

---

Theses and Dissertations

---

Fall 2010

# The impact of recognition on talent award winners: a follow-up study of Davidson Fellows Scholarship winners

Samuel Joseph Shepard  
*University of Iowa*

Copyright 2010 Samuel Shepard

This dissertation is available at Iowa Research Online: <http://ir.uiowa.edu/etd/883>

---

## Recommended Citation

Shepard, Samuel Joseph. "The impact of recognition on talent award winners: a follow-up study of Davidson Fellows Scholarship winners." PhD (Doctor of Philosophy) thesis, University of Iowa, 2010.  
<http://ir.uiowa.edu/etd/883>.

---

Follow this and additional works at: <http://ir.uiowa.edu/etd>

 Part of the [Educational Psychology Commons](#)

THE IMPACT OF RECOGNITION ON TALENT AWARD WINNERS: A FOLLOW-  
UP STUDY OF DAVIDSON FELLOWS SCHOLARSHIP WINNERS

by

Samuel Joseph Shepard

An Abstract

Of a thesis submitted in partial fulfillment of the requirements for the Doctor of  
Philosophy degree in Psychological and Quantitative Foundations (Counseling  
Psychology) in the Graduate College of The University of Iowa

December 2010

Thesis Supervisors: Professor John S. Westefeld  
Professor Susan G. Assouline

## ABSTRACT

The present study examined the impact of recognition on a group of talent award winners, including attributions for success and the consequences of these attributions for continued engagement in the talent field. Participants were winners of the Davidson Fellows Scholarship, which recognizes students under the age of 18 who have completed a significant piece of original work in the fields of science, technology, mathematics, music, literature, or philosophy. The study used survey data collected from Davidson Fellows who received an award between 2001-2007. Descriptive statistics revealed that the majority of participants (70.5%) were still clearly engaged in the field in which they received the award. Participants in the fields of science, math, and technology showed more evidence of continued engagement than participants in the fields of music, literature, or philosophy. Females were found to have higher rates of continued engagement than males.

The constant comparative method was used to qualitatively examine participants' responses to open-ended questions regarding the perceived impact of the award on their personal, academic, artistic, and professional lives. The qualitative analysis revealed 12 distinct categories of impact: Financial Support, Opened Doors, Personal Satisfaction, Validation, Recognition by Others, Reinforcement/Encouragement, Increased Confidence, Increased Pressure/Responsibility, Meaningful Connections, Process Gains, Miscellaneous, and Little to No Impact. These categories indicated receiving a Davidson Fellows Scholarship had a positive impact on participants across a variety of life domains.

Attributions of success related to winning the award were measured with regard to the extent to which participants endorsed stable, internal attributions (i.e., aptitude) and unstable, external attributions (i.e., resources). Overall, male and female participants did not differ significantly in their endorsement of aptitude-based or resource-based attributions of success. However, among participants in the fields of science, math, and

technology, males had significantly stronger endorsement aptitude-based attributions, while females had significantly stronger resource-based attributions. Despite these differences, these attributional patterns did not predict continued engagement in these fields. However, among participants in the fields of music, literature, and philosophy, aptitude- and resource-based attributions predicted 22% of the variance in continued engagement. In the overall sample, attributions of success did not predict continued engagement. Finally, no significant group differences were found with regard to attributions of success across all talent domains.

Abstract Approved:

---

Thesis Supervisor

---

Title and Department

---

Date

---

Thesis Supervisor

---

Title and Department

---

Date

THE IMPACT OF RECOGNITION ON TALENT AWARD WINNERS: A FOLLOW-  
UP STUDY OF DAVIDSON FELLOWS SCHOLARSHIP WINNERS

by

Samuel Joseph Shepard

A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy  
degree in Psychological and Quantitative Foundations (Counseling Psychology) in the  
Graduate College of The University of Iowa

December 2010

Thesis Supervisors: Professor John S. Westefeld  
Professor Susan G. Assouline

Graduate College  
The University of Iowa  
Iowa City, Iowa

CERTIFICATE OF APPROVAL

---

PH.D. THESIS

---

This is to certify that the Ph.D. thesis of

Samuel Joseph Shepard

has been approved by the Examining Committee for the thesis requirement for the Doctor of Philosophy degree in Psychological and Quantitative Foundations (Counseling Psychology) at the December 2010 graduation.

Thesis Committee:

\_\_\_\_\_  
John S. Westefeld, Thesis Supervisor

\_\_\_\_\_  
Susan G. Assouline, Thesis Supervisor

\_\_\_\_\_  
Nicholas Colangelo

\_\_\_\_\_  
Megan Foley Nicpon

\_\_\_\_\_  
Andrew Ho

To my parents, Jack and Martha Shepard, for all their love and support,

And,

To my wife, Keisha, for embarking on this graduate school journey with me without proper informed consent of all it would entail.

## ACKNOWLEDGMENTS

This project would not have been possible without the help and support of several individuals. My advisor, John Westefeld, has been an outstanding mentor and guide ever since the first day I entered the program. I could not have imagined a more perfect fit with an advisor than what I found with John. I also owe a huge debt to Susan Assouline, Megan Foley Nicpon, and Nick Colangelo, for welcoming me into the Belin-Blank Center and the field of gifted education and talent development with enthusiasm and open arms. Susan and Nick were also instrumental in allowing me access to the amazing group of Davidson Fellows who were surveyed here. Thanks is also owed in this respect to the Davidsons themselves—though we have never met, I thank you both for all the wonderful work you do on behalf of gifted and talented students, and for allowing myself and the Belin-Blank Center to be a part of it. Andrew Ho was an incredible help with the statistics seen here—thank you, Andrew, for being a patient and wonderful teacher even when I asked statistical questions that a 3rd grader probably could have figured out on their own. I would also like to thank Kathy Schuh for consulting on the qualitative methodology, and Alissa Doobay for her help with coding and peer review. Finally, thank you to all my family and friends who ever offered an encouraging word or allowed me to vent during this process.



## ABSTRACT

The present study examined the impact of recognition on a group of talent award winners, including attributions for success and the consequences of these attributions for continued engagement in the talent field. Participants were winners of the Davidson Fellows Scholarship, which recognizes students under the age of 18 who have completed a significant piece of original work in the fields of science, technology, mathematics, music, literature, or philosophy. The study used survey data collected from Davidson Fellows who received an award between 2001-2007. Descriptive statistics revealed that the majority of participants (70.5%) were still clearly engaged in the field in which they received the award. Participants in the fields of science, math, and technology showed more evidence of continued engagement than participants in the fields of music, literature, or philosophy. Females were found to have higher rates of continued engagement than males.

The constant comparative method was used to qualitatively examine participants' responses to open-ended questions regarding the perceived impact of the award on their personal, academic, artistic, and professional lives. The qualitative analysis revealed 12 distinct categories of impact: Financial Support, Opened Doors, Personal Satisfaction, Validation, Recognition by Others, Reinforcement/Encouragement, Increased Confidence, Increased Pressure/Responsibility, Meaningful Connections, Process Gains, Miscellaneous, and Little to No Impact. These categories indicated receiving a Davidson Fellows Scholarship had a positive impact on participants across a variety of life domains.

Attributions of success related to winning the award were measured with regard to the extent to which participants endorsed stable, internal attributions (i.e., aptitude) and unstable, external attributions (i.e., resources). Overall, male and female participants did not differ significantly in their endorsement of aptitude-based or resource-based attributions of success. However, among participants in the fields of science, math, and

technology, males had significantly stronger endorsement aptitude-based attributions, while females had significantly stronger resource-based attributions. Despite these differences, these attributional patterns did not predict continued engagement in these fields. However, among participants in the fields of music, literature, and philosophy, aptitude- and resource-based attributions predicted 22% of the variance in continued engagement. In the overall sample, attributions of success did not predict continued engagement. Finally, no significant group differences were found with regard to attributions of success across all talent domains.

## TABLE OF CONTENTS

LIST OF TABLES.....	vii
CHAPTER 1: INTRODUCTION.....	1
Definition of Terms.....	2
Positive Psychology.....	3
Talent Development.....	4
Impact of Award Winning.....	5
Attribution Theory.....	6
Purpose and Significance of the Present Study.....	7
Research Questions.....	8
CHAPTER 2: REVIEW OF THE LITERATURE.....	9
Positive Psychology.....	9
Gifted and Talented Students.....	11
Attributions of Success.....	19
Impact of Award Winning.....	26
Summary of the Literature.....	33
Research Questions.....	34
CHAPTER 3: METHODOLOGY.....	35
Participants.....	35
Measures.....	38
Procedures.....	42
CHAPTER 4: RESULTS.....	47
Qualitative Results.....	47
Quantitative Results.....	54
Summary of Results.....	58
CHAPTER 5: DISCUSSION.....	60
Comments on the Sample.....	60
Impact of Recognition.....	62
Continued Engagement.....	66
Attributions of Success.....	69
Limitations of the Study.....	73
Conclusion.....	75
REFERENCES.....	77
APPENDIX: DAVIDSON FELLOWS FOLLOW-UP SURVEY.....	81

## LIST OF TABLES

### Table

1.	Comparison of Study Sample to the Population of Davidson Fellows.....	37
2.	Classification of Attributions of Success on the Davidson Fellowship Follow-up Survey.....	40
3.	Example of Continued Engagement Coding.....	42
4.	Qualitative Categories and Subcategories.....	47
5.	Continued Engagement Scores for Overall Sample, with a Comparison of SMT and non-SMT Groups.....	55
6.	Gender Comparison of Continued Engagement Scores.....	55
7.	Comparison of Continued Engagement Findings with Previous Studies of TAWs.....	66
8.	Table 8. Two-tailed Pearson Correlations between Continued Engagement and Demographic Variables.....	75

## CHAPTER 1: INTRODUCTION

Recognizing and rewarding the achievements of students is not a new idea. For decades, elementary teachers have handed out gold stars, high schools have placed students on honor rolls, and universities have published dean's lists to honor the accomplishments of students. For highly talented and motivated individuals, opportunities to pursue skills and interests outside of the formal educational curriculum have typically involved a component of competition and recognition as well, such as science fairs and essay contests.

For gifted young people, national talent competitions offer the chance to be recognized as an eminent young contributor to an established field of study. These awards often involve nationwide exposure, and include monetary prizes such as scholarships and grants. For instance, since 1942, the Intel Science Talent Search (formerly sponsored by Westinghouse), has been recognizing and rewarding high school seniors who have completed original research projects in science or mathematics (Society for Science & the Public, 2008). Currently, the 40 award finalists receive scholarships ranging from \$5,000 to the top prize of a \$100,000 four-year scholarship. The Davidson Fellows Scholarship, another prestigious, national talent award competition, was founded in 2001. This award recognizes students under the age of 18 who have completed a significant piece of work that has the potential to make a positive contribution to society in one of the following areas: science, technology, mathematics, music, literature, philosophy, or any other graduate-level work (Davidson Institute for Talent Development, 2008). Multiple Davidson Fellows are named each year, and receive scholarships of \$50,000, \$25,000, or \$10,000.

Despite the availability of these national talent competitions, and the significant financial commitment that each foundation has made to recognizing highly gifted students, little research has been done to examine the impact of recognition on these students. This study will explore this issue by asking previous winners of the Davidson

Fellows Scholarship about the impact that this award has had on their lives. In addition, this study will ask these award winners about their current and future educational and career goals, and investigate how these may be impacted by the way in which these individuals attribute their success in winning the award.

#### Definition of Terms

##### *Gifted and Talented*

In the field of gifted education, a document commonly referred to as the Marland Report (U.S. Department of Health, Education, and Welfare, 1972) established a federal definition of giftedness. For the purposes of this study, the terms “gifted” and “talented” will be used synonymously to refer to students who meet this definition. According to the Marland Report, gifted and talented children are defined as persons who, by virtue of outstanding abilities, are capable of high performance. This definition was also extended to children who demonstrated achievement and/or potential ability in any of the following areas: 1) general intellectual ability; 2) specific academic aptitude; 3) creative or productive thinking; 4) leadership ability; 5) visual and performing arts; and 6) psychomotor ability.

