the extent that the honors program is addressing gifted students' needs. Data collected form the survey was analyzed using SPSS 23 version. Analysis of variance (ANOVA Repeated Measures) was used to compare the survey items through descriptive statistics. Simple correlation was applied to look at the relationships between the three identified needs (academically challenging needs, creative-productive needs, and social and emotional needs). Based on survey responses, participants were selected as groups for interviews. More information about selecting interview groups can be found in Methodology chapter.

**Phase II**

Interview participants were selected and interview questions were created based on the information obtained from phase I regarding students' experience in the honors program. More information about the criteria used to select the participants can be found in the findings chapter. To conduct the interviews, at the first time, emails were sent through the Honors Program society to selected student for an invitation interview, following with two reminders. Only five students agreed to participate in to interview. All interviewees that had been chosen were out of town during summer 2019 thus the interviews were conducted over the phone during the period from June 13th till July 27th. Then a new group was formed for another interview invitation. On August 5th, emails were sent through the Honors Program for another interview invitation. A

second reminder was sent the week after. Before the end of August, four students were interviewed on the second interview round. A total of nine students were interviewed to learn their perceptions about how their academic and affective needs were addressed in the honors program? (see appendix C for interview consent form).

Semi-structured interviews were conducted with each student. Rapport may develop more easily with a semi-structured interview compared to a structured interview. Participants were asked to describe their experiences with addressing their needs in the honors program. Additionally, participants were asked to provide more details and examples about their experiences. The interviews then were analyzed to derive themes and triangulate data. Subsequently, these data were used to discover various patterns including whether the program meets gifted students' needs and is developing holistic thinking of students in the honors program.

## Conclusion

The methodology chapter described and presented (a) research questions, (b) research design, (c) researcher positionality, (d) population and sample, (e) institutional context, (f) and research instruments. The latter included: strategies for establishing validity, reliability for quantitative research and strategies for establishing trustworthiness for qualitative and quantitative data analyses. Finally, data collection and analysis for the study were discussed.

# CHAPTER 4

# FINDINGS

In this chapter, I present the findings of the data analyses in response to the research questions. First, I provide description for both quantitative and qualitative phase participants. Then, the findings section is organized by the following research questions:

1. Are there statistical differences in participating gifted and talented STEM students' opinion of the Honors College addressing their academically challenging needs, creative-productive needs, and social-emotional needs?
2. What are the relationships among the three categories: academic challenging, creative-productive, and social-emotional needs? What are the participating gifted and talented STEM students' understanding of each category?
3. To what extent do participating gifted and talented STEM students perceive the honors program as addressing their needs and developing their holistic thinking?

## Description of Quantitative Phase Participants

The goal of the quantitative phase was to examine which domains of academically challenging needs, creative-productive needs, and social-emotional needs do participants perceive as being addressed in the Honors Program. Quantitative data was collected via the Survey of Gifted Students' Needs. The core survey items were rated on a five-point scale: *(1) Not at all, (2) At times, (3) Regularly, (4) Very often beyond all my expectations, and, (5) N/A*. The survey's 33 items reflected the following three composite categories: academically challenging needs (11 items), creative-productive needs (10 items), and social-emotional needs (12 items) (see appendix E). Participants responded to each item by rating their opinion to which they felt honors classes addressed their needs.

Criteria used in participant selection for the quantitative phase included the following: STEM students who were active in the Honors Program during the spring 2019 semester. In addition, they had to be (1) enrolled in the Honors Program during the time period from the spring 2015 semester to the spring 2019 semester; and (2) met the admission criteria for Honors Program eligibility. A total of 274 students met these criteria. Students were from four programs: Science, Technology, Engineering, and Math. Descriptive statistics on participant demographic information is presented in Table 4.1.

*Table 4.1: Frequencies and Percentages of Participant Demographic Information*

| Variable | Category | Scale | Survey N = 83 | % |
|---|---|---|---|---|
| Gender | Male | 1 | 36 | 43.37% |
| | Female | 2 | 47 | 56.62% |
| Race/Ethnicity | African | 1 | 2 | 2.40% |
| | American | 2 | 69 | 83.13% |
| | White | 3 | 3 | 3.6% |
| | Asian | 4 | 5 | 6.02% |
| | Latinx | 5 | 4 | 4.81% |
| | Two or more | | | |
| Student Classification Year | Freshman | 1 | 22 | 26.50% |
| | Sophomore | 2 | 19 | 22.89% |
| | Junior | 3 | 26 | 31.32% |
| | Senior | 4 | 16 | 19.27% |
| University Major | Science | 1 | 63 | 75.90% |
| | Technology | 2 | 2 | 2.40% |
| | Engineering | 4 | 18 | 21.68% |
| | Math | 5 | 0 | 0 |
| First Year of Participation in the Honors Program | 2015 | 1 | 10 | 12.04% |
| | 2016 | 2 | 21 | 25.30% |
| | 2017 | 3 | 21 | 25.30% |
| | 2018 | 4 | 28 | 33.73% |
| | 2019 | 5 | 3 | 3.61% |
| Has Conducted Research | Yes | 1 | 44 | 53.01% |
| | No | 2 | 39 | 46.98% |
| Pell Grant Recipient | Yes | 1 | 18 | 21.68% |
| | No | 2 | 65 | 78.31% |

The online survey was emailed to all students by the Honors Program on April 24th after receiving permission from the Honors Program director. The survey was closed on May 16th.

Overall, 120 participants responded to the survey by answering a couple of questions but not all of them. Only 83 responded to all items. This constituted a response rate of 30.29%. additionally, no students responded from the Math major.

An examination of student demographic information (Table 4.1) reveals that the gender of participants was not evenly divided: 56.62% were female and 43.37%were male. Furthermore, the vast majority of the participants were White (83.13%) and science majors (75.90%). However, there were varying responses among the following demographic information: Student Classification Year, First Year of Participation in the Honors Program, Has Conducted Research, and Pell Grant Recipient.

**Description of Qualitative Phase Participants**

The goal of the qualitative data was to gather detailed views from participants to help explain the initial results from the quantitative data. The qualitative data was collected using semi-structured interviews. The analysis of phase 1, the quantitative findings, was used to help select an interview samples and develop interview questions for phase 2, the qualitative portion of the study.

The sample of the accessible population of honors program students assured that selection of interview participants was not biased. A purposive sample of students were selected based on their experience in the Honors Program as the following four steps; first, all survey responses were organized into three tables based on students' responses on all three categories (Academic challenging needs, creative productive needs, and social emotional needs). Second, each table was rated from low (0) to high (4). Third, a new table was formed to include students who had a positive experience in all needs areas (average >3.59), students who had moderate experience that includes low experience in one or two categories (average<1.99 in one or two),

and students who had poor experience in all three needs areas (average <1.99). Fourth, a sample of students were chosen from each group as follows; 20.45% from the positive experience group, 66.26% from the moderate group, and 13.25% from the poor experience group. Table 4.2 highlights the descriptive analysis of each group.

*Table 4.2: Participants Groups based on their Experience*

| Groups | Gender | Race | Classification | Major | Year starting | Research conducted | Pell grant |
|---|---|---|---|---|---|---|---|
| Positive experience | 7 Male<br>10 Female | 2 African/A<br>13 White<br>1 Asian<br>1 Latinx | 4 Freshman<br>4 Sophomore<br>3 Junior<br>6 Senior | 13 Science<br>2 Tech<br>2 Engineer | 3 2015<br>3 2016<br>6 2017<br>4 2018<br>1 2019 | 12 Yes<br>5 No | 2 Yes<br>15 No |
| Moderate experience | 25 Male<br>30 Female | 46 White<br>2 Asian<br>3 Latinx<br>4 T&M | 14 Freshman<br>11 Sophomore<br>22 Junior<br>8 Senior | 42 Science<br>13 Engineer | 7 2015<br>17 2016<br>13 2017<br>18 2018 | 31 Yes<br>24 No | 14 Yes<br>41 No |
| Poor experience | 4 Male<br>7 Female | 10 White<br>1 Latinx | 4 Freshman<br>4 Sophomore<br>1 Junior<br>2 Senior | 8 Science<br>3 Engineer | 1 2016<br>2 2017<br>6 2018<br>2 2019 | 1 Yes<br>10 No | 2 Yes<br>9 No |
| Total= 83 students | 36 Male<br>47 Female | 2 African/A<br>69 White<br>3 Asian<br>5 Latinx<br>4 T&M | 22 Freshman<br>19 Sophomore<br>26 Junior<br>16 Senior | 63 Science<br>2 Tech<br>18 Engineer | 10 2015<br>21 2016<br>21 2017<br>28 2018<br>3 2019 | 44 Yes<br>39 No | 18 Yes<br>65 No |

*Note.* Positive experience total students =17, (17/83*100= 20.45%); Moderate experience total students =55, (55/83*100=66.26%); and Poor experience total students =11, (11/83*100=13.25%).

I ended up with a sample constituted of two students who had positive experience in all categories, two students who had poor experience in all categories, and five students who had moderate experience (had low experience in one or two category). Using these four steps helped

to ensure various experience among participants who had expressed in phase their opinion about the honors program addressing their needs in Phase 1. Additionally, all selected participants agreed to take part in the study and gave permission for interviews to be recorded. Phone interviews were conducted to answer the research questions.

Second, since interview participant was selected based on specific criteria, interviews questions were varied depending on students' responses on the survey. Interview questions were mainly about five points; overall experience, definition of three survey three categories, details and examples, significance, relationships among items. However, some questions were aimed at all groups while other questions were specific for each group based on their experiences. Interview questions were open-ended, allowing participants to present their opinion. The interview was comprised of five questions. Some were direct (e.g., "What academic needs means to you?''), whereas others were designed to capture a wider range of opinion (e.g. ''To what extent have those opportunities been important in your education?''). (see appendix F)

A total of nine students were interviewed for the current study. All interview participants demographic information is summarized in Table 4.3 (names are pseudonyms).

*Table 4.3: The Demographic Information of the Interview Sample*

| Experience | Participants | Gender | Race | Classification | Major | Year starting | Research conducted | Pell grant |
|---|---|---|---|---|---|---|---|---|
| Positive | Noah | Male | Asian | Freshman | Engineer | 2018 | Yes | No |
| experience | Emily | Female | White | Junior | Science | 2016 | Yes | No |
| | Simon | Male | Latin | Freshman | Science | 2018 | No | Yes |
| Moderate | John | Male | White | Junior | Engineer | 2017 | No | No |
| experience | Ethan | Male | Latin | Freshman | Science | 2018 | No | Yes |
| | Anna | Female | More | Junior | Science | 2016 | Yes | Yes |
| | Wan | Male | White | Senior | Science | 2015 | Yes | No |
| Poor | Cody | Male | White | Freshman | Engineer | 2018 | No | Yes |
| experience | Ivan | Male | White | Senior | Science | 2016 | No | No |

## Findings

**Q1. Are there statistical differences in participating gifted and talented STEM students' opinion of the Honors College addressing their academically challenging needs, creative-productive needs, and social-emotional needs?**

The survey had one group, STEM students in the Honors Program, who responded to a survey of three different categories or variables: Academically Challenging, Creative-Productive, and Social-Emotional. As a result, ANOVA Repeated Measures was used to compute one group into three variables. The assumptions associated with ANOVA Repeated Measures were also checked. One of the assumptions is that independent variables (also known as the within subject factors) should consist of related groups. Related group indicates that the same subjects are present in all groups (Gliner, Morgan, & Leech, 2009). For this study, there were related groups, each subject had been measured on each of the survey category.

A General Linear Model statistical procedure was used to analyze the survey data.

When the mean of all three categories were compared using ANOVA Repeated Measures, the results showed no difference between the mean of three groups; $P > 0.05$. The Mauchly's Test of Sphericity was not violated; $X^2$ (2) = 5.555, P= 0.062. Table 4.4 presents the total frequencies and means on each scale of the three categories.

*Table 4.4: Total Frequencies and Means of Student Responses to each Survey Category*

| Needs Category | Not at All | At Times | Regularly | Very Often | Mean | Standard Deviation |
|---|---|---|---|---|---|---|
| Academically Challenging | 40 | 218 | 442 | 178 | 2.59 | .820 |
| Creative-Productive | 51 | 282 | 337 | 156 | 2.70 | .624 |
| Social-Emotional | 124 | 293 | 360 | 209 | 2.58 | .716 |

Since the mean of all three groups are the same, the mean and the frequency of each of

the four survey scales' counts helped analyze the participants' answers to each item. For this study, I counted a rating of 5 as zero.

The total frequencies and means of the survey scale items show that most of the participants were on the scale from 2 to 3 when rating how they felt that the Honors Program addressed their needs. The data reflects that at times and regularly throughout their program, their academic challenging needs were met with mean of 2.59 and standard deviation of 0.82; their creative-productive needs were met with mean of 2.70 and standard deviation of 0.624; and, their social-emotional needs were met with mean of 2.58 and standard deviation of 0.716.

The following tables show the frequencies of each category on the survey to provide a better understanding of survey items.

*Table 4.5: Frequencies and Percentage of Student Responses on Academic Challenging Needs Category*

| | Not at All | At Times | Regularly | Very Often |
|---|---|---|---|---|
| Make judgments about the value of information, arguments, and methods | 1 | 18 | 53 | 9 |
| Analyze basic elements of ideas, experiences, and theories | 0 | 9 | 55 | 17 |
| Engage in complex, open-ended discussion and writing | 0 | 11 | 40 | 28 |
| Solve complex world problems | 15 | 29 | 26 | 6 |
| Work effectively with others | 2 | 22 | 37 | 19 |
| Learn effectively on my own | 1 | 11 | 46 | 21 |
| Select and organize evidence to support critical arguments | 3 | 20 | 40 | 17 |
| Find multiple solutions to the same problem | 1 | 35 | 31 | 13 |
| Link apparently unconnected elements to create a new understanding | 6 | 18 | 39 | 18 |
| Visualize complex problems to understand relationships and devise solutions | 8 | 24 | 35 | 14 |
| Synthesize complex information | 3 | 21 | 40 | 16 |
| Totals | 40 | 218 | 442 | 178 |
| Percentage of Total | 3.6% | 19.8% | 40% | 16% |

According to Tables 4.5, 4.6, and 4.7, responses to items 1, 2, and 6 in the academically challenging needs category had a high frequencies rating of 3 (Regularly) on the scale: 53, 55, 46, respectfully, well above the 40% average response rate for that scale rating for the first

category. Items 4 and 7 in the creative-productive needs category also had high frequencies rating of 3 on the scale: 40 and 38, respectively. Additionally, items 3, 9, and 11 in the social-emotional needs category had high frequencies rating of 3 on the scale; 38 for each.