##### *Talent Award Winner*

In order to adequately distinguish this study’s target population from other groups of gifted and talented individuals, a unique label must be created. For the purposes of this study, the term “talent award winner” (TAW) will be used to refer to any individual who has been nationally recognized for a significant and unique contribution to an established field of study before graduating from high school. This term is meant to include winners of competitions such as the Davidson Fellows Scholarship and Intel Science Talent Search, as well as other competitions with similarly rigorous standards. While a variety of labels have been used previously to describe this population, such as “prodigious,” “eminent,” and “profoundly gifted,” these terms have also been used elsewhere in the gifted literature to refer to students who have not been judged to make a significant

contribution to a field at an early age. As a result, the term “talent award winner” was chosen to more clearly reflect the unique accomplishments of this population.

#### *SMT and Non-SMT*

Unlike the Intel Science Talent Search, the Davidson Fellows Scholarship is open to submissions from the arts and humanities as well as science and mathematics. As a result, the current study is able to compare the experiences of these two broad talent populations. For ease of reading, a shorthand term is needed to differentiate these two groups. Throughout the current study, the term “SMT” will be used to refer to a talent award winner who received an award in science, mathematics, or technology. Conversely, the term “non-SMT” will be used to refer to TAWs in the fields of music, literature, and philosophy.

#### Positive Psychology

Why is it important for counseling psychologists to study the experiences of talent award winners? While contemporary psychology is primarily concerned with mental illness and psychopathology, there are many in the field who feel that psychologists should also be interested in people’s strengths, accomplishments, and positive experiences (Seligman & Csikszentmihalyi, 2000). This movement within the field has been referred to as positive psychology.

While positive psychology has received an increasing amount of attention ever since Martin Seligman made it a key component of his 1998 American Psychological Association Presidential Address (Seligman, 1999), it can originally be traced back to early psychological tradition. Prior to World War II, the field psychology had three distinct missions: treating mental illness, making peoples’ lives more productive and fulfilling, and identifying and nurturing gifts and talent (Seligman & Csikszentmihalyi, 2000). After WWII, the field began to adopt a disease model similar to the medical profession, and has since concerned itself primarily with treating mental illness. Proponents of positive psychology acknowledge the tremendous importance of

continuing to treat mental illness, while encouraging the field to simultaneously devote attention to the study of pleasurable activities, individual strengths, and the development of gifts and talent. In this way, the focus of positive psychology on the entirety of the human experience is very consistent with counseling psychology's historical focus on personal strengths and assets (Lopez et al., 2006).

### Talent Development

Most gifted children do not go on to become eminent adults (Winner, 2000). Many may go on to be an expert in their field, or find creative or novel solutions to problems, but few revolutionize their talent domain or create a new domain. More and more, researchers in gifted education are realizing that even highly talented students need guidance, nurturing, and appropriate challenges and educational interventions to reach their full potential; innate ability by itself is not enough.

Research into talent development has pointed to the importance of three major factors—motivation, creativity, and support. With regard to motivation, both internal and external sources of motivation have been found to contribute to the development of talent in young people (Greenspan, Solomon, & Gardner, 2004), including internal drive and passion (Winner, 2000) and financial and status rewards (Csikzentmihalyi, Rathunde, & Whalen, 1993). While talent competitions such as the Davidson Fellows Scholarship offer obvious external rewards, such as scholarship money and publicity, it is unclear how these factors influence the award winners. It is also unclear how this type of talent recognition impacts the internal motivation of these students.

Creativity is also evident in talent award winners, such as Davidson Fellows. The type of creative behavior displayed by these students is commonly referred to as “big-c” creativity, which refers to innovation that significantly influences or alters a field of study, or that creates a new field altogether (Winner, 2000) This level of creativity is thought to appear in less than 1% of the population, and includes accomplishments such as composing a symphony, making a significant scientific discovery, or completing a



previously unsolved mathematical proof. “Small-c” creativity, on the other hand, refers to “everyday” creativity, such as finding a new way of solving a problem or performing a task.

Finally, support from a variety of sources has been identified as a key component in the talent development process. Highly talented students are rarely able to find appropriate challenges in their local school systems (Colangelo, Assouline, & Gross, 2004). As a result, families of eminent individuals often report having to use their own resources—including time, energy, and money—to provide appropriate challenges and opportunities (Bloom, 1985). In addition, as a child’s talent level increases, fewer and fewer coaches, mentors, and instructors are able to meet their needs, which often requires an additional effort on the part of the child’s family to connect them with these resources.

The present study will attempt to contribute to the talent development literature by examining the role that recognition plays in the talent development process. In particular, this study will ask students directly about the impact of being awarded a Davidson Fellows Scholarship and being recognized as a highly talented individual. This study will also consider how the impact of recognition may differ across different talent fields. For instance, is the impact of a Davidson Fellows Scholarship the same for young scientists as it is for young musicians?

#### Impact of Award Winning

Very little research exists on the impact of prestigious talent awards on gifted students. In fact, only one line of research has extensively studied a group of young talent award winners (Subotnik, 1988; Subotnik & Steiner, 1993). These studies involved winners of the 1983 Westinghouse Science Talent Search, and focused primarily on aspects of science education and qualities of successful scientists. However, one study (Subotnik & Steiner, 1993) found that nearly all of the students in this award group reported that recognition by the Westinghouse Science Talent Search did not impact how they were treated academically when they arrived at college. However, no other aspects

of academic impact were reported, and participants were not asked to discuss the personal impact of winning the award. This study was also limited to the field of science, and thus did not address how students from other talent domains may be impacted by this type of recognition.

### Attribution Theory

In addition to considering the general educational and career impact of recognition on talent award winners, this study will also examine how the attributions of success made by these individuals relate to their continued engagement in their talent field. Attribution theory holds that differences in ascribing causality can have significant consequences for students' expectations for the future, which will impact achievement motivation (Schunk, Pintrich, & Meece, 2008). Weiner (1974) originally proposed that the way in which individuals attribute success or failure in a domain may determine their likelihood of future engagement in that domain. Since that time, research has indicated that the stability of attributions is the dimension most closely linked to future expectations for success (Schunk et al., 2008). According to attribution theory, attributions to unstable factors, such as effort and luck, imply that future outcomes may differ from the prior outcome (Weiner, 1974; 1986). Thus, when attributing success to an unstable source, failure is more readily considered to be a possible outcome of future efforts, which may lead to decreased motivation. Conversely, attributions to stable factors, such as ability, lead to expectations of similar results in the future. Thus, when one succeeds and attributes the success to ability, one would expect success in future related endeavors and be more motivated to stay engaged in these activities.

In extending attribution theory to gifted education, Heller and Ziegler (1996; 2001) proposed that attributional styles may relate to underachievement and disengagement among gifted students, particularly gifted females. These researchers point out that gifted females are more likely to attribute success in domains typically dominated by males—such as science, mathematics, and technology—to unstable factors,

such as effort and luck (e.g., Assouline, Colangelo, Ihrig, & Forstadt, 2006; Subotnik, 1988). As a result, these gifted and talented female students may place less emphasis on their ability in these domains, which may discourage them from future challenges, learning opportunities, or even careers within these fields.

The present study will examine the extent to which attributional styles predict participant engagement in the talent field for which they were awarded the Davidson Fellows Scholarship. In addition, particular attention will be paid to the attributional styles of female award winners in the fields of science, mathematics, and technology. The attributional styles of these females will be compared to those of the male award winners in these fields to further contribute to the literature on the impact of gender and talent domain on attributions of success.

#### Purpose and Significance of the Present Study

The purpose of this study is to better understand the impact of recognition on highly talented students. This study will examine multiple aspects of the impact of winning a talent award. First, through the use of open-ended questions and qualitative methodology, it will explore participants' perceptions of the personal, academic, artistic, and professional impact of winning a talent award. Then, it will examine how attributions of success contribute to the impact of recognition. In addition to learning more about how talent award winners attribute their success, the present study will investigate if attributional patterns can predict whether a student will continue to be engaged in the talent field for which they were recognized.

No previous studies have directly set out to examine the impact of talent award recognition on gifted and talented students. While high-profile talent competitions such as the Davidson Fellows Scholarship and the Intel Science Talent Search have sought to reward and recognize students for their contributions to various fields of study, it is unknown exactly how this form of recognition impacts these students. It is hoped that this

study will provide valuable information for individuals and institutions that work with and serve these talent award winners.

### Research Questions

In order to address the aforementioned gaps in the literature on talent aware winners, the following research questions will be addressed in the current study:

1. How do talent award winners describe the impact of receiving the award?
2. Do attributions of success for receiving a talent award differ significantly across talent domains? That is, are talent award winners in some domains more likely to attribute their success to stable, internal factors than unstable, external factors?
3. Do gender differences exist in the attributions of success made by talent award winners? That is, across all talent domains, are males or females more likely to attribute their success to stable, internal factors rather than unstable, external factors?
4. Among talent award winners in the domains of science, math, and technology, are males more likely to attribute their success to stable, internal factors than females?
5. Among talent award winners in the domains of science, math, and technology, are females more likely to attribute their success to unstable, external factors than males?
6. Among female talent award winners in the domains of science, math, and technology, does attributional style predict future engagement in these domains? That is, are female talent award winners in these domains who more strongly endorse stable, internal attributions of success more likely to have education and career goals in these domains?
7. Across all talent domains, does attributional style predict the degree of continued engagement in the talent domain for which the award was won?

## CHAPTER 2: REVIEW OF THE LITERATURE

This section will provide a thorough review of research relevant to the present study. First, a review of positive psychology will highlight the importance of studying highly talented individuals. Next, the gifted and talented population will be introduced, followed by a review of the research on talent development in this population. Then, the literature on attribution theory will be discussed, with a focus on gifted and talented students' attributions of success, gender and talent domain differences in attributions of success, and the potential consequences of different attributional styles for this population. Finally, research on talent award winners will be examined.

### Positive Psychology

Positive psychology refers to a movement within psychology that is focused on positive experiences and personal strengths rather than psychopathology (Seligman, 1999; Seligman & Csikszentmihalyi, 2000; Seligman & Pawelski, 2003). Positive psychology is not a new movement, but instead has its roots in early psychological tradition. As Seligman and Csikszentmihalyi (2000) note, prior to World War II (WWII), the field of psychology had three distinct missions: treating mental illness, making peoples' lives more productive and fulfilling, and identifying and nurturing gifts and talent. Since WWII, the profession has largely adopted a disease model similar to the one used in the medical profession. Psychology has since concerned itself primarily with treating mental illness, with far less emphasis placed on the goals of improving the lives of all individuals, fostering individual strengths, and developing the abilities of gifted and talented individuals.

Positive psychology began with Martin Seligman's 1998 American Psychological Association Presidential Address (Seligman, 1999). At that time, he argued that psychology was more than just an extension of medicine or a branch of the health care system, and challenged that the mission of psychology should be to make life better for all individuals. Thus was launched a new wave of research into personal strengths,

virtues, and the factors that make life most worth living, areas that Seligman felt psychologists had long abandoned in favor of dealing only with mental illness. However, this was not meant to imply that psychologists should abandon the pursuit of relieving distress and psychological disorders. Rather, proponents of positive psychology have emphasized that “psychology as usual is important and necessary, and positive psychology is intended as a supplement, another arrow in the quiver, and not a replacement for this endeavor” (Seligman & Pawelski, 2003, p. 159).

Positive psychology is, at its core, concerned with positive feelings, positive traits, and positive institutions (Seligman & Pawelski, 2003). Seligman (2002; 2003) has identified three desirable types of lives—the pleasant life, the good life, and the meaningful life—which rely on and incorporate positive aspects of human happiness and satisfaction. The first, known as the pleasant life, is one that successfully pursues positive emotions or attitudes about the past (e.g., pride, contentment), the present (e.g., glee, ecstasy), and the future (e.g., hope, optimism, confidence). The good life involves using one’s personal strengths and virtues to obtain ample gratification in life’s activities. Gratification in this sense refers to a feeling of immersion and full engagement in activities, which can range from stimulating conversations or exercise to intellectual pursuits and competitions. Many highly talented and creative individuals report feeling this sort of intense and pleasurable immersion, referred to as *flow*, when engaged in their craft or talent field (e.g., Csikszentmihalyi, 1996). Finally, Seligman (2002; 2003) describes the meaningful life as one in which an individual’s strengths and virtues are used to serve a greater good, such as work, parenting, or social causes.

Counseling psychology has historically been concerned with positive aspects of the human experience (Lopez et al., 2006), and thus embodies many of the goals of the positive psychology movement. Counseling psychology as a specialty has always emphasized identifying and fostering personal strengths and resources, as well as helping individuals to use these tools to more effectively (Fretz, 1985). In fact, this deliberate

focus on personal strengths is often considered to be one of the most distinctive and defining characteristics of counseling psychology, and has served to distinguish the specialty within applied psychology (Lopez et al., 2006). It is fitting, then, that the goals of counseling psychology research should align with those broader aims of positive psychology in seeking to understand optimal human experiences and ways in which to nurture individual strengths and abilities, including the study of gifted and talented students.

### Gifted and Talented Students

The terms “gifted” and “talented” have been used for decades by educators, parents, and psychologists to describe individuals with a high level of ability. While academic ability and achievement may be the most commonly acknowledged form of giftedness, it is important to note that there are numerous domains in which talent is recognized, including musical talent and linguistic ability (Von Karolyi, Ramos-Ford, & Gardner, 2003). For the purposes of this study, the words gifted and talented will be used synonymously to refer to individuals who are capable of high performance or who have demonstrated a high level of ability or accomplishment in one or more domains (U.S. Department of Health, Education, and Welfare, 1972).

The Davidson Fellows Scholarship recipients that are surveyed in this study represent a unique subset of gifted and talented students because these individuals have been recognized for making a significant creative contribution to their field before the age of 18. To highlight this distinction, this population will be referred to in this study as “talent award winners.” These students have been recognized for the products of their developed talent in a specific domain. However, it is unclear how being recognized for this accomplishment impacts the lives of these individuals. Before this question can be answered, however, it is important to consider how high levels of talent develop in these individuals, and what factors facilitate the development of this high level of talent.

### *The Development of Talent*

Developing and demonstrating expertise in a domain is one way in which gifted students may choose to utilize their abilities. The importance of recognizing talent in students has been highlighted in the work of Julian Stanley, whose talent search model emphasizes 4 key areas: the discovery of talent; the description of individual student characteristics, such as motivation, learning styles, and personality; development of talent through providing advanced educational opportunities and appropriately challenging curricula; and the dissemination of information regarding policies, practices, and research results (Brody & Stanley, 2005). Brody and Stanley argue that recognizing and nurturing talent is important for both gifted individuals as well as for society, because these individuals “have the potential to be our future problem solvers” (p. 27).

Developing talent to the highest level in any domain requires more than just innate ability. For example, some researchers have found that high levels of expertise in a domain are the result of extensive amounts of deliberate practice (Ericsson, Krampe, & Tesch-Romer, 1993; Ericsson & Lehmann, 1996). While these researchers maintain that extensive practice is the only requirement for the development of talent, others are quick to point out that practice is likely to be confounded with ability (Winner, 2000). That is, children who demonstrate early aptitude and innate ability in a domain are the ones most likely to engage in extensive practice. Practice is also likely to be confounded with two other important factors which are crucial to the development of talent: motivation and support from others. That is, in order to engage in thousands of hours of deliberate practice, students must be highly motivated, as well as have families, friends, and mentors who support their efforts and the considerable time and financial commitments that are often necessary to fully develop talent. Another factor that has been shown to play an important role in the development of talent is creativity, particularly in the case of gifted students who make significant and novel contributions to their talent field at an early age (Therivel, 1999).



This section will briefly review the role of motivation, creativity, and support in the development of talent in order to provide a clearer sense of their potential impact on gifted individuals. Most of these factors, such as the role of various types of support, are included on the survey that will be utilized in the present study as factors to which the participants can choose to attribute their success. Other factors, such as the role of creativity, are not included as choices on the attributional portion of the survey, but nevertheless play an important role in the development of talent, and thus deserve to be mentioned here.

### *The Role of Motivation*

Why do students put in the time and effort necessary for developing talent? Research has shown that both intrinsic and extrinsic motivation play a role in talent development (Greenspan et al., 2004). Intrinsic motivation, which involves doing something for its own sake, is commonly seen in gifted and talented students (Winner, 1996; 2000). Talented students are often passionate about their interests, and voluntarily engage in the disciplined practice and study required to gain expertise with great enthusiasm. Gifted students often derive a great deal of pleasure and reward from the satisfaction of engagement in a domain and the challenges it presents.

In one study investigating the motivation of gifted students for developing their talents, participants were asked to rate the importance of various reasons for engaging in their talent area (Csikzentmihalyi et al., 1993). Three items on the questionnaire described distinctly intrinsic sources of motivation (“I enjoy it,” “I get satisfaction from getting better or from learning,” and “It’s interesting to me), whereas six other items described extrinsic reasons for engaging in the talent domain (e.g., “It’s something that impresses other people,” “It’s something that will be useful for earning a living”). Of the 223 participants, almost all ranked the three intrinsic items the highest. The authors also found that attributing engagement in a talent domain to intrinsic motivation was a better predictor of continued engagement in the talent domain (as measured by the highest level

of courses taken in the domain during high school) than either personality or academic ability.

Extrinsic rewards, such as recognition, awards, and praise, also motivate students to engage in a talent domain (Greenspan et al., 2004). However, the study by Csikzentmihalyi et al. (1993) suggests that different types of external factors may motivate students in different talent areas. The authors found that students in the domains of science and math tended to rank utilitarian rewards, such as the usefulness of their field of study or the fact that it was a school requirement, higher than did students in the arts or athletics. Artists, musicians, and athletes, on the other hand, ranked the social rewards of engaging in their talent domain, such as public recognition, more highly.

### *The Role of Creativity*

There is no doubt that eminent individuals demonstrate a high level of talent in their particular field. In making unique contributions in their talent domain, though, these individuals also display creativity (Winner, 2000). Creativity can be defined as “the production of a response or a work that is both novel and appropriate to the task at hand” (Amabile, Phillips, & Collins, 1994, p. 266). However, researchers have distinguished between two types of creativity, and this distinction is relevant for the discussion of gifted and talented students. “Small-c” creativity refers to “everyday” creativity, such as finding a new way of solving a problem or performing a task (Maslow, 1968; Winner, 2000). Small-c creativity also encompasses small-scale creative behavior, such as the way in which children are creative when drawing a picture or playing a game (Huber, 2000). “Big-c” creativity, on the other hand, refers to works that significantly influence or alter a field of study, or that create a new field altogether (Winner, 2000). This level of creativity is thought to appear in less than 1% of the population, and includes accomplishments such as composing a symphony, making a significant scientific discovery, or completing a previously unsolved mathematical proof.

According to the Componential Theory of Creativity (Amabile, 1983), creativity consists of domain-relevant skills, creativity-relevant skills, and task motivation. Domain-relevant skills include the developed talents, knowledge, and technical proficiency required for the specific domain. While domain-specific skills are necessary for good technical proficiency in a domain, producing novel and creative work requires creativity-relevant skills, such as cognitive flexibility, the ability to take on new perspectives, and an energetic and persistent work style. Finally, the theory proposes that intrinsic task motivation is more conducive to creativity than extrinsic motivation. Interestingly, research that has been done on artistic, verbal, and problem-solving creativity has suggested that many of the components involved in talent competitions, such as the expectation of being evaluated and the potential of a reward, have detrimental effects on creativity (see summary in Amabile et al., 1994, p.271-2). However, these studies were not conducted with gifted and talented populations.

#### *The Role of Support*

Providing gifted students with appropriate educational challenges is a crucial step in the process of talent development (Brody & Stanley, 2005; Colangelo et al., 2004). Because school systems are rarely set up to provide the most talented students with these opportunities (Colangelo et al., 2004), the burden often falls on families to use their own resources to meet the needs of their child. In his retrospective study of eminent individuals, Bloom (1985) highlighted the large amount of time, energy, and money that families devoted to fostering the development of their child's talent. Some of these activities included seeking out and paying for coaches, instructors and mentors, purchasing equipment and supplies related to the talent domain, and even relocating great distances in order to be near appropriate training facilities. Bloom noted that these activities differed depending on the stage of talent development and domain. For instance, instructors for elite tennis prodigies are scarce, and gaining access to these individuals can often require a great deal of time and money. In general, more advanced

students required a greater commitment of resources to continue to develop their talents. As a result, socioeconomic and social class variables have the ability to greatly influence talent development, as lack of family and community resources may impede the development of high levels of talent.

Even smaller scale material contribution to a child's talent development has been shown to be beneficial. The talented population in the study by Csikszentmihalyi et al. (1993) was found to spend significantly less time working jobs outside of school and doing chores around the house than their non-gifted peers. The authors believed that by removing some of these common demands and stressors, the parents of the talented students were able to allow their children to devote more attention to their talent pursuits. However, the authors acknowledged that benefits such as not holding a part-time job may have been related to the higher socioeconomic status of the talented participants in their study compared to the general population. Bloom (1985) also noted that many parents excused their talented children from duties such as household chores so that they could spend more time devoted to their talent domain. Again, the role of social class and socioeconomic status may play a vital role in procuring the resources necessary for high levels of talent development.

The support received from mentors and teachers themselves is often considerable throughout the talent development process (Bloom, 1985). A good instructor can make all the difference, and Bloom (1985) found that students at different stages of talent development often required different types of instructors. In the latter stages of talent development, mentors and coaches could provide connections and access into these fields. Subotnik (1993) described the influence that mentors and advisors can play in the development of science talent. By taking on promising young scientists, guiding their research, introducing them to prominent scientists in the field, and encouraging them to enter their research in competitions, mentors can place talented students on paths that

allow them to become more immersed in the talent domain while simultaneously helping them to acquire domain-relevant skills.

Social and psychological support are also important for nurturing talent. While these types of support can come from a variety of sources, including peers, instructors, and counselors, families often play a primary role (Bloom, 1985; Csikszentmihalyi et al., 1993). Csikszentmihalyi and his colleagues found that the talented teenagers in their sample reported their families as more supportive, cohesive, and flexible than did their peers. Bloom noted the importance that familial psychological support played in the lives of talented individuals, but also highlighted the supportive roles that peers can play in the development of talent.

#### *Differences between Domains of Talent*

Research with talented students has included participants from a variety of different talent domains, such as mathematics, science, literature, and music. However, it is not always appropriate to group these talent domains together and assume that broad conclusions can be drawn across students in all areas of expertise. In fact, studies investigating talent development often have often grouped students by talent domain and compared results between domains (e.g., Bloom, 1985; Csikszentmihalyi et al., 1993). It is important to recognize the differences between various talent domains that have formed the basis for these groupings and comparisons.

Csikszentmihalyi et al. (1993) described important differences between the domains of music, art, mathematics, and science that should be taken into consideration when working with talented students. The authors noted that the work done in both music and art is considered to be an expressive performance, which is not the case for science or math. Instead, the goals of these latter disciplines tend to be more instrumental in nature, and often involve accurately replicating procedures and established methods. Along these same lines, the products of artistic and musical pursuits are evaluated in terms of their aesthetic value and emotional appeal, whereas scientific and mathematical works are

evaluated in terms of their contribution to a rational system of knowledge. Another factor to consider is the different type of work that is involved in cultivating talent in each domain. Music and art may more often involve group practice or work in studios with other students, while science and math are more often solitary pursuits.