*Table 4.6: Frequencies and Percentage of Student Responses on Creative Productive Needs Category*

| | Not at all | At times | Regularly | Very often |
|---|---|---|---|---|
| Research the subject matter beyond assigned texts | 3 | 24 | 35 | 21 |
| Test complex issues in the sciences and arts | 12 | 31 | 27 | 12 |
| Answer open-ended questions with "6 Ws" (Why, What, Where, Who, When and How) | 7 | 25 | 36 | 15 |
| Participate in activities that are aligned with my interests | 2 | 27 | 40 | 14 |
| Participate in activities that are full of imagination | 4 | 27 | 32 | 20 |
| Develop artistic sensibility through class activities | 13 | 27 | 32 | 10 |
| Have adequate time for in-depth thinking | 0 | 27 | 38 | 18 |
| Examine the strength of my own views | 3 | 25 | 34 | 21 |
| Share narrative stories that share my experience with my classmates | 6 | 33 | 31 | 11 |
| Produce divergent solutions not only a single answer to the problem | 1 | 36 | 32 | 14 |
| Totals | 51 | 282 | 337 | 156 |
| Percentage of Total | 5.1% | 28% | 33.7% | 15% |

*Table 4.7: Frequencies and Percentage of Student Responses on Social Emotional Needs Category*

| | Not at all | At times | Regularly | Very often |
|---|---|---|---|---|
| Understand my own and others' feelings | 5 | 31 | 29 | 18 |
| Respond to the needs of others | 7 | 26 | 35 | 15 |
| Volunteer on campus and in the community | 0 | 10 | 38 | 35 |
| Participate in social activities such as field trips | 16 | 32 | 24 | 11 |
| Get involved in fun and joyful activities | 7 | 24 | 32 | 20 |
| Utilize electronic games to solve content-related problems | 46 | 19 | 6 | 4 |
| Take part in physical activities | 25 | 33 | 20 | 5 |
| Discuss the obstacles that are standing in my way with classmates and faculty | 10 | 36 | 28 | 7 |
| Interact with faculty and staff members | 0 | 19 | 38 | 26 |
| Participate in cooperative learning environments inside and outside of class | 5 | 21 | 36 | 21 |
| Take part in mindful conversations with classmates | 2 | 19 | 38 | 24 |
| Change my first perceptions or assumptions with time | 1 | 23 | 36 | 23 |
| Total | 124 | 293 | 360 | 209 |
| Percentage of Total | 10.3% | 24.4% | 30% | 17% |

**Q2. What are the relationships among the three categories: academic challenging, creative-productive, and social-emotional needs? What are the participating gifted and talented STEM students' understanding of each category?**

***The Relationships among Survey Items***

To see the relationships between survey items as they relate to addressing gifted students' needs, all 33 items were factor analyzed using principle component analysis with Promax (oblique) rotation. The analysis yielded six factors explaining a total of 68.383% of the variance for the entire set of variables. Tables 4.8 and 4.9 show the factor analysis of the survey items.

Factor 1, labeled academic challenging skills, addressed gifted students needs due to the high loadings of the following survey items: make judgments about the value of information, arguments, and methods; analyze basic elements of ideas, experiences, and theories; engage in complex open-ended discussion and writing; solve complex world problems; work effectively with others; learn effectively on my own; select and organize evidence to support critical arguments; find multiple solutions to the same problem; link apparently unconnected elements to create a new understanding; visualize complex problems to understand relationships and devise solutions; and, synthesize complex information. This first factor explained 40.364% of the variance.

Factor 2, labeled creative productive skills and meaning sense, reflected high loadings of the following items: research the subject matter beyond assigned texts; test complex issues in the sciences and arts; participate in activities that are aligned with my interests; have adequate time for in-depth thinking; and, change my first perceptions or assumptions with time and new knowledge. This factor explained 48.361% of the variance.

*Table 4.8: Factor 1-3 Analysis for Survey Items Addressing Gifted Students Needs*

| | Loadings |
|---|---|
| **Factor (1) Academic challenging skills** | |
| Make judgments about the value of information, arguments, and methods | .873 |
| Analyze basic elements of ideas, experiences, and theories | .914 |
| Engage in complex open-ended discussion and writing | .815 |
| Solve complex world problems | .681 |
| Work effectively with others | .632 |
| Learn effectively on my own | .736 |
| Select and organize evidence to support critical arguments | .824 |
| Find multiple solutions to the same problem | .735 |
| Link apparently unconnected elements to create a new understanding | .732 |
| Visualize complex problems to understand relationships and devise solutions | .761 |
| Synthesize complex information | .750 |
| % of Variance 40.364% | |
| Cumulative % 40.364% | |
| **Factor (2) Creative productive skills and meaning sense** | |
| Research the subject matter beyond assigned texts | .736 |
| Test complex issues in the sciences and arts | .625 |
| Participate in activities that are aligned with my interests | .753 |
| Have adequate time for in-depth thinking | .473 |
| Change my first perceptions or assumptions with time and new knowledge | .751 |
| % of Variance 7.997% | |
| Cumulative % 48.361% | |
| **Factor (3) Social emotional skills** | |
| Volunteer on campus and in the community | .886 |
| Participate in social activities such as field trips | .951 |
| Get involved in fun and joyful activities | .835 |
| Participate in cooperative learning environments inside and outside of class | .484 |
| % of Variance 6.755% | |
| Cumulative % 55.116% | |

Factor 3, labeled social emotional skills, reflected high loading of the following items: volunteer on campus and in the community; participate in social activities such as field trips; get involved in fun and joyful activities; and, participate in cooperative learning environments inside and outside of class. This factor explained 55.116% of the variance.

Factor 4, labeled mixed skills, presented high loadings on the following items: answer open-ended questions with “6 Ws” (Why, What, Where, Who, When and How); examine the strength of my own views; understand my own and others’ feelings; respond to the needs of others; discuss the obstacles that are standing in my way with classmates and faculty; interact

with faculty and staff members; and, take part in mindful conversations with classmates. This factor explained 60.373% of the variance.

*Table 4.9: Factor 4-6 Analysis for Survey Items Addressing Gifted Students Needs*

| | Loadings |
|---|---|
| **Factor (4) Mixed skills** | |
| Answer open-ended questions with "6 Ws" (Why, What, Where, Who, When and How) | .762 |
| Examine the strength of my own views | .341 |
| Understand my own and others' feelings | .584 |
| Respond to the needs of others | .687 |
| Discuss the obstacles that are standing in my way with classmates and faculty | .724 |
| Interact with faculty and staff members | .362 |
| Take part in mindful conversations with classmates | .317 |
| % of Variance 5.257% | |
| Cumulative % 60.373% | |
| **Factor (5) Creative productive skills** | |
| Participate in activities that are full of imagination | .724 |
| Develop artistic sensibility through class activities | .778 |
| Share narrative stories that share my experience with my classmates | .792 |
| Produce divergent solutions not only a single answer to the problem | .486 |
| % of Variance 4.465% | |
| Cumulative % 64.838% | |
| **Factor (6) Play sense** | |
| Utilize electronic games to solve content-related problems | .846 |
| Take part in physical activities | .532 |
| % of Variance 3.545% | |
| Cumulative % 68.383% | |

Factor 5, labeled creative productive skills, presented high loadings on the following survey items: participate in activities that are full of imagination; develop artistic sensibility through class activities; share narrative stories that share my experience with my classmates; and, produce divergent solutions not only a single answer to the problem. This factor explained 64.838% of the variance.

Factor 6, labeled play sense, reported high loadings on the following items: utilize electronic games to solve content-related problems; and, take part in physical activities. This factor explained 68.383% of the variance.

According to Tables 4.8 and 4.9, academic challenging skills identified items solely from

the academically challenging needs category for a total of 11 items. Items 3 and 4 were cognitive skills; items 5 to 9 were critical skills; and items 10 to 13 were symphony sense. Creative productive skills and meaning sense presented four items from creative-productive needs and one item from social-emotional needs. These included items 14 and 15 regarding creative skills, items 17 and 20 on design sense, and item 35 on meaning sense. Social emotional skills presented only four social-emotional needs items including items 26 and 27 on empathy sense, item 28 regarding play sense, and item 33 on meaning sense. Mixed skills presented two creative-productive needs items and five social-emotional needs items including item 16 on creative skills, item 21 on story sense, items 24 and 25 regarding empathy sense, and items 31, 32, and 34 on meaning sense. Creative productive skills presented four creative-productive needs items with item 18 on design sense, and items 19, 22, and 23 as story sense. Play sense presented two social-emotional needs items including items 29 and 30 on play sense. Additionally, Pearson r correlations were calculated to check the strength of the relationships among the survey items. Table 4.10 shows the correlation between those six factors.

*Table 4.10: Component Correlation Matrix*

| Component | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| A | 1.000 | | | | | |
| B | 0.438 | 1.000 | | | | |
| C | 0.478 | 0.391 | 1.000 | | | |
| D | 0.504 | 0.510 | 0.525 | 1.000 | | |
| E | 0.456 | 0.316 | 0.275 | 0.377 | 1.000 | |
| F | 0.059 | 0.122 | 0.014 | -0.007 | -0.059 | 1.000 |

*Note*. Pearson r, correlations (r ranged between -1 to +1), Low correlation (0 - ±0.29), moderate correlation (±0.3 - ±0.49), high correlation (±0.5 - ±1).

Table 4.10 shows three high positive correlations emerged among mixed skills with academic challenging skills (r=0.504), creative productive skills and meaning sense (r=0.510),

and social emotional skills (r=0.525). This finding revealed that mixed skills, which presented creative skills as well as story, empathy, and meaning sense, was a significant indicator in explaining students' rating for the other items in the academically challenging, creative-productive, and social-emotional needs categories.

Additionally, there were six moderate correlations among the survey items. First, academic challenging skills had moderate positive correlation with three factors: creative productive skills and meaning sense (r=0.438), creative productive skills (r=0.478), and social emotional skills (r=0.456). This finding indicated that academic needs do not always predict creative and social needs. Second, creative productive skills and meaning sense had moderate positive correlations with two factors: social emotional skills (r=0.391) and creative productive skills (r=0.316). Third, mixed skills had moderate positive correlation with creative productive skills (r=0.377).

Finally, there were six low correlations among the survey items. Four were positive and two were negative. The first low positive correlation (r=0.275) appeared between social emotional skills and creative productive skills. This indicated there was low correlation between social needs (on the items related to empathy, play and meaning sense) and creative needs (on the items related to design and story sense). The remaining three low positive correlations appeared between play sense and academic challenging skills (r=0.059), creative productive skills and meaning sense (r=0.122), and social emotional skills (r=0.014). The two low negative correlations appeared between play sense and mixed skills (r=-0.007) and creative productive skills (r=-0.059).

Items with loadings 0.6 or higher were maintained. For instance, academic challenging skills had loadings higher than 0.6 in all items which explained 40.364% of the variance. This

finding was consistent with the interviews. During the interviews, the participants were asked about the kind of academic opportunities they had in the Honors Program. The most common responses were related to having experiences in practicing critical and creative skills in honors classes. Ethan for example, said, “The strongest thing about honors programs is to be creative, being able to go very deep, deep into like serious matter.” Additionally, play sense factor were maintained .846 and .532 loadings respectfully on items: Utilize electronic games to solve content-related problems; and Take part in physical activities. These items explained 3.545% of variance. Those items had high responses on the “not at all” scale respectfully 46 and 26. This finding was consistent with the qualitative data. The majority of interview participants reported that the Honors Program did not meet their needs regarding the use of technology to solve content-related problems.

***Participants’ Understanding of Survey Categories***

In order to know more about participants’ understanding of the three survey categories (academically challenging, creative-productive, and social-emotional needs) students were asked during their interviews about what they understood their meaning to be. Students provided a variety of meanings in their responses. The following paragraphs present the meaning of each category from the perspective of the participants.

**Academically Challenging Needs.** Some participants connected academically challenging needs to the ways that they themselves or their classes challenged them. John personalized the challenges and said it’s “the sort of challenges that I set for myself.” Simon viewed these challenges as being part of the classroom setting; he noted it’s “where you struggle but at the same time it's doable. Really, really strengthen your brain”.

Other participants viewed academically challenging needs from an educational

perspective. Emily stated it "involves an understanding of concepts and being able to work with those concepts and apply them in new and innovative ways… learning how to better explain and evaluate and expand on arguments in whatever field." Anna said, "Academically challenging needs are resources to assist you with educational promoted." As reflected in the literature, Long and Davis (2017) and Shavinina (2009) pointed out that academic needs include the skills of questioning, reflection, and self-discovery through learning tasks. Other participants believed that academic needs were connected to one's major. Wan said it meant "being able to make connections within…your major" and "learn information…that is important to me".

Finally, Noah had a different view. Noah saw academically challenging needs in terms of acquiring knowledge and skills for the future. He said it's about getting the information and skills that he will need to advance to a job that will financially put him "in the best shape." Noah made connections between his academic needs and future success. Hafsyan (2015) found that participation in an honors program had positive effects on both career and educational aspirations.

**Creative-Productive Needs.** Three of the participants defined creative-productive needs as the ability to look at a problem from the outside. Noah said it is "using creativity to see the box from the outside and inside…in order to find a solution to a problem." Anna said it's "going outside of the scientific box." Ethan said that it was going "outside your comfort zone".

Two other participants had the same comments as to the meaning of creative-productive needs. Emily said, "it is the ability to find new ways of looking at something." Wan understood it to be the ability to use "existing information to create new information, especially in research." Emily's and Wan's comments are consistent with the literature. Hong, Greene and Hartzell (2011) stated that creativity is the ability to produce new and divergent solutions to problems.

Furthermore, Simon and John shared similar thoughts on the other/newness of creativity. They thought creativity meant doing activities that were “out of your major” (Simon); or “beyond what's discussed in class” (John).

Finally, Ivan had a unique thought. He defined creativity as “using my own devices to form an original thought or idea without guidelines, without like strict guidelines, and being able to tap into unused or undeveloped sides”.

**Social-Emotional Needs.** Two participants defined social-emotional needs as understanding other people. Noah said it “means you're able to understand the world around you, that there are other people in the world, and you need to understand how your emotions impact this.” Ethan said, “it is about being open minded and able to put yourself in other people's position whenever it comes to an issue”.

Two other participants shared similar perspectives. Simon said social-emotional needs are the ability to “go outside the classroom to like collaborate and talk with students and other faculty members.” Emily understood these needs “as the ability to connect myself and other people in whatever area we're studying and looking at the way the things that we're talking about or thinking about affect people in a broad manner.” The literature confirms the positive effect of an honors program on successful community building (Brinkel, Rees, Ruis & Sloots, 2015).

Three other participants saw social needs from different angles. Anna stated that working with friends is as mental health and it is important to maintain a social life. Wan highlighted services for these needs and said he felt “the best way is just like having events on campus, counseling for instance…the health center for counseling and stuff like that.” John identified fellowship as a social-emotional need citing “organizations and whatnot that are within my major department”.

**Q3. To what extent do participating gifted and talented STEM students perceive the honors program as addressing their needs and developing their holistic thinking?**

Data from the survey and interviews were analyzed and integrated to answer the third question. As I mentioned above, survey items were rated on a Likert scale. Frequencies and mean ratings for each survey category were used. Additionally, a summary of demographic characteristics of participants is provided.

To further explain the quantitative data collected, participants were formed into three groups (positive, moderate, and poor) based on their experience with the Honors Program. Interview questions varied based on each group. Interview questions were analyzed to provide additional information regarding students' perceptions about addressing their needs in Honors Program. The triangulation of the quantitative and qualitative data provided an in-depth analysis of the findings and assured that multiple perspectives were analyzed. In fact, the findings provided an interesting perspective on how the Honors Program addresses students' needs in the three domains: Academically challenging, Creative-productive, and Social-emotional needs. Participants' perceptions of addressing their needs are tightly related to their overall experience in the Honors Program. Participants' perspectives on the three domains cannot be separated from their overall experience, and there is significant overlap between them. In the following sections, I discuss participants' overall experience in the Honors Program followed by details and examples of Honors Program opportunities on addressing students' needs on each domain.

***Students' Overall Experience in Honors Program***

As stated above, interview participants consisted of 9 students as follows: two students presented positive experience, five students presented moderate experience, and two students presented poor experience. To have a better understanding of students' experience in the Honors

Program and to explain how effectively students' needs are addressed in the program, Tables 4.11, 4.12, and 4.13 show the interview participants' responses on the survey on each category.