Another important difference between talent domains is the type of rewards typically associated with accomplishment in each area (Csikszentmihalyi et al., 1993). With regard to long-term extrinsic rewards, talent domains differ tremendously in terms of the potential payoffs of engagement in the talent area. Success in science and math can often lead to prestigious and financially rewarding careers in fields such as medicine and engineering. Potential career outcomes are not as clear in music and art, however. Whereas some talented artists and musicians may achieve a great deal of fortune and fame, the majority will find that the market can simply not accommodate their talents.

In the short-term, there are also significant extrinsic rewards associated with talent in science and mathematics that do not typically exist in the arts. Numerous courses in these subjects are often required throughout schooling, and parents often encourage students to develop talent in these areas (Csikszentmihalyi et al., 1993). Success in music and art, on the other hand, may garner some immediate praise from parents, teachers, and peers, but these subjects are far less emphasized in traditional school curricula, and tend to receive less endorsement from parents as suitable career choices (Csikszentmihalyi et al., 1993).

Intrinsic rewards also differ across talent areas in a way that mirrors the pattern of external rewards, such that areas that have few extrinsic incentives are high in intrinsic rewards, and vice versa (Csikszentmihalyi et al., 1993). For instance, while the pursuit of mathematics and science have numerous potential external rewards, in traditional academic settings, these disciplines may be less personally satisfying than engaging in music or art. These types of expressive performance allow individuals to enjoy their work

as it is being produced (e.g., hearing music as it is being played), whereas outcomes and goals in math and science may be more abstract and seem distant from current efforts.

Csikszentmihalyi et al. (1993) summarize this discussion by pointing out the differences in immediate gratification and long-term relevance across domains. Cultivating talent in mathematics or science, for example, typically does not bring immediate acclaim or gratification, but rather is often seen as a necessary step to eventual success in these fields. Students studying music, on the other hand, are likely to experience more immediate praise and joy from performing, but may be aware that long-term success in music is more difficult to secure than a job in science or mathematics. To test this hypothesis, the authors queried students from different domains about their experiences when engaged in their talent area. The results indicated that students involved in the sciences were more likely to feel low momentary involvement and a sense that the activity was important to their future goals, while students in the arts felt highly involved their talent activities but acknowledged that they were unimportant to their long-term goals. As a result, one might expect gifted students who have been recognized for their contribution to the field to have experienced strong involvement in these activities, but be less likely to view the pursuit of music as a long-term goal. Talented young scientists or mathematicians who have been recognized for their achievements, on the other hand, may experience low involvement in their work, but may be more likely to stay engaged in these talent fields.

#### Attributions of Success

The way in which Davidson Fellows and other talent award winners attribute their success in their talent field may impact their likelihood of future engagement in this field. This section will review the literature on attribution theory, with particular attention paid to the consequences of different types of attributions for success. Then, the literature on the attributions of gifted students will be reviewed, as well as how these attributions have been shown to differ according to gender and talent domain. Finally, the consequences of

these variations in attributional styles for gifted students and talent award winners will be considered.

### *Attribution Theory*

Attribution theory is a cognitive model that was developed in order to understand and explain achievement motivation (Weiner, 1974). The theory's primary assumption is that humans are driven to understand the causes of their successes and failures in order to better comprehend their environment and plan for the future. As a result, the sources to which individuals ascribe success or failure can influence their level of motivation for future endeavors, as well as lead to emotions such as pride, shame, and hopelessness (Weiner, 1985). This section will review the key tenets of attribution theory, as well as the development of the theory over time.

Weiner (1974) originally described a 2-dimensional attributional model. According to Weiner, attributions for success or failure could be classified according to their place on two axes—locus of control and stability. Locus of control could be either internal or external, and stability could be either stable or unstable. These categories created a 2x2 matrix with 4 core attributional sources—ability, effort, task difficulty, and luck. Ability was classified as internal and stable, while effort was internal but unstable. Task difficulty was classified as external and stable, while luck was considered both external and unstable.

The original four-cell model has since been expanded to include an additional dimension of causality, controllability (Weiner, 1985). This variable refers to the extent to which an individual has control over the factors that influence success or failure. Each of the four cells in the original model can be broken down further along the dimension of controllability, resulting in an eight-cell model. For instance, ability is not only internal and stable, but is also considered to be uncontrollable. While effort and mood are both internal and unstable factors, situational effort is largely under an individual's control, while mood is not. Similarly, external factors such as luck and help from a tutor are both



variable and unstable. However, individuals can control how much help they seek out by spending additional time and effort to find appropriate tutors or mentors. Luck, on the other hand, is considered to be uncontrollable, as well as external and unstable, as individuals cannot control how lucky they are.

Research on student attributions has utilized both the four-cell and the eight-cell model, though the four-cell model has been used more often. In these studies, attributions to internal factors, particularly ability and effort, are typically more common than attributions to external factors, such as luck or task difficulty (Assouline et al., 2006). While students' attributions tend to be more internal than external, significant differences have been found within this internal dimension with regard to stability (i.e., ability vs. effort). For example, as will be discussed in the next section, attributions to ability and effort have been shown to vary by gender and subject area.

Attribution theory holds that these differences in ascribing causality can have significant consequences for students' expectations for the future, which will impact achievement motivation (Schunk et al., 2008). Weiner (1974) originally proposed that the way in which individuals attribute success or failure in a domain may determine their likelihood of future engagement in this task. Since that time, research has indicated that the stability dimension is most closely linked to future expectations for success (Schunk et al., 2008). With regard to the dimension of stability, Weiner (1974, 1986) stated that attributions to unstable factors, such as effort and luck, imply that future outcomes may differ from the prior outcome. Thus, when attributing success to an unstable source, failure is more readily considered to be a possible outcome of future efforts, which may lead to decreased motivation. Conversely, attributions to stable factors, such as ability, lead to expectations of similar results in the future. Thus, when one succeeds and attributes this success to ability, one would expect success in future related endeavors. As a result, one would theoretically gain increased motivation for performing these types of

activities and be more likely to remain engaged in the domain or field of study in which success was found.

Fortunately, attributional styles are not fixed. Attributions, like all cognitions, can be altered and changed. As will be discussed later in more detail, evidence has shown that attributional retraining can be an effective intervention for increasing academic self-confidence and motivation (e.g., Heller & Ziegler, 2001). By studying the types of attributions that lead to motivated and successful students and positive educational and personal outcomes, psychologists can better help individuals reach their full potential.

#### *Attributions of Success among Gifted Students*

Only a few studies have examined how gifted students attribute their academic success. Assouline et al. (2006) surveyed 3,280 gifted and talented students in grades 3-11 regarding their attributions for success and failure in a variety of academic domains. Long-term effort was found to be the most common attribution for both success and failure across all domains. Ability was also a very common attribution of success across all domains. For general school success, significantly more girls listed effort as their top attributional choice, and significantly more boys chose ability. This pattern was also found in the subjects of science and math, but not for language arts. For language arts, a similar percentage of each gender chose effort as their top attributional choice.

Another study (Bogie & Buckhalt, 1987) examined gifted students' attributions for success and failure on a puzzle task. In this study, gifted students were identified by intelligence and achievement tests. The authors found that gifted students most often attributed success to the low difficulty of the task, which is an external attribution. Attributing success to their ability level, which is an internal attribution, was the second most common attribution of success. No gender differences were found among the sample.

Dai, Moon, and Feldhusen (1998) reviewed the literature on achievement motivation in both the general population and among gifted and talented students. The

authors reported that high-ability students tend to attribute success to both ability and effort. While both of these are internal attributions, ability is a stable factor while effort is unstable. Interestingly, the authors found that gifted students tend to attribute failure to lack of effort only, and not to lack of ability. It is important to note that these studies were conducted using general gifted populations, and were not investigating attributions of success among talent award winners. Most of the gifted students in these studies were identified by academic performance or IQ score. It is possible that students who have obtained early eminence and recognition in their talent field demonstrate a different pattern of attributional choices.

#### *Differences in Attributions by Gender and Talent Domain*

Some research has suggested that students' attributions of success vary according to gender and subject area. In the general educational population, there is evidence to suggest that in domains in which men have traditionally been thought to perform better, such as science and mathematics, boys tend to attribute success to ability and failure to insufficient effort, while girls attribute success to effort and failure to insufficient ability (Ryckman & Peckham, 1987; Stipek & Gralinski, 1991)

Researchers in the field of giftedness have found similar attributional patterns among high ability students. Assouline et al. (2006) found that girls were significantly more likely than boys to list effort as their top attributional choice for success in the subjects of science and math. Boys, on the other hand, were significantly more likely to attribute success in science and math to ability.

Another study (Subotnik, 1988) examined attributions for success among highly talented high school students. One hundred and forty six Westinghouse Science Talent Search winners were surveyed about their attributions for success. Females reported a greater tendency to attribute success to hard work and dedication (internal, unstable factors), whereas males were more likely to attribute success to intelligence or creativity (internal, stable factors). This study is notable because it involved a population that had

been recognized for demonstrating a high degree of talent in a specific area through performing a novel research project. However, the way in which attributions of success were measured was not ideal, as this construct was inferred from participants' descriptions of what they admired most about a scientific hero or heroine. Also, because of the nature of the award group, these results may apply only to the domain of science.

#### *Consequences of Attributions*

Heller and Ziegler (1996; 2001) have proposed that the way in which girls attribute their success may inhibit motivation and lead to future disengagement from these areas of study. Specifically, Heller and Ziegler point out that females are more likely to attribute success in non-traditional talent domains to unstable factors, such as effort, or to external factors such as luck. Drawing on Weiner's (1974) attribution theory, Heller and Ziegler propose that because of this attribution style, gifted and talented female students downplay and deemphasize their ability in these domains, which may lead to or perpetuate a lack of self-confidence regarding their aptitude for science and mathematics. This lack of self-efficacy, in turn, may lead to disengagement from future challenges, learning opportunities, and even careers within these fields. Some researchers feel that this phenomenon is accurate. For example, Heller and Ziegler (1996) noted that women and girls are significantly overrepresented among gifted underachievers in the domains of mathematics, sciences, and technology, and that this may be due to the attributional style utilized by gifted and talented female students in these domains.

Heller and Ziegler (1996, 2001) have approached this problem by investigating whether changing girls' attributions of success leads to greater engagement in the talent field. This type of intervention, known as attributional retraining, consists of intentional statements made by teachers with the aim of influencing and directing how students should attribute successes and failures in class (Heller & Ziegler, 2001). Attributional feedback given by teachers can take the form of both verbal statements as well as written

comments, such as mixing attributional feedback with performance feedback on a graded exam.

In one study of 8<sup>th</sup> grade physics students in Germany, internally stable attributional feedback (i.e., attributions to ability) was given to girls when they succeeded (Heller & Ziegler, 2001). This resulted in significant performance increases for girls in the control group at both mid-year and year-end evaluations. In addition, these girls demonstrated more interest in physics instruction and had a higher level of competence in physics than girls in the control group.

While these studies have suggested that attributing success to unstable factors may hinder future involvement in a talent domain, other authors have suggested that attributions to stable factors are to blame for students' withdrawal from talent domains. One possibility, according to McNabb (2003), is that viewing success as resulting from natural ability may discourage students from continued engagement, as failure in future endeavors could threaten their sense of innate intelligence and competence. Dweck (1986) cautions that attributing success to intelligence or ability may encourage students to take an "entity" or "fixed" view of their intelligence, and as a result they may avoid future intellectual challenges in order to protect their self-concept as "smart." On the other hand, when students attribute success to effort, they may develop an "incremental" view of their intelligence, and view their intelligence as malleable. As a result, they will be more likely to seek out challenges and demonstrate other adaptive academic behaviors that will further their learning. Dweck (2002) argues that gifted and talented students with a fixed view of intelligence can become too invested in their identity as an intelligent person, to the point that they resist testing their limits and pushing themselves to achieve. As support for this theory, she has conducted research on the consequences of fixed and malleable views of intelligence among college students at prestigious universities (see Dweck, 2002, for a review). However, none of this research has been conducted with a group as precocious and high-achieving as talent award winners. According to this

perspective, one might expect that TAWs in the current study who attribute success to ability would have lower educational outcomes than students who attribute success to other factors.

Because the literature is unclear about the potential consequences of the types of attributional choices that gifted students make, additional research is needed in this area. It is also unclear if this phenomenon is occurring among students who have shown a tremendous amount of dedication and talent. For students who have been recognized as some of the most eminent young minds in their field, would attributions for this type of recognition still influence whether or not they continue to be engaged in their talent field?

### Impact of Award Winning

What is the impact of being recognized by a highly prestigious award? How does it impact an individual on a personal, academic, or artistic level? There is very little research on this phenomenon in general, and even less as it pertains to talent award winners with a high degree of talent in the arts and sciences. What is more, the impact of recognition on young talent award winners may need to be considered from a developmental perspective, as the experience of being recognized for contributing to a field at the age of 60 is likely to vary greatly from the experience of recognition at the age of 17. The research that has examined talent award winners has not approached this population from a developmental perspective. Even though there is a limited amount of research on this population, reviewing this line of research is important in order to understand the needs and experiences of these individuals. This section will focus on studies that have examined talent award winners. Of particular interest to the current study is the impact that recognition has had on the lives of these students. Research on the educational and career outcomes of gifted students will also be reviewed, with an emphasis on the proportion of students that have chosen to remain engaged in their talent fields at the postsecondary level and beyond.

### *Research on Young Talent Award Winners*

Very little research has examined the impact of winning a prestigious award on talented individuals. Instead, most of the work that has been done on eminent individuals has been retrospective in nature, with the aim of discovering factors that might have enabled these individuals to achieve at such high levels (e.g., Bloom, 1985; Clark & Rice, 1982; Rothenberg & Wyshak, 2005; Wantman, 1986). While these types of retrospective studies often describe childhood and adolescent experiences, including early success and recognition, the fact that all participants eventually attained significant eminence means that this subject pool may not be representative of all young talent award winners.

To date, only one line of longitudinal research has followed a group of young talent award winners through their postsecondary and early employment experiences (Subotnik, 1988; Subotnik & Steiner, 1993). The participants in this line of research were honors recipients, semi-finalists, and finalists of the 1983 Westinghouse Science Talent Search (hereafter referred to as the 1983 Westinghouse winners). The Westinghouse Science Talent Search (which has been known as the Intel Science Talent Search since 1998) is a highly prestigious award that recognizes high school seniors who have completed an original research project in science or mathematics (Society for Science & the Public, 2008).

The first published study of the 1983 Westinghouse winners (Subotnik, 1988) sought to describe the characteristics of these students who had achieved early success in science. A survey questionnaire was completed by 146 participants (50 male and 98 female). Many of the variables under investigation do not pertain to the present study, such as students' attitudes regarding the role of scientists in social issues, students' interest in the social impact of scientific research, and the frequency of discussion of social issues in the students' secondary science classes. However, two findings from this investigation are relevant to the present study. The first relates to students' attributions of success—as stated earlier, the results indicated that female participants had a greater

tendency to attribute success to hard work and dedication than men, who were more likely to attribute success to intelligence and creativity. However, attributions for success were not directly assessed, but were inferred from participants' descriptions of scientists they idolized. Another key finding was the vast majority of participants (77.6%) chose curiosity as their primary motivation for conducting research, with very few participants indicating that they were primarily motivated by external influences, such as potential financial reward, prestige, or meeting academic or school requirements. This finding suggests that talent award winners in the field of science may be primarily driven by intrinsic motivation, which is similar to findings among gifted and talented students in general (Winner, 1996).

A second study of the 1983 Westinghouse winners (Subotnik & Steiner, 1993) surveyed the cohort eight years after they received the award in order to follow-up on the career choices of the participants, reasons for retention and attrition in science fields, and the effects of being labeled as a Westinghouse Science Talent Search winner. Ninety-eight of the 1983 Westinghouse winners (60 males and 38 females) completed telephone and in-person interviews with the researchers. The authors found that 49 of the 60 male participants (82%) and 25 out of 38 female participants (66%) could still be categorized as scientists or mathematicians based on their current employment or course of study. Of the participants who had remained in science, many shared similar educational histories, including positive experiences with science during their undergraduate career and positive relationships with mentors. The authors noted that mentors seemed to play a greater role in the retention of women in the sciences.

Award winners who had left the field of science cited a variety of reasons, including the unavailability of mentors, receiving inappropriate guidance from parents or high school guidance counselors, dissatisfaction with the instruction of undergraduate courses, feeling that a scientist's lifestyle was unappealing, or finding other fields more attractive (Subotnik & Steiner, 1993). Perhaps of greatest interest to the present study is



the finding that most of the participants reported that being recognized by the Westinghouse Science Talent Search did not impact how they were treated by their undergraduate universities. While the authors felt that some participants may have perceived this as discouraging, the lack of special treatment or recognition at the undergraduate level appeared to be equally common among participants who had stayed in the field of science and among those who had left. Of the 11 men who left the field of science, not one described being treated as a talented scientist upon entering college. Of the 49 men who were still in the field of science, only two reported being offered unique opportunities in college because of their status as Westinghouse winners. In addition, the authors found that males who attended highly selective undergraduate universities reported feeling uncomfortable about asking for special attention, as they felt that all students were likely to have a high degree of talent. Of the 13 women who left the field of science, six reported feeling ignored by their universities. Five of the 13 women reported receiving special treatment as a result of winning the Westinghouse award, which involved being placed in an elite group at their undergraduate university. However, all five women reported that this treatment did not appropriately meet their needs. The authors did not elaborate on what this special grouping involved or how it failed to meet the needs of these women. Of the 25 women who remained in the field of science, only two reported special treatment, which involved being placed in honors programs.

Thus, it appears that for the 1983 Westinghouse winners, the award itself rarely had an impact on how students were treated at their undergraduate universities. In fact, the authors noted that significant obstacles, such as lack of undergraduate research opportunities, had to be overcome for these students to stay engaged in the field of science (Subotnik & Steiner, 1993). Even when students were given special treatment, they often found it to be of little value, as it typically did not provide opportunities that the authors felt would have been most valuable, such as increased individual attention or opportunities to participate in research with a professor.

While winning the award did not have a major impact on how the 1983 Westinghouse winners were treated by their universities, there are a variety of other ways that winning the award may have impacted the participants that the authors did not investigate. For instance, winning the award might have increased students' interest in science or self-confidence in their abilities, which may have helped them to persevere as scientists despite a discouraging lack of recognition or unique opportunities afforded to them in college. In addition, the receiving the award itself may have allowed them gain entrance to a more prestigious university. The authors also did not investigate how attributions of success might have impacted students' decisions regarding retention or attrition in science.

One limitation of the studies of the 1983 Westinghouse winners conducted by Subotnik and her associates is that specific methods of analysis were not discussed in all of the studies. While the 1993 study states that grounded theory was utilized to analyze the survey data, the 1988 study merely alludes to "survey analysis." As a result, it is unclear how the authors arrived at the themes and conclusions presented in some of these studies. Another limitation is that these studies were confined entirely to the domains of science and mathematics. Research on the impact of recognition in fields such as music and literature is needed to examine potential differences in the experiences of these students.

#### *Educational Outcomes of Gifted Individuals*

Do highly gifted and talented individuals generally stay in their talent areas, or do they pursue other fields of study after their talent is recognized? Longitudinal research on mathematically precocious youth has addressed this question. Benbow, Lubinski, Shea, and Eftekhari-Sanjani (2000) followed up with 1,975 students that were identified as part of the Study of Mathematically Precocious Youth (SMPY). These students were originally identified after having scored within the top 1% of their age group on the mathematics portion of the Scholastic Aptitude Test (SAT-M) when they were between

the ages of 12-14. When surveyed at the age of 33, Benbow and her colleagues found the sample to be very educated, with 26% of the participants holding a doctorate (compared to the national base-rate of 1% of the U.S. population holding doctorates). With regard to retention in the fields of science and math, over 52% of these students had earned at least one postsecondary degree in math or science. Males were more likely to have earned a degree in the inorganic sciences and engineering, while females were more likely to have received degrees in biology, the health sciences, or the humanities.

While the SMPY participants clearly represent a very talented sample, they would not be considered to be talent award winners using the definitions set forth in the present study. That is, the SMPY participants were recognized for their performance on a test, and not for making a significant contribution to their field of study at an early age. Thus, it is possible that the continued math and science engagement demonstrated by the SMPY participants may differ from that of talent award winners. Another limitation of this study is that it did not investigate reasons for retention and attrition in science and math, and in particular it did not consider how being recognized (via identification as a top-scorer on the SAT-M) impacted the participants on a personal or academic level.

Some limited data exists on the educational outcomes of talent award winners. Feist (2006) investigated the educational and career outcomes of Westinghouse Science Talent Search finalists and members of the National Academy of the Sciences. Participants included finalists from the 1965, 1975, 1985, and 1995 Westinghouse competition. Information regarding the highest degree earned was obtained from 89 participants. The results indicated that 74 of these participants (83%) had earned a doctoral degree (either a PhD or an MD). Seven of the remaining participants earned bachelor's degree, and the other 8 earned master's degrees. The vast majority of the doctorates (90%) were earned in either the physical sciences (which included natural sciences, engineering, math, or computer science) or biological-medical sciences. In addition, over 80% of participant's bachelor's degrees were in the physical sciences or

the biological and pre-medical sciences. However, a significantly higher proportion of men earned bachelor's degrees in science, technology, or mathematics than did women ( $p < .04$ ).

With regard to career outcomes, Feist (2006) found that of the 100 Westinghouse finalists for whom career data could be obtained, 79 were considered to be in scientific disciplines, such as engineering, computer science, mathematics, social science, and medicine. The author did not include purely clinical careers in medicine or psychology as scientific careers. Again, a significantly higher percentage of men remained engaged in science fields, with 43% of female Westinghouse finalists engaged in non-science careers compared to only 11% of the male finalists ( $p < .001$ ) When participants who had remained in the sciences were surveyed about the motivation for their career choice, intrinsic rewards, such as satisfying one's curiosity, were endorsed most often, while extrinsic sources of motivation, such as the financial rewards of a career in science, were endorsed least often. The author did not provide information regarding why some Westinghouse finalists chose to leave the field of science.

As discussed earlier, Subotnik and Steiner (1993) surveyed Westinghouse Science Talent Search winners about their career and educational outcomes 8 years after receiving their award. The findings were similar to those found in Feist's (2006) study of Westinghouse winners, with 82% of the male participants and 66% of the female participants still engaged in science or mathematics either in their employment or course of study.

These studies suggest that talent award winners in the fields of science and mathematicians tend to stay engaged in these domains after being recognized at a young age for significant contributions to the field. Among those individuals who choose to leave these fields, however, a greater proportion tend to be female, a significant finding. Because these studies were limited to the fields of science and math, it is unknown whether talent award winners would show a similar pattern of continued engagement in

fields such as music and literature. In addition, these studies did not directly assess the impact of recognition or the role that students' attributions for success had on their continued engagement in their talent domains.

#### Summary of the Literature

The literature that has been reviewed here provides some insight into how (early) talent recognition might impact talent award winners, but limitations and gaps remain. The most significant limitation of the existing research on talent development and attributional theory is that very little work has been carried out with talent award winners who have been recognized for a significant contribution at an early age. Thus, it is not clear if the results of the reviewed research can be applied directly to this population. For example, many of the studies on attributions reported gender differences among general gifted populations. Do these gender differences also exist among talent award winners? Do they exist across all talent domains? Some studies found that female gifted students attributed success in non-traditional fields, such as science and math, in different ways than gifted male students, and that these attributional differences may contribute to the fewer number of females in these fields. Do these same phenomena exist among talent award winners, who may already be very deeply engaged in their talent fields?