*Table 4.11: Interview Participants Responses on the Academic Challenging Needs Category*

| | Positive experience | | Moderate experience | | | | | Poor experience | |
|---|---|---|---|---|---|---|---|---|---|
| | Noah | Emily | Simon | John | Ethan | Anna | Wan | Cody | Ivan |
| | 4 | 3 | 3 | 2 | 2 | 3 | 2 | 1 | 2 |
| | 4 | 4 | 3 | 2 | 3 | 4 | 3 | 1 | 3 |
| | 4 | 4 | 3 | 3 | 2 | 4 | 4 | 1 | 2 |
| | 4 | 4 | 2 | 2 | 3 | 3 | 3 | 1 | 1 |
| | 4 | 3 | 3 | 3 | 1 | 2 | 2 | 1 | 2 |
| | 4 | 4 | 3 | 2 | 3 | 2 | 3 | 1 | 3 |
| | 4 | 3 | 3 | 2 | 3 | 2 | 4 | 1 | 2 |
| | 4 | 4 | 2 | 2 | 2 | 3 | 4 | 1 | 2 |
| | 4 | 4 | 3 | 2 | 3 | 4 | 3 | 1 | 1 |
| | 4 | 3 | 3 | 2 | 3 | 1 | 4 | 1 | 1 |
| | 4 | 4 | 3 | 2 | 4 | 4 | 3 | 1 | 1 |
| Average/ participant | 4 | 3.63 | 2.81 | 2.18 | 2.63 | 2.90 | 3.18 | 1 | 1.81 |
| Average/ group | 3.815 | | | | 2.74 | | | 1.40 | |

*Table 4.12: Interview Participants Responses on the Creative Productive Needs Category*

| | Positive experience | | Moderate experience | | | | | Poor experience | |
|---|---|---|---|---|---|---|---|---|---|
| | Noah | Emily | Simon | John | Ethan | Anna | Wan | Cody | Ivan |
| | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 1 | 2 |
| | 4 | 3 | 2 | 2 | 3 | 4 | 2 | 1 | 1 |
| | 4 | 2 | 2 | 2 | 3 | 2 | 3 | 1 | 1 |
| | 4 | 4 | 4 | 3 | 2 | 4 | 2 | 1 | 2 |
| | 4 | 4 | 4 | 2 | 3 | 4 | 2 | 1 | 1 |
| | 4 | 4 | 3 | 2 | 1 | 4 | 1 | 1 | 2 |
| | 4 | 4 | 3 | 2 | 3 | 4 | 3 | 1 | 2 |
| | 4 | 4 | 2 | 3 | 3 | 3 | 3 | 1 | 2 |
| | 4 | 4 | 2 | 2 | 1 | 3 | 1 | 1 | 2 |
| | 4 | 4 | 4 | 3 | 2 | 4 | 3 | 1 | 2 |
| Average/ participant | 4 | 3.6 | 2.9 | 2.4 | 2.5 | 3.6 | 2.3 | 1 | 1.7 |
| Average/ group | 3.8 | | | | 2.74 | | | 1.35 | |

*Table 4.13: Interview Participants Responses on the Social Emotional Needs Category*

| | Positive experience | | Moderate experience | | | | | Poor experience | |
|---|---|---|---|---|---|---|---|---|---|
| | Noah | Emily | Simon | John | Ethan | Anna | Wan | Cody | Ivan |
| | 4 | 4 | 3 | 2 | 3 | 2 | 4 | 1 | 2 |
| | 4 | 4 | 2 | 2 | 3 | 1 | 4 | 1 | 2 |
| | 1 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 2 |
| | 1 | 3 | 1 | 2 | 3 | 3 | 3 | 1 | 1 |
| | 2 | 4 | 1 | 2 | 3 | 4 | 3 | 1 | 1 |
| | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| | 1 | 3 | 1 | 2 | 3 | 3 | 2 | 1 | 1 |
| | 4 | 3 | 2 | 1 | 3 | 1 | 3 | 1 | 1 |
| | 4 | 4 | 2 | 2 | 3 | 4 | 3 | 2 | 3 |
| | 4 | 4 | 1 | 2 | 3 | 3 | 4 | 1 | 2 |
| | 4 | 4 | 2 | 3 | 3 | 4 | 4 | 1 | 2 |
| | 4 | 4 | 2 | 2 | 3 | 4 | 3 | 1 | 2 |
| Average/ participant | 2.83 | 3.41 | 1.75 | 2 | 3 | 2.75 | 3.16 | 1.25 | 1.66 |
| Average/ group | 3.121 | | | | 2.532 | | | 1.455 | |

In order to confirm and enrich the quantitative data related to students' opinions with addressing their needs in the Honors Programs, the participants were asked, during the interviews, to summarize their overall experience with addressing their needs. Around 80% of the participants (n=7) agreed that the Honors program addressed their needs and around 20% of the participants disagreed (n=2) and believed that the program opportunities did not meet their needs.

Five students from the agreed group and one student from disagreed group showed consistence with their responses on the survey and interviews. While the other students from the disagreed group and two students from the agreed group showed inconsistencies. Their interviews responses did not reflect their responses on the survey. Cody, Simon, and Anna showed conflict between the two collection modes of survey and interview. Cody whose survey indicated poor interest with the program, presented different perspectives on his experiences with the Honors Program. Cody reported low averages: 1, 1, and 1.25 respectively for academically challenging, creative-productive, and social-emotional needs; yet he replied that "Honors

Program was a big, a big plus." This statement does not reflect his responses on the survey.

Also, Simon, whose survey indicated moderate interest with the program indicated different opinions. Simon, reporting an average of 2.81, 2.9, and 1.75 respectively for academically challenging, creative-productive, and social-emotional needs, found the Honors Program ability to "spread word about special events" helpful. Simon's words do not reflect his overall satisfaction about the social-emotional needs category.

Finally, Anna, reporting an average of 2.9, 3.6, and 2.75 respectively for academically challenging, creative-productive, and social-emotional needs, said, "Regarding my academic and social needs, I do not meet my expectations with the Honors Program".

Five students who agreed that the Honors Program addressed their needs showed consistency between the survey and interviews. Two students indicated positive experience ratings. Noah, reporting an average of 4, 4, and 2.83 respectively for academically challenging, creative-productive, and social-emotional needs, said, "In the Honors Program I am being challenged to become better aware in order to experience different needs and feel good in real life applications." Emily, reporting an average of 3.63, 3.6, and 3.41 respectively for academically challenging, creative-productive, and social-emotional needs, asserted her interest with the Honors Program, and said that a large part of her interest was "contributed by the professors" who "had been essential to it being a good and positive experience." Another three participants from the moderate experience group indicated moderate interest with the program. Ethan, Wan, and John reported their interest with Honors program social opportunities. Ethan, reporting an average of 2.63, 2.5, and 3 respectively for academically challenging, creative-productive, and social-emotional needs, appreciated mentorship, stating how "great" it was to "meet each semester with your mentor." Wan, reporting an average of 3.18, 2.3, and 3.16

respectively for academically challenging, creative-productive, and social-emotional needs, said of the faculty, “they encourage people to get involved” and that the “main goals” of the Honors Program were “to become better leaders, get more involved.” John, reporting an average of 2.18, 2.4, and 2 respectively for academically challenging, creative-productive, and social-emotional needs, appreciated that the Honors Program helps him in several ways. He explained, “I am very pleased with the honors program, because I mean, I was a transfer student coming into the campus. So automatically. I was very unfamiliar with the campus and I didn't really have that data. I was a little lost at that time, so they really helped me show a lot of encouragement and even direct me to different opportunities.” John continued,

> If I wasn't an Honors Program member, I think I would have not been successful. I think I could not have been involved on campus without them. It really helped me orient myself to make student connections and fellowship among, not only students that are in my major, but students that are within the honors program. And it's also given me an opportunity to connect with different faculty that, otherwise, I never would have ever come across. And it's also given me an opportunity to meet with a second advisor who, in some regards has my support.

He concluded “I personally am striving for a higher goal. I want to graduate with honors and have good, I guess, good college connections while I'm on campus, and to have worthwhile memories”.

Finally, the other student who disagreed about the Honors Program addressing his needs showed consistency between his interviews and overall averages on the survey. Ivan reported averages of 1.81, 1.7, and 1.66 respectively for academically challenging, creative-productive, and social-emotional needs. When he was asked about his experience, he replied that the

"Honors Program didn't offer something new".

In general participants presented that they had good experiences as they enjoyed honors classes. However, I noticed conflict in their responses. Thus, I continued with them to have more details about their perceptions and to understand how the program addresses their needs. The following section provides details and examples of students' experiences in the Honors Program.

### *Details and Examples*

To understand students' perceptions about how their academically challenging, creative-productive, and social-emotional needs are addressed by the Honors Program, the participants were asked to provide more details and examples of the kind of opportunities they had in the Honors Program. In the following sections, I present the study findings based on the three categories: Academic challenging needs, creative productive needs, and social emotional needs, and connect that to students' overall experience in the Honors Program.

**Academically Challenging Needs Category.** Quantitative data indicated that the majority of the participants reported having a lot of opportunities to develop academically challenging competencies. The students' response percentages were 16%, 40%, 19.8%, and 3.6% respectively on scales very often, regularly, at times, and not at all. Five items were composed from Moon's survey (2012). These items are as follows: make judgments about the value of information, arguments, and methods; analyze basic elements of ideas, experiences, and theories; select and organize evidence to support critical arguments; synthesize complex information; and learn effectively on my own. According to Moon (2012), all five items are loaded under the cognitive processing factor; and honors students reported higher means on these items than honors-eligible nonparticipants. The current study had similar findings for the students in the program. These items reported high frequencies (40-55) on the scale as the overall average

number of times “regularly” was selected in response to a survey item was (40%). This indicated more frequent development to cognitive skills. Further, these data indicate that Science majors experienced these opportunities more than their peers on this category. And it appears that these experiences increase throughout for White students versus the other races. This was expected as the majority of current research participants were White and science majors (See Table 4.1). The other demographic information such as Student Classification Year, First Year of Participation in the Honors Program, and Pell Grant Recipient, are varying among the interview groups. Thus, I had difficulty to connect students’ background to the research finding.

In order to know more about students’ experiences that fulfill their Academic needs, participants were asked to provide examples of academic opportunities they had in the Honors Program. The most common responses were summarized into three themes: going deep into topics to do project and research, thinking critically and creatively, and having deep classroom discussion. In the following sections, I concisely discuss each theme.

***Conducting Research Opportunities.*** When comparing the quantitative and qualitative data on this theme, it was evident that the results supported one another. For example, demographic information of interview participants showed that four of the participants who confirmed doing research also replied “yes” on the survey item related to conducting research. This finding showed that those who have opportunities to conduct research report positive experiences when developing academic skills. In fact, interview groups (moderate, and positive experience) confirmed having opportunities to conduct research with other students or faculty.

Noah (from the positive experience group reporting an average 4 on academically challenging needs category), for example, said “In honor class, you can take extra steps to learn more about subjects and do projects at the end, or do a small research project.” This statement -

and others including, “Honors program has truly given me an opportunity that not many places and classes do, being able to do research in the future through the honor assembly”- left clear evidence that the Honors Program addresses honors students’ academic needs. This finding reflects the quantitative data that was stated earlier.

Several other students (from the moderate experience group) also agreed that the Honors Program gives opportunity to its students to work with faculty across disciplines, pursuing research that seeks to make a difference in the world. Wan and Ethan, reporting an average of 3.18 and 2.63 respectively on the academically challenging needs category, said that they had good opportunities to go deep into research and write a thesis about the research topic. Ethan explained,

> I would say we have a weekly essay, […] and we'll have to do research based on what we know and go deep into it. Then we go to class and talk about what we found, to be able to, I guess, communicate with our peers, share our different thoughts. For our final projects, we really have to choose a topic, and go into depth about it, like. It can be a topic that we talked about during the semester, but we had to go deeper into.

Another participant provided an example of research that he had done in an Honors class. Simon, reporting an average of 2.81 on the academically challenging needs category, said, “In an honors course, the history of the secret language, we did get the opportunity to do research on how people created manuscripts. We ourselves created our own manuscript. I felt like that was really fun and I learned a lot and it really pushed me outside of what I am used to”.

From this finding, it was understood that in both positive and moderate experience students had a great chance to develop their academic skills and do projects or research. This

finding was consistent with finding from phase 1. The demographic information of interview participants in Table (4.3) shows that Noah and Wan had experience in conducting research.

Furthermore, one participant who had experience in conducting research recommended having more research type classes. Wan said,

> In my opinion, I think, I think every student should do some type of research to discuss something new. It could be like an existing stuff. Like, maybe like a small paper they can, you know, write. For example, I am a physics major sometimes I wish had more topics, like, maybe creative thinking in physics, like a general class or maybe, maybe more research topics such as world problems.

He continued stating, "I think the Honors Program should have maybe a variety of research classes, and my opinion because maybe like half of the topics, I don't like. Some of the subjects that wasn't focused or maybe the syllabus could have been more forward." Wan's view reflects the quantitative data for the academic challenging needs category. According to Table 4.5, solving complex world problems has low frequencies which is 6 on the very often versus 15 on not at all scale. That indicated that Honors Program did not offer variety of topics or classes such as discussing world problems.

***Thinking Critically and Creatively.*** The Next Generation Science Standards vision of science education for the 21st century connects STEM to the 4C's: collaboration, communication skills, creativity, and critical thinking. Thus, the new trend is to prepare STEM students to be proficient in these 4 Cs and to compete globally (NEA, 2010). I found similar practices in the Honors Program. In considering the goal of developing creativity and critical thinking, both the quantitative and qualitative findings agreed that the Honors Program encouraged students to be challenged and to think critically and creatively. As mentioned above, the five items composed

from Moon's survey (2012) reported high frequencies (40-55) selecting "regularly" on the scale, which indicated more frequent development to cognitive skills. Also, qualitative data supported this finding. Noah, who scored 4 out of 4 on those five items, expressed the importance of being challenged in Honors classrooms. He said, that it allowed him "to move in order to become better later on, be able to pursue a job in the future. Especially, being in STEM allows me to being able to not only do the problems and read textbook, but to be able to think critically".

Another participant from the moderate experience group elaborated on his perception about the opportunity of developing critical skills in the Honors Program compared to his colleagues. Wan said,

> On academic needs I can learn critical thinking skills. I think that's sort of lacking in college. You know, like for example like, they ask you to write an essay, but they don't really tell you, like, how to write like a good essay. Like for example, in physics they don't teach you. They don't teach you like to learn on your own and how to critically think. But I think that this emphasis, and maybe, teaching critical thinking skills better. I think it would be useful.

Offering the opportunities for students to engage in the learning processes is known as "active learning"; "it includes any activity in which every student must think, create, or solve a problem" (Graham, Frederick, Byars-Winston, Hunter & Handelsman, 2013, p.1456). This kind of opportunity helps students identify as scientists because they participate in scientific thinking with peers and they create a scientific community together.

The Honors Program also offered opportunities for students to practice their creativity. In fact, participants from all three groups (positive, moderate, poor) asserted the opportunities to express creativity in honors classes. One student from the positive experience group

demonstrated that the Honors Program addressed her creativity needs. Emily, reporting an average of 3.63 on the academically challenging needs category, said,

> I really appreciate Honors classes; they are very unconventional. It is personally appreciated as I am an honors student with a science major in biological sciences and chemistry. It's a Great Club of everyday academia. It's more hands on. it's more visual and I'm able to express my creativity in classes. While in my chemistry classes, I have to memorize equations, I have to memorize passwords in history and I'm not able to implement my own creativity in those classes. I feel like it's a matter of productivity where needs are met.

She provided an example of practicing creativity and scientific methods. She said,

> Last year I took discussion in arts and sciences and focused on the intersection between art and science, and the question of understanding the subject in order to grow academically. And things are kind of hard compared to a conventional classroom. For example, in the first unit we would do with our project (Spaghetti and Marshmallow). It's pretty common to have projects with special question to leading to one approach […] and instead of focusing on the physics of building the bridge. We focused on what we have learned from our mistakes, and things in more of a psychological way. There is an art teacher, as well as a science teacher in the classroom. And so, we were able to implement, like, you know, art techniques on using creativity and also add a scientific approach.