Even the research that has been conducted with talent award winners leaves much to be desired. One limitation to this line of research is that it has included only Westinghouse Science Talent Search students, which limits the domains of talent under investigation to those of mathematics, science, and technology. In addition, this research has been concerned primarily with understanding the development of science talent rather than studying the impact of recognition. It is not known how recognizing talented students at an early age impacts these individuals on a personal, academic, and professional level.

### Research Questions

In order to further understand the impact of recognition on talent award winners, the following research questions were addressed in the current study:

1. How do talent award winners describe the impact of receiving the award?
2. Do attributions of success for receiving a talent award differ significantly across talent domains? That is, are talent award winners in some domains more likely to attribute their success to stable, internal factors than unstable, external factors?
3. Do gender differences exist in the attributions of success made by talent award winners? That is, across all talent domains, are males or females more likely to attribute their success to stable, internal factors rather than unstable, external factors?
4. Among talent award winners in the domains of science, math, and technology, are males more likely to attribute their success to stable, internal factors than females?
5. Among talent award winners in the domains of science, math, and technology, are females more likely to attribute their success to unstable, external factors than males?
6. Among female talent award winners in the domains of science, math, and technology, does attributional style predict future engagement in these domains? That is, are female talent award winners in these domains who more strongly endorse stable, internal attributions of success more likely to have education and career goals in these domains?
7. Across all talent domains, does attributional style predict the degree of continued engagement in the talent domain for which the award was won?

## CHAPTER 3: METHODOLOGY

This chapter describes the research design and methodology of the study. First, a description of the study participants is provided, including relevant demographic variables. Then, the survey used in the study is discussed. Finally, the research procedures, including data collection and analysis, are presented.

### Participants

The participant pool for this study included all individuals who were awarded a Davidson Fellows Scholarship between the years of 2001-2007. Davidson Fellows Scholarships are awarded annually to students under the age of 18 who have completed a significant piece of work, defined as: “an accomplishment that experts in the field recognize as significant and has the potential to make a positive contribution to society” (Davidson Institute for Talent Development, 2008). Multiple scholarships of \$50,000, \$25,000, and \$10,000 are awarded each year. There are seven award categories to which students can apply: Science, Mathematics, Technology, Music, Literature, Philosophy, and Outside the Box. To be eligible for the award, students must be U.S. citizens residing in the United States or a Permanent Resident of the U.S. residing in the United States. All Fellows receive their awards at an award reception in Washington, D.C., with travel and lodging expenses provided by the Davidson Institute.

The projects submitted by Davidson Fellows represent a wide range of disciplines and pursuits. For instance, award winners in the Science category have investigated novel treatments for brain cancer, found cost-effective methods for the synthesis of silicon nanoparticles used in medical imaging, and developed new and environmentally-friendly recycling processes. Fellows in the Mathematics category have tackled mathematical proofs and conjectures, advanced game theory and number theory, and developed formulas and theorems with applicability to fields such as aerodynamics, astronomy, and medical imaging. Several projects in the Technology category have contributed to the field of computer science, including inventing novel data encryption techniques,

investigating facial recognition software, and developing or expanding computing algorithms. Fellows in the Music category have displayed masterful technique in vocal or instrumental performance, and often submit original compositions. Award winners in the Literature category typically submit portfolios of original works, which include poetry, essays, and both fiction and non-fiction narrative; these works often have a unifying theme or topic area. Fellows in the Philosophy category have submitted original philosophical works, such as essays or lectures, which have addressed issues such as religion, science, and the nature of existence. The Outside the Box category is defined as any work that is comparable to the level of a university graduate but does not fit into the other categories. However, between the years of 2001-2007, no awards were given in this category. A complete list of past scholarship recipients and their projects can be found online at <http://www.davidsongifted.org/fellows>.

From 2001-2007, 107 individuals were awarded a Davidson Fellows Scholarship (Davidson Institute for Talent Development, 2008). Of this potential pool of participants, 48 completed the Davidson Fellows Follow-up Survey that was utilized in the current study. This represents a 45% response rate. Two of these respondents were removed from the study because of incomplete responses, leaving the study with 46 participants.

#### *Demographics*

Of the 46 participants in the study, 27 were male and 19 were female. The participants ranged in age from 14-24, with an average age of 19.67. Twenty-six participants identified themselves as White, 18 identified as Asian, and 2 identified as Multiracial. Six of the participants received awards in the Literature category, 5 received awards for Mathematics, 8 received awards for Music, 2 received awards for Philosophy, 17 received awards for Science, 7 received awards for Technology, and one participant did not specify his/her award category. Seventeen of the participants were awarded \$50,000 scholarships, 14 were awarded \$25,000 scholarships, and 15 were awarded \$10,000 scholarships. With regard to these variables, this sample is largely representative



of the population of Davidson Fellows as a whole (see Table 1 for a comparison of the sample and population).

Table 1. Comparison of Study Sample to the Population of Davidson Fellows

Variable	Sample	Population
Gender	59% Male, 41% Female	54% Male, 46% Female
Age	Range = 14-24, Mean = 19.67	Range = 8-24, Mean = 19
Race/Ethnicity	57% White, 39% Asian, 4% Multiracial	52% White, 44% Asian, 2% Multiracial, 1% Black/African American, 1% Hispanic/Latino-a
Award Category	38% Science, 18% Music, 16% Technology, 13% Literature, 11% Mathematics, 4% Philosophy	37% Science, 22% Music, 16% Technology, 13% Literature, 10% Mathematics, 2% Philosophy
Award Amount	37% \$50,000, 30% \$25,000, 33% \$10,000	42% \$50,000, 28% \$25,000, 30% \$10,000

### *Family Information*

Ten of the participants reported that they had no siblings, while another 25 reported having one other sibling. Seven participants reported 2 siblings, 2 reported 3 siblings, and another 2 participants reported having 5 siblings. Thirty-five participants provided estimates of their family's income at the time of the award. The average family income was approximately \$100,000 annually, with a range of zero to \$250,000. Participants were also asked about the highest level of education completed by each parent or guardian. All participants' parents/guardians completed high school. Ninety-one percent of the participants reported that each of their parents/guardians had a Bachelor's degree. Sixty-two percent of participants reported that each parent/guardian had a Master's degree (or equivalent). Fifty-eight percent of all participants had at least one parent/guardian with a Doctoral degree, and 20% of participants reported that each of their parents/guardians had a Doctoral degree.

## Measures

This study utilized data collected by an online survey, the Davidson Fellowship Follow-up Survey. This survey was created in 2007 by researchers at the University of Iowa Belin-Blank Center for Gifted Education and Talent Development. The purpose of the survey was to investigate group characteristics of the Davidson Fellows, including current and past educational experiences, employment experiences, and the perceived effect of being awarded the scholarship. The survey asked past Davidson Fellows about demographic information, their experiences after receiving the award, their current academic or employment situation, their experiences as undergraduate and graduate students (if applicable), and life satisfaction. The survey was anonymous and did not collect internet protocol (IP) addresses or internet service provider information.

The Davidson Fellowship Follow-up Survey consists of two components. First, a general set of survey questions is completed by all participants (see Appendix A). Then, the survey directs each participant to a set of questions that is unique to his or her current educational or occupational status: K-12 student, post-secondary student, or employed. The information used in the current study was derived almost entirely from the general survey questions presented in Appendix A. Only two questions from the supplemental survey sections were used in the current study; in order to assess each participant's continued engagement in the domain in which they received their award, the current major of participants in college was noted from the supplemental survey, along with the current occupation of employed participants.

### *Variables of Interest*

Only selected items from the Davidson Fellowship Follow-up Survey were used for the current study. This included demographic and background information, items related to the perceived impact of being awarded the scholarship, and items related to attributions of success. In addition, this study utilized data from items that indicated the extent of current and future engagement in the field in which each award was given.

### *Impact of Award Winning*

Three open-ended questions from the survey were used to measure the perceived impact of being awarded the Davidson Fellows Scholarship. The first question, item 11a of the general survey (see Appendix A), asks participants to describe the impact the Fellowship had on them academically or artistically. The second question, item 11b, asks participants to describe the impact the Fellowship had on them personally. The third question, item 11c, asks participants to describe the impact the Fellowship had on them professionally, with the instruction that participants may leave this item blank if it is not applicable. All three items are open-ended, and participants were given an unlimited amount of space in which to type their responses.

### *Attributions of Success*

Participants' attributions for their success in winning a Fellowship were measured by items 12a-h on the general survey. These items present numerous factors that may potentially relate to winning a Davidson Fellowship, such as general intelligence or having a connection to a university, and participants are asked which factors are necessary to earn a Davidson Fellowship. Participants rate each factor on a scale from 1 ("Strongly Disagree") to 4 ("Strongly Agree"). These items have been classified according to the categories of Weiner's (1974) attributional theory (see Table 2).

In order to facilitate statistical analysis and increase the reliability of variables, selected factors from items 12a-h were combined to form composites. These new composite variables were formed by averaging each participant's responses to the items that contribute to each composite variable. Based on the literature examining the attributional patterns of gifted students that was reviewed in Chapter 2, it was decided that two composite variables would be created.

The first composite variable measures participants' level of endorsement of attributions of success related to intelligence and ability, which are stable, internal factors. This composite variable, which will be referred to as "aptitude," was formed

Table 2. Classification of Attributions of Success on the Davidson Fellowship Follow-up Survey

Item	Stability	Locus of Control
12a: Intrinsic Motivation	Unstable	Internal
12b: Extrinsic Motivation	Unstable	External
12c: Parental/Guardian Encouragement	Unstable	External
12d: Sufficient Resources	Unstable	External
12e: Connection to a college or university	Unstable	External
12f: A Mentor	Unstable	External
12g: High general intelligence (IQ)	Stable	Internal
12h: High ability in a specific area	Stable	Internal
12i: A strong self-confidence	Stable	Internal
12j: The ability to focus on a single task	Stable	Internal
12k: The ability to multitask	Stable	Internal
12l: The ability to take criticism	Stable	Internal

by calculating the average of each participant's ratings of factors 12g and 12h—"high general intelligence (IQ)," and "high ability in a specific area," respectively. The second composite variable measures participants' level of endorsement of attributions of success that involve unstable and external sources. This composite variable, which will be referred to as "resource," was formed by calculating the mean of each participant's ratings of factors 12c ("parental/guardian encouragement"), 12d ("sufficient resources"), 12e ("connection to a college or university"), and 12f ("a mentor").

Pairwise correlations were calculated among the variables within each composite to obtain a sense of internal consistency. The two variables that comprised the aptitude composite (High IQ and High Ability) were moderately correlated ( $r = .55, p < .01$ ). However, within the resource composite, only two of the four variables (Parental Encouragement and Resources) had a statistically significant correlation ( $r = .42, p <$

.01). As a result, for comparison, a second, two-item resource composite was created using only these two variables. All analyses were first conducted as originally proposed, using the original four-item resource composite. The analyses were then re-run using the two-item resource composite to determine if this new variable would have any impact on the analyses.

### *Continued Engagement*

In order to determine the extent of each participant's continued engagement in the domain in which they were awarded a Fellowship, a new variable was created by coding the responses provided for item 23d on the general survey. This item asked, "What are your educational and career goals?" and provides an unlimited amount of space to type a response. These responses were coded on a scale from 0-3 to indicate the level of continued engagement. A score of "0" indicates that the participant's educational and career goals do not include continued engagement in the talent field for which the award was given. A score of "1" indicates that the participant is unsure of his or her future plans, and has provided no indication of a future field of study or employment. A score of "2" indicates that the participant mentioned continued engagement in the talent field as a possible option, but also mentioned other potential fields of study or employment. A score of "3" indicates that the participant intends to continue exclusively in the talent field for which they were awarded the Fellowship. For post-secondary participants who indicated their major field of study elsewhere in the survey, or employed participants who provided their current occupation, this information was used to further inform the coding process. Table 3 provides an example of how the continued engagement variable was created using the information described above.

This coding process was originally completed by the author. In order to test the reliability of the coding, a peer who was unaffiliated with the research project also independently coded participant responses. The author and this peer had an 87% agreement rate. On items where there was a discrepancy in coding, each party explained

the reasoning behind their coding decision. This process was usually sufficient for both parties to agree on the most appropriate way to code the information. Some items required a more lengthy debate before a consensus was reached. Discrepancies tended to be minor (e.g., 0 vs. 1 or 2 vs. 3), and were all able to be resolved with minimal effort or contention.

Table 3. Example of Continued Engagement Coding

Award Category	Educational/Career Goals	Classification	CE
Science	Earn a Master's of Divinity degree through seminary, then a doctorate in Systematic Theology or Philosophy of Religion. (Major: Philosophy)	No continued engagement in the talent award field	0
Science	Not completely sure at this time. (No major declared)	Unsure of future plans	1
Literature	Possibly go to MIT to study science writing. Possibly go to med school. Career maybes: science writer, poet, doctor, medical researcher. (Majors: Biology & Writing Seminars)	Considering continued engagement in talent award field	2
Music	I want to be a "house singer" in Austria. (Major: Vocal Performance/Opera)	Clearly demonstrated continued engagement	3

\*Note: CE = continued engagement.

### Procedures

The process of contacting participants began in February 2008, when a letter was sent via email and postal mail inviting all 2001-2007 Davidson Fellows to complete the online survey. Reminder postcards were sent via postal mail in April 2008 and again in July 2008. Phone calls were also placed to all potential participants during the months of July-September 2008. A final reminder email was sent in September 2008. All communication material was approved by the Institutional Review Board of the Human Subjects Office.

Before beginning the survey, participants were directed to an online informed consent document. This document explained the purpose of the study, the risks and benefits of participating, and informed participants that they could stop the survey at any time without penalty. Participants were also informed that all information would be kept confidential, and that no identifying information would be collected. However, participants were informed that because the Davidson Institute maintains a public web site with information about each Fellow, absolute anonymity could not be guaranteed. Participants were instructed to give consent by clicking a button that directed them to the online survey.

### *Data Analysis*

This section will describe the methods of data analysis that were used to address the research questions posed by the present study. A variety of types of analysis were performed, as the study involved both qualitative and quantitative methods.

#### *Qualitative Analysis*

Research question 1 asked participants' perceived impact of winning a talent award. This question was addressed qualitatively using the constant comparative methodology that is characteristic of grounded theory analysis (Glaser & Strauss, 1967; Strauss & Corbin, 1990). This process began by identifying individual units of information contained in each participant's responses (Lincoln & Guba, 1985). The next was to group these units into categories, with each new idea or statement being compared to how previous ideas and statements were grouped and categorized (Lincoln & Guba, 1985). This method of constant comparison is intended to allow the researcher to continually revise the categories as dictated by the data.

The next stage in the process involved defining the rules and properties of each category, with the goal of creating distinct categories that are as internally homogenous as possible. Once categories were defined, the units in each category were reviewed and evaluated to see if they still fit within the category, or if some needed to be moved to

either a new or preexisting category (Lincoln & Guba, 1985). In grounded theory, these categories would then be further studied in order to draw conclusions and develop a theory from the data. However, the constant comparative method stops short of this step, as its goal (and the goal of the present study) is to accurately describe the full range of participants' responses, rather than to create a theory to account for it.

In the present study, the open-ended responses to items 11a, 11b, and 11c were used in the qualitative analysis. These items asked participants, respectively, to describe the impact that the award had on them academically or artistically, personally, and professionally. Responses to each question were not coded separately, however. Instead, the answers provided to all three questions were considered simultaneously during analysis. Because the goal of the constant comparative method is to form categories that are informed by the data, it would not have been appropriate to begin with the categorical structure implied by the separate items. In addition, it was felt that some participants would provide similar but unique information when answering these items, and that performing separate analyses for each item would not take advantage of the full richness of each participant's responses across all three items.

All coding was performed by the author. In order to increase the reliability and trustworthiness of the results, however, the author engaged in the process of peer debriefing after categorization was completed. The peer debriefing process, as described by Lincoln and Guba (1985) involved reviewing the qualitative analysis with a peer who had no involvement with the research, but who was knowledgeable about the area of inquiry (i.e., gifted education and talent development). The purpose of the debriefing was to assess the objectivity of the analysis that had been performed and question the basis of any of the interpretations or categorization. The debriefing involved an independent review of all units of data within each category, in order to assess both the homogeneity within each category and the heterogeneity between categories. The peer also provided feedback about the names and descriptions of each category. After the peer debriefing



procedure, it was concluded that the author's categorization was an accurate representation of the responses provided by the participants. The process did, however, result in minor changes to some category names and definitions, which strengthened the overall presentation of the data.

### *Quantitative Analysis*

The remaining research questions were addressed using quantitative methodology. The statistical procedures that were performed to address each question are presented below, along with a description of the independent and dependent variables for each analysis. An alpha level of .05 was used for all analyses.

*Research Question 2.* In order to determine if attributions of success for receiving a talent award differ significantly across talent domains, a multivariate analysis of variance (MANOVA) was performed. The independent variable for this analysis was award category, and the dependent variables were the aptitude composite and the original resource composite variable. Once the analysis was run with the original resource composite variable, the data were re-analyzed using the two-item resource composite variable. In addition to comparing all talent domains using the MANOVA, the award categories were also grouped dichotomously, and the attributions of SMT participants were compared to those of non-SMT participants using 3 separate t-tests, with each of the three attribution composites serving as the dependent variable for one of the tests.

*Research Question 3.* In order to determine if gender differences existed in the attributions of success made by talent award winners, a second MANOVA was performed. The independent variable for this analysis was gender, and the dependent variables were the aptitude and original resource composite variables. Again, the analysis was also performed with the two-item resource composite variable substituting for the original.

*Research Question 4.* In order to determine if male talent award winners in the domains of science, math, and technology are more likely to attribute their success to

stable, internal factors, a t-test was performed on all participants who received awards in these categories. The independent variable for this analysis was gender, and the dependent variable was the score on the aptitude composite variable.

*Research Question 5.* In order to determine if female talent award winners in the domains of science, math, and technology are more likely to attribute their success to unstable, external factors, a t-test was performed on the participants who received awards in these categories. The independent variable for this analysis was gender, and the dependent variable was the original resource composite variable. A second t-test was also performed with the two-item resource composite as the dependent variable.

*Research Question 6.* In order to determine if the attributional styles of talent award winners in the domains of science, math, and technology were predictive of future engagement in these fields, a multiple regression analysis was performed using all the participants who received awards in these categories. The dependent variable for this analysis was the continued engagement variable. The independent variables for this analysis were gender and the aptitude and resource composite variables. The analysis was also run using the two-item resource composite variable.

*Research Question 7.* In order to determine if the attributions of success measured in the present study predict continued engagement for participants in all talent domains, a multiple regression analysis was performed. The continued engagement variable served as the dependent variable for this analysis. The independent variables for this analysis were the aptitude and resource composite variables. Once again, the analysis was also run using the two-item resource composite variable.

## CHAPTER 4: RESULTS

### Qualitative Results

#### *Research Question 1*

Participants' responses regarding the impact of the Fellowship were grouped into 12 categories: Financial Support, Opened Doors, Personal Satisfaction, Validation, Recognition by Others, Reinforcement/Encouragement, Increased Confidence, Increased Pressure/Responsibility, Meaningful Connections, Process Gains, Miscellaneous, and Little to No Impact. This section will describe these categories individually. Examples of representative participant responses from each category will be provided. Two categories spawned subcategories; a summary of the categories and subcategories is outlined in Table 4.

Table 4. Qualitative Categories and Subcategories

1. Financial Support
1a. Secondary Financial Gains
2. Opened Doors
3. Personal Satisfaction
4. Validation
5. Recognition by Others
6. Reinforcement/Encouragement
7. Increased Confidence
8. Increased Pressure/Responsibility
9. Meaningful Connections
9a. New Friends/Colleagues
9b. Inspiration/Encouragement
9c. Perspective
9d. Miscellaneous
10. Process Gains
11. Miscellaneous
12. Little to No Impact

### *Financial Support*

Nineteen participants mentioned that the scholarship money they received from the Fellowship had an impact on themselves or their family by easing the financial burden of paying for college. One participant reported that the Fellowship “allowed me to worry less about how to pay for college,” while another stated that “the scholarship funds have allowed me to pursue my studies without financial burdens for my family.”

### *Secondary Financial Gains*

Five of the nineteen participants in this category reported that the financial support they received from the Davidson Fellowship had an impact beyond reducing their financial burden. Participants in this sub-category all noted that having the scholarship money led to non-financial benefits as well. Three participants in this group mentioned that the scholarship funds allowed them to devote more time to their studies rather than holding a job. Another participant noted the benefits of not having to work to pay off loans, saying, “I will be able to go directly into a low-paying internship in my career field immediately after graduation, which would not be possible without the scholarship.” The fifth participant in this sub-category stated that the scholarship allowed her to attend a better (and more expensive) university, which she feels has helped her development in her career field.

### *Opened Doors*

Several participants (n = 11) reported that the Fellowship helped them to reach personal or professional goals or gave them opportunities that they may not have otherwise had. Many students felt that the Fellowship made them more competitive for admission at top universities, or that it helped them to secure positions working with prestigious faculty members at their university. One student remarked that the Fellowship “is unbeatable on a résumé.” Another noted that the “free publicity” that resulted from receiving the Fellowship helped his career.

### *Personal Satisfaction*

Nine participants stated that receiving the Fellowship was personally satisfying and described a variety of positive emotions, such as pride, honor, and gratitude. One participant stated that she was “very proud and touched to receive the award.” Another participant said that he was “deeply honored and gratified that I was chosen.”

### *Validation*

Some participants (n = 7) reported that they felt validated after receiving the award. As opposed to participants who reported personal satisfaction, these participants tended to report positive feelings that were specifically related to their ability and talent domain. Many mentioned that after winning the Fellowship, they felt reassured of their abilities in their talent domain. One participant wrote that the Fellowship “served as vindication of my artistic talent. Before earning the Fellowship, I didn’t dream that my talent was anything extraordinary.” Others felt the recognition of the Davidson Institute legitimized or validated their effort and work in their field. For instance, a participant stated: “I feel my beliefs about how music benefits society have been validated by an organization.”

### *Recognition by Others*

Another way in which Davidson Fellows were impacted by the award was that it changed how others saw the individual or behaved around them. Six of the participants reported this phenomenon. Several of these participants reported that the Fellowship brought them recognition, acknowledgement, and praise from their family, friends, and teachers. One student reported that the award “gave others confidence in my abilities—particularly people like my father, who would never have believed I was a good writer unless I had earned money for it.”

### *Reinforcement/Encouragement*

Several participants (n = 13) perceived the Fellowship as “positive reinforcement,” and noted that the award in some way encouraged continued involvement

in their field. For some, this encouragement was at least partly financial. Noted one participant: “I think that it helped motivate me to continue in science and helped demonstrate that there are various rewards available to dedicated scientists. In that regard, it provided an incentive for me to continue my aspirations.” Others felt that the award supported their ambitions and pushed them to continue to excel in their talent domain. Some participants also reported that they may not have remained in their field were it not for winning the Fellowship. For instance, one participant stated that the Fellowship “made me reconsider writing as a career and devote more time and energy to development as a writer than I would have otherwise.” Another participated wrote: “I’m no longer afraid to take poetry seriously. I now see that there is always a chance to do what you love for a living.”

#### *Increased Confidence*

Many participants (n = 15) noted that winning the award improved their academic, artistic, or personal confidence and self-esteem. This increase in confidence, however, was not directly connected to a feeling of reinforcement or encouragement to continue in any specific endeavors, and as a result was seen to represent a separate category than Reinforcement/Encouragement. One participant reported that the Fellowship “gave me confidence in my academic and intellectual abilities that I carry with me to this day.” Another participant stated that it gave him confidence to know that a panel of judges liked his work.