Another student from the moderate experience group, Ethan said, "The strongest thing about honors programs is to be creative, being able to go very deep, deep into, like, serious matter." Finally, Ivan (from poor experience reporting an average of 1.81on the academically

challenging needs category) said, “there are interesting classes, being, like, a science major, you have to take a lot of science classes. And you do not often get an opportunity to take something like out of the box. That is my favorite part about the honors program, just taking something interesting to me.” However, this finding showed that Ivan’s interest in practicing creativity does not reflect his overall average on academic challenging needs category.

***Having Deep Classroom Discussion.*** In this theme, I focus only on the following items: engaging in complex open-ended discussion and writing; and learning effectively on their own; those items had respectively high frequencies of 46 and 40 “regularly” on academic challenging needs category (see Table 4.5).

Consistent with the qualitative data, the moderate experience group participants appreciated the opportunities of having deep classroom discussion. Wan and Simon, asserted that through a class called Global Food Economy, they had opportunities to form their own ideas and to analyze them and to then bring those to the table so that they can discuss. Simon described his experience in this class this way,

> In the course I took, there is a lot of reading to do on my own time and you're kind of free to explore like different pieces of it. Allowing you to read topics on your own, show certain websites or videos that we can look at on our own time. That was really helpful. And along with that they post a lot of questions for us two days before class to think about that before coming to class to be ready to discuss. And when they did that, I think that was really important, because I would get that time to formulate my own thoughts, my own hypotheses.

Simon provided another example in his honor seminar class. He stated, “there were two co-professors who taught it. They would kind of open up the discussion floor and talk to our

fellow students".

John provided two examples where he had opportunities to apply his knowledge in honor classes. The first example was in the Supreme class, he said,

> We actually went to one of the student building blocks. What we had to do was we had to go up against one of the other honors students and we had to defend a point of view of the law within this class that we had covered. And it was very interesting to see because for me, we ended up having my, my discussion with my other classmates on gun control, and it really challenged me. A lot of views that I didn't really consider before, and, you know, just kind of take for granted. What I thought was factual, but it really provided an opportunity for me to research both sides of the argument and then come to a level-headed conclusion for that.

Another example was in the Health Communications class; he said,

It was very similar.

> We were put into place where we all kind of were able to discuss what privileges we have and were given here in the US. And, you know, contemplate solutions, you know, for a sustainable future. And these different cultures that, you know, may be without fresh water or, you know, may have an outbreak of some disease that, you know, there's not a lot of research going into that, and it could possibly, you know, turn into a very bad event.. The class was structured so that we had time to do things outside of class, but then we also have built-in time during class to actually, you have the sort of deep conversation among peers.

Final thought, Wan summed up his discussion about academic opportunities by stating, "This program is great. It is known for like small discussion-based classes, it was a small

discussion of ideas and thoughts on certain topics in psychology classes for which I got honor credits".

Again, participants' description of their experiences in classroom discussion seemed to be very consistent with high frequencies obtained from the quantitative data (28 responses) on the "very often scale". These frequencies are above the overall average (17%) of participants selecting "very often" on the survey scale. Even Ivan, who presented as having a poor experience on the academic category, said, "I just like the atmosphere, the room is a good room for discussion, like, a kind of square table type deal, it was good experience".

Additionally, participants provided more understanding of the particular areas in which the Honors Program needs improvement. Wan, for example, added a comment for program improvement. He recommended that more work be done for academic needs improvement. In particular, Wan suggested "more of a variety of classes." Anna also recommended that "Honors Program can emphasize on academic side as I feel they made just few," because "they think honor students were able to handle academics very well and that is, most of the time, not true".

**Creative-Productive Needs Category.** Analyzation of the survey indicated high frequencies rating "regularly" on the scale (40 and 38) for the following items: participate in activities that are aligned with my interests; and have adequate time for in-depth thinking. These frequencies were above the overall average (33.7%) of participants selecting "regularly" on the survey scale (see Table 4.6). As mentioned above in the Academic challenging needs category, the demographic information of participants indicated that the majority of students are White and science majors. The other demographic information was varying among the interview groups.

To further understand students' experiences that fulfill their creative productive needs, participants were asked to provide examples of creative productive opportunities they had in the

Honors Program. Consistent with the survey finding, the interview data analysis showed that several interview participants positively expressed the opportunities that were offered by the Honors Program to encourage deep thinking and present their own ideas. However, other participants expressed the opportunity of connecting art with science. This result leads me to discuss the item of "Testing complex issues in the science and arts". The frequencies for this item was 12 on both scales "not at all" and "very often". But the frequencies were 31 on at times scale and 27 on regularly scale. These frequencies were on the average. The discussion below addresses how participants presented their perspective related to the creative productive opportunities that were offered by the Honors Program.

***Encourage Deep Thinking and Examine Their own ideas.*** Two participants from positive experience, Noah and Emily, reporting an average 4 and 3.9 respectively on the creative and productive needs category, stated that in the honors classroom, they were encouraged to dig into deep thinking and to present their own ideas. Emily described her experience this way,

> Because of the Honors Program I feel like I have gotten a much more in depth, well rounded education. I think that if there hadn't been an importance on, not just memorizing facts, but being able to apply the concepts that we're learning to process the emotions that some of the information brings about, a lot of the things that are going on, I don't think I would have been able to progress as much as I have without each of those things being focused.

Two students from the moderate experience group, Simon and Wan, reporting an average 2.9 and 2.3 respectively on creative productive needs category, presented their experience as follows: Simon said,

> In my honors course we've looked at this whole manuscript that is heavily coded. And

people are still trying to crack that code. And we weren't taking a really serious dive trying to break it, but we kind of thought about it and thought of different ways of how we would break it to actual scientists and how they're doing it. That's really important because in that way you're really getting a sense of how you should be thinking.

Wan explained one class assignment by saying,

Most of the honor classes I had they're having … more in depth thinking than regular classes. Professors encouraged you to explore the strength of your own views. And in one class, I wrote a paper. It was about a topic and the professor said maybe I should discuss other viewpoints like pros and cons. It was sort of like a persuasive essay. So, I had, sort of, only listed the pros. The good side instead of maybe the bad side, when I should have examined both sides of my view.

Consistent with the participant's view about engaging in deep thinking, Clark and Zubizarreta (2008) and Doris (2002) asserted that all honors classes should encourage student to provide creative, flexible answers and students should be engaged in the discussion of open-ended questions with the "6 Ws" (Why, What, Where, Who, When, and How). Doris (2002) stated that "answering 6Ws questions provided opportunities for students to think deeply, and it also trained students to solve real world problems" (p. 168). In fact, the survey item related to open-ended questions and the 6 Ws received 36 responses rating "regularly" on the survey scale, which is above the overall average (33,7%) of participants selecting "regularly" on the survey scale. This finding showed consistency with the literature.

***Art and STEM Integration.*** Participants asserted the positive impact of combining art to their STEM majors. For example, Simon said, "With the Honors Program I had a chance to explore art. It is very important because, like, it opens up different pieces of your mind, not just

only reading books." He added, "I feel more geared towards like, kind of like, getting away from your major and learning different things that meets your interest".

Another student appreciated this kind of integration since that allows students to do activities outside the STEM major. John (from the moderate experience group reporting an average 2.4 on creative productive needs category) emphasized honors classes as sort of a break. He said, "I guess, in the heavy, you know, being a STEM major, it was a really nice break from the heavy math and science computations that can sometimes get a little overwhelming". He illustrated,

> For instance, the health communications class. It was interesting to read a case study about different problems that might be going on in different countries and make a sort of a battle plan for how we could go about solving these issues. And then the cinema class it, you know, it was interesting because, again, it is kind of gave us an opportunity to kind of sit around during class and watch movies. And then, you know, discuss with our professors. It is kind of being in a little bit of a break these, I'm not saying these classes were easy by saying, you know, that it was it is a break.

In fact, the current research in the Honors Program reflects the calling for art and STEM integration. It models the intellectual excitement and individualized attention of a small college of liberal arts and sciences within a comprehensive research university. The Every Students Succeeds Act (ESSA) promotes "integrating […] arts into STEM programs to increase participation in STEM, improve attainment of STEM-related skills, and promote well-rounded education" (U.S. Department of Education, 2015, p. 1).

Other participants shared similar views about taking liberal art classes. Cody (from the poor experience group reporting an average 1 on the creative and productive needs category),

Ethan (from moderate experience group reporting an average 2.5 on creative productive needs category), and John believed that liberal arts was not very conductive to their major. Ethan said, "There's so many courses, like, not related to science, …like, liberal arts classes. Like other majors internally focused too much on science. Uh huh. That's the weakest link in my perspective." John said,

> I feel like the University honors classes lack a little bit in reflecting my field of interest. It's more liberal arts classes that you take instead of more scientific or engineering based classes. So in that regard I think, you know, they have a little bit more room for improvement to get maybe some STEM Professors involved to develop some honors classes for that, because you know, in my situation where I am, in a STEM major coming to see more of these liberal classes, it's very unique. I think for somebody who's already in a liberal-based major, I think it would be just as rewarding as has been for someone as unique as me. If they had that opportunity to do, maybe a more STEM base class and kind of take a break from a more liberal, sort of like, whenever I say liberal arts, I mean more like foreign language or anything quite like that.

To this point, John's responses reflected his conflicting and blended perceptions of combining Art to his STEM major. The quantitative finding on the item test complex issues in the science and arts, revealed that John scored 2. This finding may be reflected by his different thoughts of connecting art to a STEM major.

Cody presented his excuse for not taking honors classes by saying, "You know with the workload I am dealing with, in general, it just seems like it is not a great fit for me. I think my dissatisfaction comes from, I don't feel like my STEM classes or honors classes scheduled are a match for each other. They don't fit." It looks that having free time is his main concern because

he added, “I like branching outside of STEM but my class schedule is rigorous. But if I had free class schedule space, I would be able to participate in the Honors classes to meet the Honors Program requirement.” Cody’s opinion reflects the quantitative finding. He reported an overall average of 1 out of 4 on creative productive needs category and scored 1 on the item test complex issues in the science and arts.

Regarding the creative-productive needs category, it is important to report the following point. The survey found on the item related to sharing narrative stories 31 “regularly” responses and 11 “very often” responses on the survey scale. These response rates are slightly under the overall average (33.7%) on this category. However, the literature asserts the significance of using creating stories strategy in classrooms. According to Pink (2006), teachers and students can use different kinds of activities to craft stories because most people organize experiences, knowledge, and thought processes as stories. Practicing story sense in the academic setting relies on the teachers’ and students’ abilities to place facts in context and to present them with an emotional impact.

**Social-Emotional Needs.** In this category, I noticed the importance to discuss the limitation of social studies in higher education before presenting the finding, since this limitation had impacted me on conducting the survey on social emotional needs items, as well as presenting the finding on this category.

As stated in the literature review chapter, higher education has paid little attention to developing college students’ personal and social interactions. There are limited studies focused on addressing the social and emotional development of college students even though Pritchard and Wilson (2003) reported a positive correlation between emotional and social factors and the prediction of student success in college. Reviewing the literature on developing social emotional

needs in college students shows that "Emotionally gifted students have deep empathy and respond to the needs [...] of others" (Shavinina, 2009, p. 445). Also, developing honors students' holistic thinking can be connected to Pink's senses (Gould, 2009). Thus, the current research survey on social-emotional needs was composed of items from Pink's empathy, play, and meaning senses.

Analyzation of the quantitative findings showed that the participants identified as having several opportunities to develop social competencies. In particular, students had response rates well over the 30% overall average of rating "regularly" on the survey scale when responding to social-emotional needs items (see Table 4.7). These included volunteer on the campus and community (38); interact with faculty and staff members (38); take part in mindful conversations with classmates (38); participate in cooperative learning environments inside and outside of class (36); change my first perceptions or assumptions with time (36); and, respond to the needs of others (35). While other social-emotional needs items had the low responses: utilize electronic games to solve content-related problems (46 "not at all"). As mentioned above in the academically challenging needs category, students' different race and majors are overwhelmingly White and science majors. The other demographic information was hard to explain since they are varied among the interview groups.

During the interviews, participants were asked to provide examples of social emotional opportunities they had in the Honors Program. Students' responses indicated that the Honors Program offers variety of opportunities that fulfill their social and emotional needs. Students presented varied experiences that were consistent with the quantitative finding. That includes volunteering services, interacting with honors program instructors and staff, connecting and collaborating with honors students, and camping trips and social events. The least offered

experience by the Honors Program is using technology to solve content-related problems. In the following sections, I concisely discuss these five themes.

***Volunteering Services.*** Quantitative findings showed that participants reported high ratings on the item volunteering on the campus and community (35 responses on "very often" scale versus 2 responses on "not at all"). This finding was reflected in the interviews' findings.

During the interviews, participants were asked to talk about their volunteering opportunities. They demonstrated that volunteering is required to increase involvement in the University life. The Honors Program requires 20 hours of volunteering a year, 10 hours of volunteer a semester. Wan (from the moderate experience group reporting an average 3.16 on social and emotional needs category) stated that being involved on the campus was consistent with the honors program goals, and the current research university is a blend of community/university service.

Volunteering opportunities was the most common theme discussed by interview participants on the social aspects. Participants emphasized their benefits of volunteering opportunities this way. For example, Emily (from the positive experience group reporting an average 3.41 on the social and emotional needs category) said, "Volunteer hours of the Honors Program definitely helped me because I had to work in different places either on or off campus with different people and to learn how to build relationships, how to offer my specific skills to those people and sort of get a better community knowledge, and more. Enough personal experience with other people around the campus and local community." Cody (from the poor experience group reporting an average 1.25 on the social and emotional needs category) summed up his impression of volunteering services saying, "One time I did help in blood drives, I gave one several times. It was a good way to get hours. I really enjoyed that experience. You know,

that was kind of my interest because of science and math". Cody's perception reflected his responses on the item: volunteer on the campus and community, where he scored 3 "regularly" on this item; even though he had low overall average 1.25 on social needs.

Additionally, one participant stated that the Honors Program community usually make announcement of volunteering opportunities. Noah (from the positive experience group reporting an average 2.83 on the social and emotional needs category) said, "Honors program offers a lot of volunteering opportunities that they send by emails or set out in the newsletter; if you walk into the office, there are a lot of signs pointing out different civic engagement opportunities." However, when he was asked about his experience with volunteering opportunities, he pointed out that he recently joined the Honors Program with only 6 credit hours. Thus, he did not involve himself in any volunteering services. On the survey item related to volunteer on campus and community, Noah scored 1, which indicates not at all. Noah's response reflects his low score.

***Interacting with Honors Program Instructors and Staff.*** It is interesting to note the apparent links between the survey and interviews findings on the opportunities of communicating with faculty and staff. Quantitative analysis shows that the participants reported 26 responses on "very often" scale and zero on "not at all" scale related to the item "interact with faculty and staff member". This indicates that participants had a positive experience while interacting with Honors faculty and staff. That resulted with positive impacts on addressing students' social and emotional needs. Interviews on participants' perspectives supported this finding.

Participants from all interview groups (positive, moderate, and poor) appreciated the opportunities of interacting with Honors Program instructors. Noah said, "When I went in, I have always been welcomed by whoever is in the office." Ivan and Cody (from the poor experience

group) emphasized their appreciation to faculty who are nice, helpful, caring, and interested in what is going in and outside classes. Ivan reported an average 1.66 on the social and emotional needs category.

To address the significance of this opportunity, it is important to discuss the benefits that participants gain while interacting with Honors Program faculty, which are as follows: (1) positive experience, (2) helped in many different ways, and (3) mentorship.

First of all, participants presented their positive experience with Honors Program faculty. For example, Emily said,

> I think that professors that have been chosen to be, and that I've worked to be in the Honors Program teaching classes, really do focus on making a more than standard classroom experience. I think that they really put a lot of effort into making interesting creative provoking assignments, choosing very specific readings and texts that are going to encourage deep thinking rather than surface level thinking, And so, I really think that the professors that have been a part of the Honors Program in my years have been essential to it being a good and positive experience that offers each of those areas of further learning, the deeper academic learning, the emotional the social, and the creativity. And so, I think that a big part of it is contributed by the professors.

Wan outlined his good experiences in interacting with honors staff, “Through the Honors Program, to get honor credit I have to do extra projects for the class to get honor credit. This gave me more opportunities to engage with faculty.” Finally, John (from the moderate experience group reporting an average 2 on the social and emotional needs category) summed up his experience with Honors professors this way:

> I guess the two or three professors that I've had at the University Honors actual classes,

supreme and then health communications. I had, I think it was Dr. Karen. She was very generous with her time to us, you know. If we needed anything, or just wanted to talk to her about different, different things outside of her own field, because she was a radio and broadcasting major, I think, which was very interesting. Being able to sit down and actually talk with somebody who, you know, has their PhD in this broadcasting and you know publicity, and how, see how this is relayed and, you know, how things are censored. It's, it was very rewarding. I thoroughly enjoyed coming into contact with her and Dr. Free Google, and Dr. Met. They were all very, it was very interesting and very, very rewarding to be able to, you know, meet and talk with him because like I said I, I never would have even considered, or even probably ever even coming across contact with anybody in the School of Journalism, or cinematography, or anything like that had I not taken the Honors Program. So, great.

The second benefit of interacting with Honors Program instructors was to help students in many different ways. John, for instance, said,

For the Honors instructors, I think they, in some ways are rewarding. They honestly help in a lot of ways, with meeting, like, different scholarship opportunities, helping me, you know, write my resume. And I guess for me, the sort of challenges that I set for myself.

Ivan provided another way of help by saying, “Honors professors have high experiences and knowledge. They encourage us to read to understand the world and our emotions. There were some texts that she (professor) recommended that they were not required that just be a good reading books. I myself took advantage of the reading and a whole lot out of things from that class”.

The third benefit of interacting with Honors Program faculty was receiving mentorship.

Mentorship is one of the Honors program's goal as it states, "The Mentors in the University Honors program will help connect you to faculty and academic resources; the local community; and other opportunities to explore your potential and find your own path". Through mentorship services, advisors have to mentor each student individually through their undergraduate years. The participants' responses asserted that mentorship is the main attraction in the Honors Program.

Participants referred to their advisors if they had a problem and needed counseling. For example, Simon said, "Mentors are like having somebody who is, kind of, not necessarily watching for you but is somewhat there for you in case you are going through a rough time. And that is like just having a support system on the emotional side." Wan said, "Honors Program encourages students to talk to mentors if they need counseling or have problem." John appreciated that the Honors Program gave him an opportunity to meet with his mentor, academic advisor by saying, "Having a mentor is, I think, in some ways rewarding. It has been very, very rewarding to be able to meet and talk with him to discuss your problems. I thoroughly enjoyed coming into contact with my advisor." Finally, Cody said, "My mentor, I felt I had a real connection with him. He was very understanding, and I felt like he listened very well".

Not only for counseling, also mentors can provide other services to all students. Participants reported that having a mentor is beneficial in different ways. For instance, John said,

> My Honors advisor has been very productive in reaching out with different registered student organizations and different chapters. Organizations at campus that encompass the engineering department, and he's been a complete wealth of knowledge. He has been tremendous help to me. He provided me with so many opportunities that I can do. He's written recommendation letters for me.

Ivan said, “My advisor helps me to work to write my resume”. Moreover, Ethan said, “I guess whenever you go to mentorship, it is great to meet with your mentor and talk about academic improvement and how things have been doing.” Noah said, “Honors program advisor helped me in doing research with associate professors in the mechanical engineering department, working with them, and competing in science fairs. It is really going to like another level and in terms of being able to research and perform”. Cody said, “I was really satisfied by the mentor meetings. Any time I did see my advisor, that was a big plus.” In all, participants agreed that mentorship has positive impact on their progressing in the program.

Additionally, according to student’s perspective, the Honors Program requires all students who are in the program to meet with Honors advisors once a semester. However, some students meet with their advisors more than that. For example, John said, “You know it is required that we meet with our honors advisors at least once a semester for 30 minutes but I often see my advisor more frequently than that. Just because he is very unique person, and he goes a step further”.

***Connecting and Collaborating with Honors Students.*** On this theme both quantitative and qualitative data presented high equivalent findings related to the survey items: take part in mindful conversations with classmates; and respond to the needs of others, participants asserted that honors program offered opportunities to increase interaction among honors students.

From the participants’ perspectives, the Honors Program of current research seeks to develop students’ life-long habits of thinking independently by engaging them in democratic dialogue and creative collaboration. Participants reported the opportunity to collaborate with many students. In his interview, Noah described this opportunity by saying, “I feel like Honors Program is more directed towards humanities and multi-culture. So, interactions between

people…I have felt a lot of connection between meeting other people and becoming more involved in events, and I feel that I am talking to other Honor students and they feel in a similar way".

John also enjoyed being connected with others by saying,

> Being in those Honors classes was a really good opportunity to connect with other Honors students. These honors classes, in turn, are kind of rewarding for the Honor students. Each one by, you know, being able to sit down and have a time to enjoy. And you got to just connect with other Honors students that you may not have ever even come across, because your majors are so different. So that was a really, really cool opportunity.

Simon shared his similar feeling of collaboration by saying, "Honors program does bring students together. In my grade, I maybe know, like five or like, you know, I know a few. But like in honors program, I get like to collaborate and talk to a bunch of students".

Other participants asserted the benefit of collaborating with others to meet their social needs. Emily described her social experience as, "usually expect collaboration with your classmates that fulfill social need in the classroom. Um, I feel like the classes I've taken in the Honors Program have allowed me to work with other students, such as their yoga class, discussion in our class, Atomic Age class, which I'm taking this semester, as well as the global narrative class." John also expressed his thoughts by stating, "I think this fellowship and the connections that you make, are awesome. I mean, whether it's, you know, them, having a Teacher day or popcorn Friday, where you know that's just kind of a social opportunity for Honor students to come in and, you know, mingle and, you know, eat and drink some food. I think that's a very unique way of, you know, getting students to connect. Similar to how their classes have done." He explained,

> Probably maintain a social and student life, make good connections with them. It's very rewarding that there are people who are going and facing the same challenges, you know. It does create a deeper depth of, you know, conversation with these people who were able to connect on a more personal level because we understand what each other's doing. I guess it definitely helps you know the honors program. It definitely helps, and like I said before, connecting with multiple people. It has definitely helped me gain a sense of purpose I guess outside of the classroom with other people.

Positive experience group participants' description of their social benefits of connecting with others seemed to be very consistent with high frequencies obtained from the quantitative data. Noah and Emily scored 4 "very often" on the items take part in mindful conversations with classmates; and respond to the needs of others. Simon and John who presented moderate experience scored 2 and 3 on those items.

***Social Events and Camping Trips*.** The quantitative data revealed the following items ranked the highest respectively on regularly scale. Participate in cooperative learning environments inside and outside of class (36); change my first perceptions or assumption with time (36); and get involved in fun and joyful activities (32). Participate in cooperative learning environments received the highest ratings on social category. They seemed to be the most common responses from interview participants.

During the telephone interviews, participants provided a variety of social opportunities for addressing their social needs. Participants claim having a variety of social events either inside or outside classrooms. Ivan said, "There is always events that my teacher would announce explaining what is going on related to the current things that we are talking about, so there are always, like, opportunities to do that outside of class".

Emily discussed the importance of having out of classrooms experience. She said,

> I think that having a wide range of non-standard class options has also been really important to it. Offering things that aren't found in other places, like one class I was really excited about this semester is the forests and humans class where we go out and we study the Simon forest system. We go on outside of class excursions like camping trips, those sorts of things where you're taking the learning outside of the classroom, I think, are really essential in building that better education system. And so, I think a lot of the little details that have been implemented in the honors program are really what make it so strong.

Emily's enjoyment about the field trip was reflected in her quantitative response. She scored 4 that indicates very often on the item: involved in fun and joyful activities.

Through social events, the Honors Program seeks to connect students to campus and the local community. Furthermore, these social experiences help to change students' perceptions or assumptions over time. John believed that working with community is very rewarding. He said,

> One of the main activities that I have taken part in in the honors program has been one of their service outreach opportunities at Dampier farms, we would go out there and basically go and help these farmers who were living a very sustainable lifestyle having a very big farm. And we would help them, you know, clean out their animal pens or we would help them plant, different vegetables. Whether it was cabbage or carrots broccoli, whatever they were, you know, needing in order to, you know, reap the benefits here. Come, you know, in the fall, or whatever that would be, but it was very rewarding to get to do that. Just because you there's a sense of accomplishment when you could go back and see the, what you've done, you've planted these vegetables and whatnot and you

> come back and they, you know, they're growing and you know they're asking you to come and, you know, help them harvest what you planted. It was very, very rewarding to get to do that with my, my peers, I mean, I think that's even more rewarding. And, you know, apart from this one aspect of, you know, the service opportunities that I've done through the honors program.

Wan and Ivan made two important comments about Honors Program events. Wan thought that since participation in campus activities is optional most of the time, he would like participation to be mandatory. He said, "maybe the Honors Program should maybe help students get more involved on campus events and certain things, like maybe more requirement for, like, getting more involved." The other comment is about the similarity of the Honors Program events. Ivan said, "Definitely there are a number of events. It is always nice to have those opportunities for students to go. But like many more, but also like, just like diverse options… If I would just say, make sure they are not all the same type of events. I think should make something different or think about something new." His point of view "maybe like different students would be affected by different ones," and he added "If I am available and interested in doing something, I will consider, like, going to different events".

***A lack of using technology to solve content-related problems***. During the interviews, participants were asked their thoughts on the low response rate reported for the item "utilize electronic games to solve content-related problems." Students' responses on this item is only 4 on very often scale versus 46 on not at all. Participants confirmed the lack of technology used to solve content-related problems in Honors classes. For instance, Simon said, "Personally I have not used electronic games in any class, but I feel like it could be a good method, because…it would be something different to get you engaged. Maybe not better but, like, reinforce topics that

like, have trouble teaching it, You'd have a desire to learn rather than, kind of, almost enforcement." Noah thought that "having technology there to help is…a really good benefit." He provided an example stating,

> "For example, right down in biology class and having the electronic interactive animations helps a lot to break down the topics for learning. So, it's much easier to understand. Since the biology, for example, cells in the body is so complex you can't just take a look at it like a ball in your hand if you are, like, going deeper. The cells are tiny. Having technology there to help is a really good benefit."

Gould (2009) states that using games in Honors classes enhance the whole brain abilities to solve campus and community problems. Further, playing games in a group enhances social interaction.

**Special Benefits.** During the interview, participants mentioned special benefits that the Honors Program provided, such as early registration and Honors contracting. These benefits were not covered in the survey. However, they are listed on the Honors Program website under "The Honors Experience".

Honors' students have the benefit of early registration for all classes. Cody demonstrated that the benefits of early class registration are nice. In addition to early registration, the Honors Program offers an opportunity for students to have contracted credits through other classes and credit those hours. According to the Honors Program, Honors students can earn an honors certificate when they meet honors certificate requirements of 18 hours completion of University Honors Program coursework. This coursework may include up to 6 hours of AP or up to 6 hours of Honors courses taken at other institutions. According to the Honors Program, AP refers to the Advanced Placement program is offered by the university and allows willing and academically prepared students to pursue college level studies and earn college credit for those hours.

Participants presented their experience in AP and contracting opportunities. For example, Wan said, “In my physics class I did some research to get honors credit for it. So, I did have an opportunity to do that.” Cody said, “I didn’t actually haven’t taken any true honors classes yet. I have credit from the AP. You know I could do some Honors contracting. I would do extra work for non-Honors courses.” Ivan said,

> I started the Honors Program in my second semester of college and freshman year and originally, I thought it was just kind of like better on resume. I didn’t think a whole lot of it, so most of my credits for Honors Program I contracted through other courses. So that was a whole of interaction with Honors Program at first, but after a while, I took Honors class and I took another one and another one. And I found these ones were impactful on learning about different things.

## Conclusion

Chapter four presents the study’s findings. In this study, a mixed method research design was used. An explanatory sequential design was employed in which qualitative data approach were used to expand the understanding of the quantitative data approach. Both approaches were used sequentially to answer the research questions and understand the research problem. Using this design provided a better understanding of students’ perceptions about addressing their needs in Honors Program. In this study, ANOVA Repeated Measures, descriptive statistics, and correlation were used to analyze the quantitative data. The qualitative data was analyzed through theming the data.

In the following chapter, I discussed the findings of this study and provided important implication as well as recommendations for future research related to honors education.

# CHAPTER 5

# IMPLICATIONS AND CONCLUSIONS

In this study, I addressed the following concepts: (a) which domain of academically challenging needs, creative-productive needs, and social- emotional needs the participants perceived as being addressed in the Honors Program, (b) the relationships among survey items and the students' understanding of the survey categories, and (c) students' perceptions about how their academically challenging, creative-productive, and social-emotional needs are addressed by the Honors Program. This chapter presents the findings of this study in relation to the existing literature. Interpretation of the results for each research question is presented as well as implications and recommendations for future research.

The purpose of this study was to examine the extent to which the Honors Program at a midwestern University addresses the needs of gifted and talented students and developed their holistic thinking. This study responded to Huggett's (2003) assertion that understanding the connections between gifted students' needs, holistic thinking development, and learning environment is essential to a successful honors program. The significance of this study was to provide a better understanding of the extent to which an honors program improved the holistic thinking of gifted and talented STEM students. The results from this study may serve as an opportunity to review the program's effectiveness at meeting STEM students' needs and to assist other university programs when determining the benefits of placing students in an honors program.

To answer the research questions, I used an explanatory sequential mixed method design (Tashakkori & Teddlie, 2003) to better understand the research problem. Through this design, I first collected quantitative survey data and analyzed it before I conducted follow-up interviews.

Through content validity measures, I was able to increase my result's validity. Yet, my findings' external validity are limited and cannot be easily generalized to STEM students participating in the same setting as this research. Reliability of the survey was determined for this study using Cronbach's alpha coefficient. The result indicated high reliability**.**

My instrument was composed of items from Moon's (2012) survey, Lanier's (2008) survey, and concepts in Pink's (2006) and Gardner's (2006) books. The purpose of connecting students' needs to Pink's senses and Gardner's ideas was to approach how the whole-brain thinking of gifted and talented students can benefit their holistic academic growth (Gould, 2009). Thus, the main phenomenon of the current study is to investigate the development of holistic thinking and addressing the academic, socio-emotional, and creative needs for students in an honors program.

Based on my analysis of these quantitative data, I noticed specific patterns that appeared to emerge, which I used interviews to help explain. These data also helped me triangulate my findings. Finally, to increase the degree of transferability of these findings, I provide detailed description of the participants, the setting, and findings. Direct quotations from many participants' responses are included, which allows the findings of a qualitative data to be applied to other situations. The combination of data sources presents a more complete understanding of the phenomenon of honors programs attempting to meet the needs of gifted students, and this highlights the complexity discussed in the literature (Goldberger, 2012; Gould, 2009). In the following paragraphs, I summarize and discuss the findings from the three research questions and connect that to the related literature.

**Discussion of Major Findings of are there statistical differences in participating gifted and talented STEM students' opinion of the Honors College addressing their academically**

**challenging needs, creative-productive needs, and social-emotional needs?**

Findings from the quantitative survey utilized to answer this research question provide some insight into addressing honors students' needs. Quantitative data were collected via the Survey of Gifted Students' Needs. The core survey items were rated on a five-point scale: Not at all (1), At times (2), Regularly (3), Very often beyond all my expectations (4), and, N/A (5). For this study, I counted a rating of 5 as zero. The survey reflected the following three composite categories: academically challenging needs, creative-productive needs, and social-emotional needs. Participants responded to each item by rating their opinion to which they felt Honors classes addressed their needs in a given area. This scale was used consistent with the literature (Lanier, 2008; Moon, 2012).

In the quantitative analysis, the mean of all three categories were compared using ANOVA Repeated Measures. The results showed no difference between the mean of three categories: academic, creative, and social. Since there was no difference between the means of the three groups, the mean and the frequency of each of the four survey scale categories helped analyze the participants' answers to each item. The total frequencies and means of the survey scale items show that most of the participants were on the scale at 2 and 3 when rating how they felt that the Honors Program addressed their needs. The data reflected that at times and with some regularity their academically challenging needs, creative-productive needs, and social-emotional needs were met.

**Discussion of Major Finding of what are the relationships among the three categories: academic challenging, creative-productive, and social-emotional needs? What are the participating gifted and talented STEM students' understanding of each category?**

Quantitative and qualitative data were analyzed to answer this research question; each

were formalized to answer a specific part. In the first part, I focused on studying the relationships among survey items. Correlation analysis was used to study the relationship among the survey items. Pearson r (ranged between -1 to +1) correlations were calculated to check the strength of the relationships among the survey items. Qualitative data was used to support the quantitative finding. In the second part, I focused on studying the students' understanding of the survey categories. Qualitative data were collected to evaluate students' understanding of the survey's three needs categories: academically challenging, creative-productive, and social-emotional. In the following paragraphs, I discuss each part.

Part one, to see the relationships between survey items as they relate to addressing gifted students needs all 33 items were factor analyzed using principle component analysis with Promax (oblique) rotation. The analysis yielded six factors: (1) academic challenging skills, (2) creative productive skills and meaning sense, (3) social emotional skills, (4) mixed skills, (5) creative productive skills, and (6) play sense. These factors explained a total of 68.383% of the variance for the entire set of variables. The correlation between those six factors shows three high positive correlations emerged among Factor (4) mixed skills and the Factors (1) academic challenging skills, (2) creative productive skills and meaning sense, and (3) social emotional skills. In other words, this finding revealed that the mixed skills factor was a significant indicator in explaining students' rating for the other items in the academically challenging, creative-productive, and social-emotional needs categories. This finding was expected since the mixed skills factor was a combination of items from the creative-productive needs and social-emotional needs categories.

Additionally, there were six moderate correlations among the survey items. Further, it appears that the cognitive, creative, and critical skills and Pink's (2006) empathy, meaning,

design, and symphony senses have high or moderate correlation. Yet, Pink's play and story senses presented low correlation with the aforementioned skills and senses. This finding was not consistent with the literature; Pink (2006) stated that "play sense is correlated to creativity."

Studying the correlation among the survey items provided minimal information about the three survey categories and which factors were correlated because in some cases, factors had a mix of items that loaded on different categories. According to the factor analysis using principle component analysis with Promax (oblique) rotation, the analysis showed that two factors had mixed items. Factor (2) had items from both creative productive skills and meaning sense, and factor (4), mixed skills, had items from both creative needs and social needs. Thus, it was difficult to identify relationships among the three categories and though my qualitative data can give some insights, more studies are needed to examine the current survey component.

Qualitative data was used to explain these loadings from the previous paragraphs. Items with loadings 0.6 or higher were maintained. For instance, the academic challenging skills factor had loadings higher than 0.6 in all items which explained 40.364% of the variance. This finding is consistent with the interviews. During the interviews, the participants were asked about the kind of academic opportunities they had in the Honors Program. The most common responses were related to having experience in practicing critical and creative skills in honors classes. Ethan for example, said, "The strongest thing about honors programs is to be creative, being able to go very deep, deep into like serious matter." Additionally, play sense factor was maintained with .846 and .532 loadings respectfully on these items: Utilize electronic games to solve content-related problems; and Take part in physical activities. These items explained 3.545% of variance. Also, they had high responses on the survey on "not at all" scale respectfully 46 and 26. This finding was consistent with the qualitative data. Interview participants reported that the

Honors Program did not meet their needs regarding the use of technology to solve content-related problems.

In part two, to see the students' understandings of the survey categories, interviews were conducted with a focus on understanding the three needs categories from students' perspectives. Students were asked during their interviews about what they understood the meanings to be. Students provided a variety of meanings in their responses. The following paragraphs present the meaning of each category from the perspective of the participants and how the literature supports these.

***Academically Challenging Needs***

Some participants connected academically challenging needs to the way of being challenged in the classroom. The literature asserts that academic skills are developed by practicing a variety of challenging tasks which require higher-order thinking, analyzing, evaluating, and creating (Camci-Erdogan, 2015; Davis & Rimm, 2004; Moon, 2012; Renzulli, 2009). Camci-Erdogan (2015) found that classroom instruction that stimulated higher-order thinking developed STEM talents.

Other participants viewed academically challenging needs from an educational perspective. For instance, Emily stated that academically challenging needs "involves an understanding of concepts and being able to work with those concepts and apply them in new and innovative ways… learning how to better explain and evaluate and expand on arguments in whatever field." As Long and Davis (2017) and Shavinina (2009) pointed out, academic needs include the skills of questioning, reflection, and self-discovery through learning tasks.

Other participants believed that academic needs connected to one's major. Another participant saw academically challenging needs in terms of acquiring knowledge and skills for

the future. Connecting academically challenging needs to a students' major or future success is supported by the literature. Previous studies found that Honors students had greater potential for excellence in their professional lives (Hafsyan, 2015; Brimeyer, Schueths & Smith, 2014; Scager, Akkerman, Keesen, Mainhard, Pilot & Wubbels, 2012; Seifert, Pascarella, Colangelo & Assouline, 2007). Additionally, Hafsyan (2015) found that participation in an honors program had positive effects on both career and educational aspirations.

***Creative-Productive Needs***

Three of the participants defined creative-productive needs as the ability to look at a problem from the outside. Gardner (2006) states that a creative mind has the ability to generate new ideas, pose unfamiliar questions, conjure up unique ways of thinking, and arrive at unexpected answers to solve a problem. Emily defined creative-productive needs as "the ability to find new ways of looking at something." Simon and John shared similar thoughts on the otherness/newness of creativity. According to Hong, Greene and Hartzell (2011), creativity is indicated by students' ability to produce original and divergent solutions to problems posed to them. In STEM classes particularly, teachers can develop creative skills by encouraging students to embrace innovative and alternative views or diversified solutions that may be required to effectively address complex issues in science (Kawasaki & Toyofuku, 2013).

Finally, Ivan defined creativity as "using my own devices to form an original thought or idea without guidelines, without like strict guidelines, and being able to tap into unused or undeveloped sides." This definition is relevant to Long and Davis (2017), who stated that creativity is simply defined as the ability to connect the unknown with the known and is important because it includes the connection between two dissimilar ideas.

### *Social-Emotional Needs*

Two participants defined social-emotional needs as understanding other people. Another two participants defined social-emotional needs as the ability to connect themselves and other people, collaborate and talk together. Regarding these two definitions, the literature confirms the positive effect of an honors program on successful community building (Brinkel, Rees, Ruis & Sloots, 2015).

One participant describes social-emotional needs as "a mental health", "in order to stay balance in contracts and academic side is important to maintain a social life." Pritchard and Wilson (2003) found that students who are emotionally and socially healthy are more likely to succeed in college. "Two other participants saw their social-emotional needs being met through different venues. One said he thought they were met by having events on campus or counseling, for example. The other participant found they were met by shows, fraternal organizations, and other organizations within one's department"

**Discussion of Major Finding of to what extent do participating gifted and talented STEM students perceive the honors program as addressing their needs and developing their holistic thinking?**

In this instance, the quantitative and qualitative data complemented each other. To understand the quantitative data related to students' opinion by addressing their needs in the Honors Programs, I collected qualitative data with the focus of understanding students' experiences in the Honors Program. I next analyzed and evaluated the qualitative data conducted with participants from telephone interviews to answer the question of summarizing their overall experience in the Honors Program with addressing their needs. The qualitative data provided more information about how students felt that the Honors Program addressed their needs. The

findings showed that the majority of the students agreed that the Honors Program addressed their needs; except two students who disagreed. Also, the findings showed conflict between participants' responses on the survey and in the interviews. In order to protect participants' identities, they were assigned pseudonyms in the reporting of the results.

Basically, students indicated that they were indeed interested in being in the Honors Program. Some students reported their interest about the Honors Program in general. While other students reported their interest in specific areas more than others. To illustrate, Noah (from positive experience group) said that the Honors Program challenged him to be more aware "in order to experience different needs and feel good in real life application." While John (from moderate experience group) appreciated that the Honors Program gives him an opportunity to meet with his mentor, academic advisor. In fact, the findings indicated that the Honors Program investigated during this study offered a variety of opportunities to meet students' needs across all three categories. A review of the program's current mission and benefits showed most academically challenging, creative-productive, and social-emotional needs were being taken into account. The program's goals are to develop creative research on the university level (academic skills), model the excitement of a small liberal arts college (creativity skills), and serve the community (social skills). Thus, this program was chosen because it meets the criteria for this research.

Another important point is related to participants' demographic information. The majority of the participants were White versus other races. It was expected as the majority of current research participants are White (83.13%). A study by Angle, Davis and Redmond-Sanogo (2016) found that fewer African American, Hispanics, and Native Americans pursued STEM degrees. They are currently an underrepresented population in many STEM fields;

however, by 2050 non-Hispanic whites will account for only 47% of the population due to current trends of increasing the diverse populace in the United States (PCAST, 2010).

To have more details about the students' experiences and to clear out the conflict perception, the participants also were asked about the kind of opportunities they had in the Honors Program to meet their needs on the three domains: academically challenging, creative-productive, and social-emotional needs. In the following paragraphs, I summarized and discuss the findings from the three domains in relation to the literature of honors education.

***Academic Challenging Needs***

The inspection of the quantitative and qualitative data for the participants responses with addressing their academic challenging needs revealed some alignment. The findings showed some common opportunities that the Honors Program offered including conducting projects or research, thinking critically and creatively, and having deep classroom discussion. That is not surprising since the literature discussed some of these points.

Regarding the point on conducting research, participants confirmed having opportunities to conduct research with other students or faculty. The PCAST's (2010) report recommended research courses for beginning undergraduates because it provides students with project ownership and intellectual challenges of empirical pursuit. According to Crowin, Dolan and Graham (2015), participating in doing research with more expert individuals helps steer students in a scientifically fruitful direction; this is because experts model how to do the work, provide feedback that helps to improve the research and validate the legitimacy of students' experience and accomplishment. Doing research also develops a stronger scientific identity since students do the work that scientists do (e.g., ask questions, design studies, collect and analyze data, or build models (Crowin, Dolan & Graham, 2015).

It is important to know that the Honors Program that was studied is within a comprehensive research university. Thus, all Honors Program participants had to meet the admission criteria for program eligibility. One admission requirement is that participants should have conducted research or created creative products. Demographic and educational information in the current survey covered that. According to Hafsyan (2015), Hebert and Mcbee (2007), Hill (2005), and Long (2002), honors program admissions are based upon several factors which can include essay submission, interview participation, and experience review focused on items such as having conducted research or created products.

Participants asserted that the Honors Program did give attention to the development of critical and creative thinking**.** Previous literature regarding honors programs identified that critical thinking development was correlated to students' academic growth. For example, Moon (2012) and Cargas (2016) found that teaching critical thinking in honors programs positively impacted the prediction of academic efficacy, academic goals, and accomplishment of important pedagogical goals. Goodstein (2013) found that participation in an honors program is related to critical and creative development.

Participants from the current study also elaborated that specific classes were included to teach critical thinking skill; however, Tsui (1999) agreed that while instructional techniques have positive effects, there is no need to design courses specifically to teach critical thinking.

Another important point that I noticed is when participants talked about having opportunities to synthesize and connect ideas together, they did not mention that brainstorming method was used in classroom activities. The literature supports the implementation of methods such as brainstorming. According to Pink (2006), Symphony senses were engaged when students used brainstorming methods to expand their thoughts, produce a handful of ideas, and then to

evaluate those ideas to come up with solutions.

Class assessment is another important consideration in regard to assessing students' academic skills. Literature mentions the significance of studying the assessment of honors classes (Cosgrove, 2004; Driscoll, 2011; Lanier, 2008; Moon, 2012; Seifert et al., 2007; Shushok, 2003; Wood et al, 2016). Moon (2012) stated that "classroom assessment is essential in honors classes" (p. 33). However, this issue is less addressed in the current study and should be considered for further research.

***Creative Productive Needs***

Both the survey and interviews indicated relevant findings to meet students' creative productive needs. For example, participants confirmed that honors classes encouraged them to dig deeper into their thinking and present ideas. These opportunities can contribute to improving students' creative skills. Hong, Greene and Hartzell (2011) asserted, that the improvement of creative thinking skills required the following: creating classroom environments to meet individual students' interests and needs, designing curriculum to ensure open-ended activities, and utilizing real-life contexts for assessing and reporting learning outcomes.

Another important aspect related to this category is the integration of art and STEM. Participants asserted that Honors classes had provided opportunities to combine art with their STEM majors and develop artistic sensibility. In fact, the Honors Program studied for this research reflects the push for art and STEM integration. The program aims to model the intellectual excitement and individualized attention of a small liberal arts and sciences college. The primary focus of the current research was to investigate how this particular Honors Program integrated aspects of the humanities and arts into STEM education to better address the needs of STEM students. In the science-art collaborative, teachers can use art to transform scientific

knowledge into a personal, emotional, and social experience, leading to creative ways to disseminate scientific information (Kawasaki & Toyofuku, 2013). For example, students in one Honors class could create a documentary film on any topic. Through the process of creating the film, students had a space to design and be creative agents.

Furthermore, participants asserted the positive impact of combining art with their STEM majors. For example, Simon said, "I feel are more geared towards like, kind of like, getting away from your major and learning different things that meets your interest." John said, "I guess, in the heavy, you know, being a STEM major. It was a really nice break from the heavy math and science computations that can sometimes get a little overwhelming." The literature is consistent with this finding. At Yale University, incorporating the humanities into medical education can offer a relief from the stresses and challenges of medicine, opportunities to become better problem-solving physicians, and better outcomes for their students ("Yale School Magazine", 2017).

***Social Emotional Needs***

The literature acknowledges that honors courses are interdisciplinary and experiential, and they connect academic study to community involvement. Long and Davis (2017) encourage student and community engagement because learning occurs through the accumulation and collaboration of knowledge between people, community, and organizations. For instance, students' exposure to community problems has the potential to affect their ability to learn, observe, collaborate, communicate, and create problem-solving skills (Long & Davis, 2017). An examination of the quantitative and the qualitative findings showed that the participants presented varied experiences that fulfilled their social and emotional needs.

Volunteering opportunities, for instance, were offered by the Honors Program.

Participants asserted that honors program requires students to have 10 credit hours of volunteer service each semester or 20 each year. The literature shows that volunteering on campus or in the community can be a great way to develop social competency (Brinkel, Rees, Ruis & Sloots, 2015).

Participants appreciated the opportunities of communicating with Honors Program instructors and staff. As Emily said, professors "have been essential to it being a good and positive experience…so I think that a big part of it is contributed by the professors." Also, Ivan expressed his appreciation by saying, "Honors professors have high experience and knowledge, they encourage us to read to understand the world and our emotion." Hong, Greene and Hartzell (2011) and Pink (2006) state that when teachers align mindfulness skills with class goals and allow students to talk about beliefs and exchange values with classmates then learning and empathy is enhanced for all members of the group.

Participants also elaborated on the opportunities that were offered by the Honors Program to increase the connection and collaboration between honors students. They presented their social benefits of connecting with others. For example, Emily described her collaboration experience with her classmates, "usually expect collaboration with your classmates that fulfill social need in the classroom. Um, I feel like the classes I've taken in the Honors Program have allowed me to work with other students, such as their yoga class discussion in our class. Atomic Age class, which I'm taking this semester, as well as the global narrative class." "The more students collaborate and communicate, the more they feel they belong to a larger community." (Crowin, Dolan & Graham, 2015, p.6). The literature does address the need for peer collaboration. It is often viewed as a catalyst in the learning process in honors programs. Wai, Lubinski and Benbow (2009) state that enhancing peer collaboration requires adjusting a

learning environment to provide meaningful activities.

In all, the survey and interview findings agreed that the Honors Program offered a variety of social opportunities such as social activities inside and outside classrooms, camping trips, and other social events. This finding corresponds to the literature by Brinkel, Rees, Ruis and Sloots (2015) which stated that one of the standard goals of honors programs is to provide students social support in which they feel less isolated. Graham, Frederick, Byars-Winston, Hunter and Handelsman (2013) state that the opportunities such as students gathering places or events that enable them to work and learn from each other is known as a "learning community"; this kind of learning stimulates intellectual growth and strengthens professional identity.

Additionally, the qualitative data provided other benefits that were not listed in the survey such as early registration and honors contracting. Participants showed their appreciation for this kind of benefits. Ivan, for example, said, "I found those ones were impactful on learning about different things." Also, participants presented that honors program credits AP courses. The literature found the positive impact of AP courses on STEM students' success (Angle, Davis & Redmond-Sanogo, 2016).

## Implications for Practice

This study presents a new lens in the field of Honors education. Previous studies have focused on the holistic thinking of honors students (Gould, 2009; Goldberger, 2012). While the current study contributes to the research to provide STEM gifted and talented students with a holistic experience that meets their academically challenging, creative-productive, and social-emotional needs. These findings add to the literature on STEM students' satisfaction with honors programs regarding needs fulfillment and provides some guidance in honors program development.

The major focus of the current study was to investigate the extent to which the Honors Program addressed the needs of and developed the holistic thinking of gifted and talented students. Student perspectives on the survey and interviews were the only study findings. Students reported important information regarding needs fulfillment. However, conflicting and blended perceptions were reported, especially when participants were asked about whether they were satisfied or not with the Honors Program. Brinkel, Rees, Ruis, and Sloots (2015) suggested that in order to have more feedback about an honors program, key people should be included in the study. These people include students, instructors, coordinators, director, and alumni of the program. The limited results of this study highlight the importance of this recommendation.

This study also examined the relationships among three needs categories: academic challenging, creative-productive, and social-emotional. The relationships between these three variables have not been examined in the literature. Therefore, this study contributes to the research by examining these relationships in relation to students' satisfaction with their honors program experience. In examining the relationship between the three variables, a positive correlation was found between some of the items. However, further inspection revealed that some of the social-emotional needs items related to play sense were negatively associated with creative skills. Pink (2006) found a positive relationship between play sense and developing creativity skills. Since this finding was not consistent with previous literature, these relationships should receive more attention and be viewed cautiously. The intent in sharing this point was to create awareness of the importance of taking small steps to change honors classroom practices to meet all students' needs.

This study identified findings from both qualitative and quantitative data to support this contention. However, the quantitative data provided minimal confirmation of the relationship

between students' educational background and their responses on the survey. Since the relationships identified were poor, this study did not reflect the full picture of the impact of student demographic information on their experience in the Honors Program. Rather, it reflected the perception of STEM students' who have a similar background. This limitation raises additional concerns for future research: do factors such as GPA, race, or ethnicity influence student responses regarding their experiences?" Thus, this study leaves room for exploring other relationships.

As the Honors Program seeks to recruit the best and brightest students, they should be aware that developing talents could further benefit these students. The activities and support provided to students in the honors program should be made more widely available to undergraduate students at an institution. According to Gagne (2009), educators tend to recognize giftedness as a talent that can be found and developed in each person. As mentioned in Chapter one, the U.S. education supports the movement to provide an education of quality for all students. This shift has impacted the programming in honors education to increase opportunities to nourish and support the potential of all students (Moon, 2012). This leaves Honors Programs with an imperative to do more to support all students. Although it can be challenging for Honors faculty to encourage all students to be active and engaged learners, the opportunity for active learning, discussion, and debate need not be restricted to honors classes alone. On a campus level, faculty and staff also can work together to make meaningful changes to the way students learn and encourage them to use program offerings to achieve their academic and personal goals.

The current research Honors Program is a university-wide undergraduate program attempted to serve the whole of students; However, the demographic findings show that the majority of the students enrolled in the program are White and the minority students are less

represented in the program. If Honors Programs can be successful in emphasizing diversity of thought and opinion in the classroom, they should work toward serving all diverse students. The Honors Program faculty and administrators should interpret this finding as an opportunity to redouble recruitment efforts to enhance the diversity of their programs.

In this study, factor analysis was calculated to study intercorrelation between the survey categories. It provided limited information about how the survey items are interrelated. It might be because the research sample ,83 participants, is too small for conducting meaningful factor analysis. Thus, it is recommended in order to do factor analysis, five participants are needed for every item.

Literature related to collecting the demographic information of special social groups reveals that collecting this information at the beginning of an instrument is problematic. Steele and Aronson (1995) state:

> Stereotype threat occurs when cues in the environment make negative stereotypes associated with an individual's group status salient, triggering physiological and psychological processes–including anxiety, negative cognitions and emotions, physiological arousal, and reductions in performance expectations, effort, self-control, and working memory capacity that have detrimental consequences for behavior (p. 1).

Stereotype threats repeatedly reflect that cognition, emotions, and intellectual performance of social groups, such as persons of color or those from low socio-economic status groups, can be particularly sensitive to the situational context in which measurements are usually administered. Since my instrument collects this demographic information at the beginning, it is possible that it was vulnerable to this type of an internal validity threat.

## Recommendations for Future Research

There are several areas that can be suggested for future research based on the current study's findings and other literature. Based on this study's findings, participants clearly appreciated the opportunities offered by the Honors Program; however, they also indicated a need for extra efforts to provide variety of classes and incorporate technology tools and devices in classrooms. For this reason, the primary recommendation is for future researchers to more closely look at the Honors Program curriculum. In-depth analyzation can identify the skills that students need for the Conceptual Age. Designing curricula to meet honors students' needs should be considered for further research.

Since honors program participation is optional, more studies are needed to investigate whether gifted and talented students don't participate because of social and emotional barriers. Jones (2015) and Needham (2012) contended that some gifted students who don't receive opportunities that meet their emotional needs possess a level of emotional sensitivity that sets them apart from others and might prevent them from reaching their academic potential.

Further, one essential topic is missing from the discussion of honors education. Researchers recognize that assessment and evaluation are essential and powerful tools to develop honors education (Driscoll, 2011; Lanier, 2008; Moon, 2012; Wood-Nartker, Hinck & Hullender, 2016). Moon (2012) stated, "classroom assessment is essential in honors classes" (p. 33). The challenge is how to measure students' growth in variety of skills such as critical, creative, and social skills. Tsui (1999) argues that developing honors students' critical thinking requires special measures to judge their growth in the ability to think critically. Thus, there is a need for future research to explore in greater detail the effective methods of assessment in the honors classroom.

Another important point discussed in the literature and less addressed in the current research regards honors instructors' qualifications. Hong, Greene and Higgins (2006) and Needham (2012) pointed out that classroom instructors play an influential role in the educational experience for students' holistic growth. Thus, honors program instructors have to meet preparation standards to be eligible to teach honors classes. I recommend to studying the qualifications necessary for instructors to teach in an honors program.

Last, findings from this study addressed only STEM students' satisfaction with the Honors Program in addressing their needs. The honors program in the current study serves all of the university's students; therefore, further investigation of the program's impact on honors students from different majors is encouraged. Additional research conducted with a larger, more diverse sample might correct the limitations of the current study regarding race/ethnicity and participant major.

## Conclusions

This dissertation opened with statements that creativity is more important than ever and that innovations are built upon a creative mind. In an age of increasing competition within higher education, universities become an investment in one's future; a place to develop creativity as well as for academic growth and social improvement. High-ability students contribute to campuses by providing longstanding benefits to the institutions that include commitment to student organizations, research experiences, community service work, boost for college rankings, and improve institutional reputations. Honors Programs can provide meaningful ways for institutions to harness student energy, encourage active learning and intellectual growth, increase innovation in research and creative efforts, and establish a sense of community. This study was conducted in an effort to make a meaningful contribution to the body of Honors Program

research.

Previous studies in the field have not focused on the development of holistic thinking and honors students' needs fulfillment. This study addressed a gap in honors education research. It offers meaningful insights from the perspectives of honors students regarding their satisfaction with the Honors Program's opportunities. Moreover, it shows a great connection between honors involvement and student experiences with addressing fulfillment of the following needs categories: academically challenging, creative-productive, and social-emotional. Such findings provide confirmation that participation in honors programs can enrich and develop the holistic thinking of honors students.

The findings from this study were reported in relation to the research questions posed. Reliability and validity of the survey scale items were established. An ANOVA repeated measure was used to study the mean differences of the survey. Correlation and factor analysis were used to study the relationships among the three variables: academically challenging needs, creative-productive needs, and social-emotional needs. A mixed-methods sequential design was used to analyze the data. Quantitative and qualitative methods resulted in higher quality of inferences (Tashakkori & Teddlie, 2003) and underscored the elaborative purpose of the mixed-methods sequential explanatory design. In the illustrative study, the quantitative and qualitative phases were connected during the intermediate stage while selecting the participants for the qualitative phase. The second connecting point included developing interview questions for the qualitative data collection phase based on the results acquired during the quantitative data collection phase. In presenting the findings, results from the quantitative and qualitative phases were mixed and integrated during the interpretation of the outcomes for the entire study. Thus, this study adds to understanding the way of interpreting the data based on this design.

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## APPENDIX A

## RECRUITMENT EMAIL

Subject: Research Request

Dear honor student:

My name is Noor Alrajhi, I am a Doctoral Candidate in the Department of Curriculum and Instruction at Southern Illinois University Carbondale.

The purpose of the study is to seek a deeper understanding on the degree that honors programs can address gifted and talented STEM students' needs and develop their holistic thinking. I am also interested in knowing students' satisfaction and perceptions about how their academic and affective needs are addressed in the honors program.

Your e-mail address was obtained from the Honors Program. A blind copy format will be used so that the list of recipients will not appear in the header.

You are invited to participate in this study because you are enrolled in the Honors Program. Since the University Honors Program is designed for gifted and talented students, I am reaching out to you to understand its role in the education of high achieving students like yourselves.

Please find attached a survey that should take approximately 15 minutes. To take part in this study you must be 18 years and older. Doing this survey is completely voluntary and you have the right to withdraw at anytime without penalty. Your responses will remain confidential and will be kept in a password protected, encrypted file, which will be destroyed when I have completed the study. If you do not respond to this survey or return the opt-out message, you will be contacted again with this request twice during the next two weeks, after which your name will be automatically removed from any future mailings. If you participate, I may contact you after you have answered the survey for an interview. However, participation in that as well is completely voluntary.

This survey is part of my doctoral dissertation and your participation is greatly appreciated. If you participate, your email address will be entered into a raffle for one of ten $50 Amazon gift cards. If you win, you may pick up your gift card from SIU Honors Program front desk. Make sure to type your email correctly, to be entered into the raffle.

If you have further questions about this survey you may contact me or my supervising professor, Dr.Grant Miller, Department of Curriculum and Instruction, SIUC, Carbondale, IL

62901. Phone: (618) 453-4250, Email: gmiller@siu.edu

Thank you for taking the time to assist me in this research.

Name: Noor Alrajhi, Phone: (618) 5595007, E-mail: nooor@siu.edu

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

## APPENDIX B

## SURVEY CONSENT FORM

**TITLE OF THE STUDY:**

Addressing the Needs of Gifted and Talented STEM Students Through Holistic Thinking in an Honors Program

**INVESTIGATORS:**

Noor Alrajhi, Doctoral Candidate, Department of Curriculum and Instruction - Southern Illinois University at Carbondale

**PURPOSE OF THE RESEARCH:**

This research seeks on understanding the degree that honors programs can address gifted and talented students' needs and develop their holistic thinking. It also examines students' satisfaction and perceptions about how their academic and affective needs are addressed in the honors program.

**PARTICIPANTS**:

You have been invited to participate in the study because you are studying at the Honors Program at SIUC during the Spring 2019 semester.

**PROCEDURES:**

Your participation in this study will be totally voluntary. As a participant in this study, you will participate by answering the two sections of the survey. Your responses will remain confidential and will be kept in a password protected, encrypted file, which will be destroyed when I have completed the study. If you do not respond to this survey or return the opt-out message, you will be contacted again with this request twice times during the next two weeks, after which your name will be automatically removed from any future mailings. If you participate, you may have a chance to win a $50 Amazon gift cards. If you win, you may pick up your gift card from SIU Honors Program front desk. Make sure to type your email correctly, to be entered into the raffle. Also, I may contact you after you have answered the survey for an interview. However, participation in that as well is completely voluntary.

**CONFIDENTIALITY:**

During the study, you have the right to withdraw at anytime without penalty. Thus, your decision to participate in or withdraw from the study will have no impact on your academic status or standing.
I appreciate your time. I am also more than welcome to share the results with you if you would like to receive and read the data. Thus, I can email you an electronic copy of my paper.

If you have any questions about this study, please feel free to contact my advisor Dr. Grant Miller, or me. Our contact information is listed below:

Dissertation Chair
Grant Miller, PhD
Associate Professor
Southern Illinois University Carbondale
Department of Curriculum and Instruction
618.453.4250
gmiller@siu.edu

Noor Alrajhi
Doctoral Candidate
Southern Illinois University Carbondale
Department of Curriculum and Instruction
6185595007
nooor@siu.edu

If you have any questions regarding your rights please contact SIU office of the IRB through their phone number (618) 453-4533 or via E-mail siuhsc@siu.edu

**Please check the boxes after you read the statements below:**

I confirm that I have read the consent form and have had an opportunity to ask questions to fully understand all written sections.

☐ yes ☐ No

I agree to participate in this study and I understand that my responses will be used for educational

purposes only.

☐ yes ☐ No

……. ……

Signature Date

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, Southern Illinois University, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu

## APPENDIX C

## INTERVIEW CONSENT FORM

**TITLE OF THE STUDY:**

Addressing the Needs of Gifted and Talented STEM Students Through Holistic Thinking in an Honors Program

**INVESTIGATORS:**

Noor Alrajhi, Doctoral Candidate, Department of Curriculum and Instruction - Southern Illinois University at Carbondale

**PURPOSE OF THE RESEARCH:**

This research seeks on understanding the degree that honors programs can address gifted and talented students' needs and develop their holistic thinking. It also examines students' satisfaction and perceptions about how their academic and affective needs are addressed in the honors program.

**PARTICIPANTS**:

You have been invited to participate in the study because you are studying at the Honors Program at SIUC during the Spring 2019 semester.

**PROCEDURES:**

The purpose of the interview is to understand the participants' perspectives about if and how honors classes develop their holistic thinking. The interview will be conducted individually, you will talk about your experiences at Honors Program. The interview will provide an opportunity for you to address your views about the honors program's approaches to meeting the needs gifted and talented students at SIUC. The interview is designed to be flexible, offering opportunities to raise matters you considered to be important, to ask any questions when you do not understand any question fully, and you can skip any questions you do not wish to answer. This interview session will last approximately 35-45 minutes depending on your availability and held in the place of your convenience at SIU Morris library.
All reports based on this research and written by the researcher will maintain the confidentiality of individuals. Only interview data will be reported, and no names will be used.

**CONFIDENTIALITY:**

Participating in the research's interview is completely voluntary and you have the right to withdraw at anytime without penalty. Your participation will be anonymity and you will not be contacted again in the future. Thus, your decision to participate in or withdraw from the study will have no impact on your academic status or standing. Also, in order to keep your personal information confidential, you will select a pseudonym to protect and hide your identity and all your responses will be recorded and remain confidential within reasonable limits. The data, including the audio-records will be locked in a password protected, encrypted file on my personal laptop, and I will be the only one who is able to access the data and listen to the audio-recordings. If you do not want to be audio recorded, you will be eliminated from the interview portion of the study. I may use your responses to conduct further research. If you participate, a $10 Amazon gift card will be applied for each participant.

I appreciate your time. I am also more than welcome to share the results with you if you would like to receive and read the data. Thus, I can email you an electronic copy of my paper.
This interview is part of a doctoral dissertation and your participation is greatly appreciated. If you have further questions about this interview or any questions about this study, please feel free to contact my advisor Dr. Grant Miller, or me. Our contact information is listed below:

| | |
|---|---|
| Dissertation Chair | Noor Alrajhi |
| Grant Miller, PhD | Doctoral Candidate |

Associate Professor
Southern Illinois University Carbondale
Department of Curriculum and Instruction
618.453.4250
gmiller@siu.edu

Southern Illinois University Carbondale
Department of Curriculum and Instruction
6185595007
nooor@siu.edu

If you have any questions regarding your rights please contact SIU office of the IRB through their phone number (618) 453-4533 or via E-mail siuhsc@siu.edu

**Please check the boxes after you read the statements below:**

I confirm that I have read the consent form and have had an opportunity to ask questions to fully understand all written sections.

☐ yes ☐ No

I agree to participate in this study, and I understand that my answers will be audio-recorded.

☐ yes ☐ No

I agree and understand that my responses will be quoted in the study without revealing my identity in this study

☐ yes ☐ No

……. ……

Signature Date

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, Southern Illinois University, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu

## APPENDIX D

## INSTITUTION CONSENT FORM

**To:** The University Honors Program at SIUC
**From:** Noor Arajhi

My name is Noor Alrajhi, I am a Doctoral Candidate in the Department of Curriculum and Instruction at Southern Illinois University Carbondale. I hope to conduct research in the Honors Program to address the needs of gifted and talented students through holistic thinking in this Program

**PURPOSE OF THE RESEARCH:**

This research seeks on understanding the degree that honors programs can address gifted and talented students' needs and develop their holistic thinking. It also examines students' satisfaction and perceptions about how their academic and affective needs are addressed in the honors program.

**DATA I NEED TO COLLECT:**

In order to know the extent that honors program meets the need of gifted and talented students, I will need to collect the following data: 1) survey, and 2) interview.

**IS THERE ANY RISK INVOLVED?**

I do not foresee any risk concerning anyone's participation in this study. Rather, it is my intent that they benefit from this experience since the University Honors Program is designed for that purpose to meets the needs of gifted students on our campus. It is possible that statements participants make or ideas they present will be attributable to them, however, I will take all reasonable steps to reduce this risk and protect their identity in all published reports or papers resulting from this study. No one will be identified by name in anything I present or write about this study. Instead, I will use pseudonyms for all participants, including the name of this university. Names will not remain on any of the data I collect, so even if someone were to gain access to these sources, they would not be able to identify anyone by name. I will assign all participants a code that will be attached to all data that refers to them. I am the only one who will have access to this collected information. The code list will be kept in a secure location separate from the data I collect and will be destroyed when I have completed this study.

I am more than welcome to share the results with you if you would like to receive and read the data. Thus, I can email you an electronic copy of my paper. If you have any questions about this study, please feel free to contact my advisor Dr. Grant Miller, or me. Our contact information is listed below:

| | |
|---|---|
| Dissertation Chair | Noor Alrajhi |
| Grant Miller, PhD | Doctoral Candidate |

Associate Professor
Southern Illinois University Carbondale
Department of Curriculum and Instruction
618.453.4250
gmiller@siu.edu

Southern Illinois University Carbondale
Department of Curriculum and Instruction
6185595007
nooor@siu.edu

If you have any questions regarding your rights please contact SIU office of the IRB through their phone number (618) 453-4533 or via E-mail siuhsc@siu.edu

**Please check the boxes after you read the statements below:**

I confirm that I have read the institution consent form and have had an opportunity to ask questions to fully understand all written sections.

☐ yes ☐ No

I give permission to Noor Alrajhi to collect the data stated on the institution consent form for the purpose of her research.

☐ yes ☐ No

I understand that a copy of the institution consent form will be made available to me for the relevant information and phone numbers.

……. ……

Administrator's Signature Date

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, Southern Illinois University, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail siuhsc@siu.edu

## APPENDIX E

## SURVEY PROTOCOL

## A FIRST VERSION

**Section I**

**University Email Address (Required)**

……

**Demographic and Educational Information**

**1. Gender**

Male Female Other preferred not respond

**2. Year of University you are in (Student's Classification)**

Freshman Sophomore Junior Senior

**3. University major**

……

**4. Year of start participating in Honor Program**

2015 2016 2017 2018 2019

**5. Credit hours you completed at Honor Program**
**……**

**6. Credit hours you completed at Honor Program**
……

**7. University GPA (Optional)**
……..

**8. Name specific research, project, or creative product you have conducted**
……..

**Section II**

The following survey has (36) items. You will respond to each item by rating your opinion on the following 5-point scale: *(1) Not at all, (2) At times, (3) Regularly, (4) Very often Beyond all my expectations, (5) N/A*. Your full completion of all survey's items will be appreciated.

**Survey of Gifted and Talented Students' Needs**

| Gifted and Talented Students' Needs | skills | Items | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| Academically challenging needs<br><br>**In my Honor seminar classes, I have the opportunity to:** | Cognitive thinking skills | Make judgment about the value of information, arguments, methods* | | | | | |
| | | Analyze basic elements of ideas, experiences, theories* | | | | | |
| | Critical thinking skills | Engage in complex open-ended tasks | | | | | |
| | | Solve complex world problems | | | | | |
| | | Work effectively with others* | | | | | |
| | | Learn effectively on my own* | | | | | |
| | | Apply disciplinary based on higher order thinking skills (analyzing, evaluating, creating) | | | | | |
| | | Select and organize evidence to support critical argument | | | | | |
| | Symphony sense skills | Find multiple solutions to the same problem | | | | | |
| | | link unconnected elements to create something new | | | | | |
| | | Demonstrate brainstorming skills to elicit multiple options and blended solutions | | | | | |
| | | Visualize complex problems to understand relationships and devise solutions | | | | | |
| | | Synthesize complex information* | | | | | |
| Creative-productive needs<br><br>**In my Honor classes, I have the opportunity to:** | Creative thinking skills | Read extra books and other subject-related materials | | | | | |
| | | Test complex issues in science and arts | | | | | |
| | | Answer open-ended questions with "6 W" (Why, What, Where, Who, When and How)* | | | | | |
| | Design sense skills | Participate in activities that are align with my interest | | | | | |
| | | Participate in activities that are full of imagination | | | | | |
| | | Develop artistic sensibility through class activities | | | | | |
| | | Have adequate time for in-depth thinking | | | | | |
| | Story sense skills | Examine the strength of my own views* | | | | | |
| | | Share narrative stories with classmates | | | | | |
| | | Create stories that have emotional content with classmates | | | | | |
| | | Produce divergent solutions not a single answer to the problem | | | | | |
| Social and emotional needs | Empathy sense skill | Understand my own feelings and others' feelings | | | | | |
| | | Respond to the needs of others | | | | | |
| | | Volunteer on the campus and community | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **The University Honors Program creates opportunities for me to opportunity to:** | Play sense skills | Participate in social activities such as field trips | | | | | |
| | | Involve myself in activities that have a greater sense of fun and joyfulness | | | | | |
| | | Utilize games to solve content-related problems | | | | | |
| | | Practice physical activities | | | | | |
| | Meaning sense skills | Discuss the obstacles that are standing in my way with classmates and faculties | | | | | |
| | | Interact with faculty and staff members* | | | | | |
| | | Participate in cooperative learning environment inside and outside of class | | | | | |
| | | Take part in mindful conversations with classmates* | | | | | |
| | | Criticize my perception about others as anew knowledge is acquired | | | | | |

- Adapted from Moon (2012), Lanier (2008).

## A COMPLETE VERSION

**Section I**

**Demographic and Educational Information**

**1. Gender**
Male Female Other prefer not to respond

**2. Race/ ethnicity**
Black/African American White Asian Latinx Two or more Other

**3. Year of University you are in (Student's Classification)**

Freshman Sophomore Junior Senior

**4. University major**

(Science, Technology, Engineer, Math)

**5. Year of start participating in Honor Program**

2015 2016 2017 2018 2019

**6. Credit hours you completed at the academic major**
**……**

**7. Credit hours you completed at Honor Program**
……

**8. University GPA (Optional)**
……..

**9. Name specific research, project, or creative product you have conducted**
……..

**10. Received a Pell grant**
Yes No

**University Email Address (Required)**

……
**Section II**
**Survey of Gifted and Talented Students' Needs**

| Gifted and Talented Students' Needs | Items | Not at all<br>1 | At times<br>2 | Regularly<br>3 | Very often Beyond all my expectations<br>4 | N/A<br>5 |
|---|---|---|---|---|---|---|
| Academically challenging needs<br><br>In my Honor seminar classes, I have the opportunity to: | Make judgment about the value of information, arguments, methods* | | | | | |
| | Analyze basic elements of ideas, experiences, theories* | | | | | |
| | Engage in complex open-ended discussion and writing | | | | | |
| | Solve complex world problems | | | | | |
| | Work effectively with others* | | | | | |
| | Learn effectively on my own* | | | | | |
| | Select and organize evidence to support critical arguments | | | | | |
| | Find multiple solutions to the same problem | | | | | |
| | link apparently unconnected elements to create something new understanding | | | | | |
| | Visualize complex problems to understand relationships and devise solutions | | | | | |
| | Synthesize complex information* | | | | | |
| Creative-productive needs<br><br>In my Honor classes, I have the opportunity to: | Research the subject matter beyond assigned texts | | | | | |
| | Test complex issues in the science and arts | | | | | |
| | Answer open-ended questions with "6 W" (Why, What, Where, Who, When and How)* | | | | | |
| | Participate in activities that are aligned with my interest | | | | | |
| | Participate in activities that are full of imagination | | | | | |
| | Develop artistic sensibility through class activities | | | | | |
| | Have adequate time for in-depth thinking | | | | | |
| | Examine the strength of my own views* | | | | | |
| | Share narrative stories that share my experience with my classmates | | | | | |
| | Produce divergent solutions not only a single answer to the problem | | | | | |
| Social emotional needs<br><br>The University Honors Program creates opportunities | Understand my own and others' feelings | | | | | |
| | Respond to the needs of others | | | | | |
| | Volunteer on the campus and community | | | | | |
| | Participate in social activities such as field trips | | | | | |
| | Get involved in fun and joyful activities | | | | | |
| | Utilize electronic games to solve content-related problems | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| for me to | Take part in physical activities | | | | | |
| | Discuss the obstacles that are standing in my way with classmates and faculty | | | | | |
| | Interact with faculty and staff members* | | | | | |
| | Participate in cooperative learning environments inside and outside of class | | | | | |
| | Take part in mindful conversations with classmates* | | | | | |
| | Change my first perceptions or assumption with time | | | | | |

## APPENDIX F

## INTERVIEW PROTOCOL

**Section I**

**Demographic and Educational Information**

**1. Gender**
Male Female Other prefer not to respond

**2. Race/ ethnicity**
Black/African American White Asian Latinx Two or more Other

**3. Year of University you are in (Student's Classification)**

Freshman Sophomore Junior Senior

**4. University major**

(Science, Technology, Engineer, Math)

**5. Year of start participating in Honor Program**

2015 2016 2017 2018 2019

**6. Credit hours you completed at the academic major**
**……**

**7. Credit hours you completed at Honor Program**
……

**8. University GPA (Optional)**
……..

**9. Name specific research, project, or creative product you have conducted**
……..
**10. Received a Pell grant**
Yes No

**University Email Address (Required)**

……

## Section II
## Interview Questions

| | | | |
|---|---|---|---|
| Overall | **All three groups** | | |
| | Tell me about your overall experience with the Honors Program? | | |
| Definition | **All three groups** | | |
| | **Academic challenging** | **Creative productive** | **Social emotional** |
| | A major focus in the survey in academic needs were make judgment about the value of information, arguments, methods; and synthesize complex information. How do you define academic needs? What does that mean to you? | A major focus in the survey in creative productive needs were research the subject matter beyond assigned texts; and produce divergent solution not only a single answer to the problem. How do you define creative productive needs? What does that mean to you? | A major focus in the survey in social emotional needs were understand my own and others' feelings; and change my first perceptions or assumption with time and new knowledge. How do you define social emotional needs? What does that mean to you? |
| Details & Examples | Positive Experience group only who have an average >3.59 in all needs | | |
| | Academic needs included items about engage in complex open-ended discussion and writing; analyze basic elements of ideas, experiences, theories; and learn effectively on my own. You tended to note that you had a lot of opportunities to do so, what can you tell me about these opportunities? Probe: which class, which topic, what activity? | Creative needs included items about have adequate time for in-depth thinking; examine the strength of my own view; and research the subject matter beyond assigned texts. You tended to note that you had a lot of opportunities to do so, what can you tell me about these opportunities? Probe: which class, which topic, what activity? | Social needs included items about volunteer on the campus and community; interact with faculty and staff members; and take part in mindful conversations with classmates. You tended to note that you had a lot of opportunities to do so, what can you tell me about these opportunities? Probe: which class, which topic, what activity? |
| Significant | Positive Experience group who have an average >3.59 in all needs | | |
| | To what extent have those opportunities been important in your education? (e.g. solve world complex problems) would you like more? How? | To what extent have those opportunities been important in your education? (e.g. develop artistic sensibility through class activities) would you like more? How? | To what extent have those opportunities been important in your education? (e.g. utilize electronic games to solve content-related problems) would you like more? How? |
| Relationships among items | Moderate group who have low experience in one or two categories (average<1.99 in one or two) | | |
| | (Low ex. in CP and SE) Fewer opportunities for creative and social needs, are these important? Why? | (Low ex. in AC and SE) Fewer opportunities for academic and social needs, are these important? Why? | (Low ex. in AC and CP) Fewer opportunities for academic and creative needs, are these important? Why? |
| | A lot of opportunities for creative and social needs, are these important? Why? | A lot of opportunities for academic and social needs, are these important? Why? | A lot of opportunities for academic and creative needs, are these important? Why? |
| | Poor experience group who have an average <1.99 in all three needs | | |
| | Fewer opportunities for academic, creative, and social needs, are these important? Why? | | |
| | A lot of opportunities for academic, creative, and social needs, are these important? Why? | | |
| | **All three groups** | | |
| | Fewer opportunities for item 29 is important? Utilize electronic games to solve content related problems. | Fewer opportunities for item 29 is important? Utilize electronic games to solve content related problems. | Fewer opportunities for item 29 is important? Utilize electronic games to solve content related problems. |
| End overall | **All three groups** | | |

# VITA

Graduate School
Southern Illinois University

Noor Alrajhi

ssn0ssn@gmail.com

Umm Al-Qura University, Saudi Arabia, Makkah
Bachelor of Science, Chemistry, March 2000

Umm Al-Qura University, Saudi Arabia, Makkah
Master of Science in Curriculum and Instruction, April 2006

Dissertation Paper Title:
Addressing the Needs of Gifted and Talented STEM Students Through Holistic Thinking in an Honors Program

Major Professor: Dr. Grant Miller