Not surprisingly, some participants identified specific benefits that have resulted from their increased confidence, some of which relate to their continued engagement in their talent field. One participant wrote that the Fellowship “increased my confidence as a musician, which helped me get better and have confidence to enter more competitions.” Another participant said: “[I]t has given me the courage to reach out to older, experienced writing faculty at my school (which is very scary to do when you’re a freshman).”

*Increased Pressure/Responsibility*

Two Fellows reported that the award impacted them by instilling a sense of responsibility or pressure to “live up to” expectations placed on them by the Fellowship. One of these participants stated, “I feel a responsibility to the Davidsons and myself to make the most of my academic opportunities.” The other participant in this category reported a more negative experience with this form of impact, saying “As validating as it was, just after winning I had a lot of difficulty writing, because I felt I had to somehow justify my ‘prodigious’ status.” This participant later stated that it is “easy to feel like a failure in prodigy terms.”

*Meaningful Connections*

Fourteen participants reported that the people they were exposed to at the awards reception in Washington, D.C., had a significant impact on them. These meaningful connections fell into four sub-categories: New Friends/Colleagues, Inspiration/Encouragement, Perspective, and a miscellaneous category.

*New Friends/Colleagues*

Six participants reported that meeting other Fellows resulted in new friends and colleagues. One participant remarked: “I have intelligent friends across the country now.” Another participant stated:

Meeting the other Fellows put me into contact with wonderfully talented people who shared my interest and passion for learning. Several of the Fellows went to college in the Boston area, and I greatly enjoyed working with them on several extracurricular projects.

*Inspiration/Encouragement*

Three participants described drawing inspiration and encouragement from the people they met in Washington, which included other Fellows as well as Bob Davidson, one of the founders of the Davidson Institute. One participant wrote: “I found Mr. Davidson to be inspirational. I admire his work ethic and his giving back to his country

through this program. I would like to model myself after him.” Another participant stated:

Meeting other exceptionally talented individuals reminded [me] how much more I could achieve. I saw many aspects in these Fellows that I wanted to emulate and push myself further, and it enlightened me to a bigger circle of peers where the standard was higher than a classroom grade. I saw new levels of creativity and ingenuity.

#### *Perspective*

Three other participants noted that meeting others at this reception gave them a new outlook or perspective, and taught them something about themselves or others. For instance, one participant stated that “meeting other Fellows opened my eyes to the number of talented and gifted kids in the world.” Similarly, another participant reported an increase in modesty, saying that the Fellowship “has made me realize the extent in which intelligence and ability runs in others and how little of it I possess myself.” Another participant stated that meeting some of the other Fellows served as a “warning,” because these individuals seemed socially disconnected and too buried in their work, which the participant viewed as an undesirable outcome.

#### *Miscellaneous*

Other types of encounters and personal connections also had an impact on four of the participants, but these items did not fit within the categories above. For example, one participant said that it was a great honor to be able to meet Julian Stanley (a pioneer in gifted education) at the event in Washington. Two other participants stated that meeting the staff of the Davidson Institute was meaningful for them. One stated that “it was uplifting to meet [staff members] who really cared about me and my talents,” while the other enjoyed seeing the level of professionalism and enthusiasm of the staff.

#### *Process Gains*

Five participants noted that certain aspects of becoming a Davidson Fellow, apart from winning the award itself, had a significant impact on them. These process aspects included applying for the award, completing a scholarly project, and being judged and



receiving feedback on their project. For instance, 3 participants noted that the process of creating their projects impacted them in a significant way. One participant noted that "putting together my Davidson portfolio made me realize how important writing is in my life," while another stated that "striving for the scholarship helped me hone my ideas and put them in to a clear format." Other participants noted that the evaluation process influenced them in some way, such as providing them with valuable feedback.

#### *Miscellaneous Impact*

Seven participant responses (from seven different participants) did not fit well in the previous categories, but are worth reporting nonetheless. In accordance with procedures suggested by Lincoln and Guba (1985), the number of units in this miscellaneous category did not exceed seven percent of the total sample. One participant noted that the award made her realize how indebted she was to those who had encouraged her to succeed and reach high. A participant who received an award in the Music category stated that the Fellowship "inspired me to make a difference in society and find ways to make a positive impact in music and in the community." Another participant stated that the award "has given me a standard I can live by in terms of the level of excellence I should pursue in my endeavors." Some participant responses were categorized as miscellaneous due to lacking the clarity that may have otherwise placed them elsewhere. For instance, one participant noted that he award "had a very small role in my decision to switch fields from math to computer science," but did not elaborate on how the award did this. Another stated that "the scope of the project did not have the most positive reflection on my academic record, but it was worth it."

#### *Little to No Impact*

Six participants responded to one of the prompts by stating that they felt the award had little to no impact on their personal, academic, artistic, or professional life. Half of these participants noted that the award did not impact their academic performance or outcomes. For instance, one participant said, "I think without it I would still have gone

to [the college I attended]...and my life would have been largely the same." Another participant characterized the award's professional impact in this way: "So far the effects of the Fellowship on me professionally have been limited. A violist was impressed by my award and asked me to write a credenza for his performance of a viola concerto in Europe, but that's about it." It should be noted that only two of the six participants whose responses constituted this category reported no significant aspects of impact across their entire response set. For the other four participants, it was typical to report minimal or no impact in one area, such as academics, but to describe significant impact in another area.

### Quantitative Results

The preceding section summarized the ways in which participants described the impact of the Fellowship. Categories such as Reinforcement/Encouragement and Increased Confidence implied that several participants planned to continue to stay engaged in their talent field. This section will review the rates of continued engagement among the sample, examine participants' attributions of success, and explore how these attributions impact continued engagement.

### *Continued Engagement*

Table 5 summarizes the continued engagement scores of the participants. Two participants did not provide enough information to determine their continued engagement score. For the remaining 44 participants, frequency data are provided for both the total sample, as well as for the SMT and non-SMT groups.

At the time of the survey, the majority of participants could still be considered to be engaged in the field in which they won their award, based on their stated educational and career goals or current educational or occupational status. Among all participants, 70.5% were clearly still engaged in the field in which they received the Fellowship, and 11.4% indicated that they were still considering their award field as a career. Another 11.4% were no longer engaged in their award field, and 6.8% were simply unsure of their future plans. A higher percentage of SMTs than non-SMTs (78.6% vs. 56.3%) reported

Table 5. Continued Engagement Scores for Overall Sample, with a Comparison of SMT and non-SMT Groups

Continued Engagement	Total Sample (n = 44)	SMT (n = 28)	Non-SMT (n = 16)
No continued engagement	5 (11.4%)	3 (10.7%)	2 (12.5%)
Unsure of future plans	3 (6.8%)	2 (7.1%)	1 (6.3%)
Considering continued engagement	5 (11.4%)	1 (3.6%)	4 (25%)
Clearly demonstrated continued engagement	31 (70.5%)	22 (78.6%)	9 (56.3%)

clearly demonstrated continued engagement. However, when comparing participants who had either clearly demonstrated continued engagement or were at least still considering a career in their talent field, the groups were very similar (82.2% of SMTs compared to 81.3% of non-SMTs).

Overall, females reported higher levels of continued engagement than males ( $p < 0.10$ ). Table 6 displays continued engagement scores by gender and SMT status. The gender discrepancy was most pronounced within the SMT group, where 100% of females reported clearly demonstrated continued engagement, compared with 68% of SMT males ( $p = 0.08$ ). Even when comparing participants who had either clearly demonstrated continued engagement or were at least still considering a career in their talent field, female SMTs were still more engaged than their male counterparts (100% vs. 74%).

Table 6. Gender Comparison of Continued Engagement Scores

Continued Engagement	SMT Males (n=19)	SMT Females (n=9)	Non-SMT Males (n = 7)	Non-SMT Females (n = 9)
No continued engagement	3 (15.8%)	0	1 (14.3%)	1 (11.1%)
Unsure of future plans	2 (10.5%)	0	1 (14.3%)	0 (0%)
Considering continued engagement	1 (5.3%)	0	2 (28.6%)	2 (22.2%)
Clearly demonstrated continued engagement	13 (68.4%)	9 (100%)	3 (42.9%)	6 (66.7%)

### *Research Question 2*

In order to determine if attributions of success differed significantly between talent domains, a MANOVA was performed. The two attribution composites were used as dependent variables, and the independent variable was talent domain. The MANOVA was not statistically significant ( $F(10, 76) = 1.86, p \approx .07$ ). When the two-item resource composite was used, the results were still not statistically significant. When the award categories were grouped into SMT and non-SMT categories, there remained no difference in group attributions for any of the composites. These results suggest that participants in different talent domains did not differ significantly in their endorsement of aptitude-based or resource-based attributions of success.

### *Research Question 3*

A second MANOVA was performed in order to determine if attributions of success differed between male and female participants. The two attribution composites were again used as dependent variables, with gender as the independent variable. The MANOVA was not statistically significant ( $F(2, 43) = 1.67, p \approx .20$ ). When the two-item resource composite was used, the results were still not statistically significant. These results suggest that male and female participants did not differ significantly in their endorsement of aptitude-based or resource-based attributions of success.

### *Research Questions 4 & 5*

For research question 4, a two-tailed t-test was performed in order to determine if male SMTs were more likely than female SMTs to attribute their success to aptitude. The independent variable was gender, while the aptitude composite was used as the dependent variable. The results of the test were significant ( $t(27) = 2.21, p < .05$ ), suggesting that male SMTs had significantly higher scores on the aptitude composite than female SMTs. Group mean data indicated that male SMTs in the sample ( $n = 20$ ) had an average aptitude composite score of 3.47, while female SMTs in the sample ( $n = 9$ ) had an average aptitude composite score of 3.00. These results indicate that male SMTs

endorsed the importance of high IQ and high ability for winning a Fellowship more strongly than female SMTs.

For research question 5, another two-tailed t-test was performed in order to determine if SMT females were more likely than SMT males to attribute their success to their available resources. The independent variable for this analysis was gender, and the resource composite was used as the dependent variable. The results were not statistically significant ( $t(27) = 1.82, p \approx .08$ ). However, when the two-item resource composite was used, the results were significant ( $t(27) = 2.07, p < .05$ ), suggesting that female SMTs had significantly higher scores on this two-item resource composite than male SMTs. Group mean data indicated that on this two-item resource composite, female SMTs had an average score of 3.50, while male SMTs had an average score of 3.05. These results suggest that female SMTs endorsed the importance of parental encouragement and sufficient resources more strongly than male SMTs, but that significant gender differences did not exist regarding the importance of having a connection a college or university or having a mentor.

#### *Research Question 6*

A multiple regression analysis was used to determine if the attributions of success made by SMTs predicted continued engagement in these fields. The regression model used gender and the two original attribution composites as independent variables, and continued engagement as the dependent variable. This regression equation was not statistically significant ( $F(3, 24) = 1.42, p \approx .26$ ). The equation was also not significant when the two-item resource composite variable was substituted for the original resource composite as one of independent variables in the model. These results suggest that, among participants in the fields of science, math, and technology, gender and attributions of success were not predictors of continued engagement in these fields.

Interestingly, when the same model was fit to non-SMTs, the coefficient for the aptitude composite was statistically significant ( $p < .05$ , adjusted  $R^2 = 0.19$ ). The

standardized coefficient was 0.52. This suggests that, among Fellows who received awards in non-SMT domains, stronger endorsement of attributions of success related to high IQ and ability—that is, the aptitude composite—was associated with a greater degree of continued engagement in these fields. When the nonsignificant gender variable was removed from the model, the standardized coefficient for the aptitude composite increased to 0.53, while the adjusted  $R^2$  increased to 0.22. Removing the original resource composite from the model reduced the overall predictive ability of the model, leading to a decrease in the adjusted  $R^2$  value. Thus, the gender variable was removed to allow for a more parsimonious model, and the resource composite, while not statistically significant, was retained on substantive grounds. This final model accounted for 22% of the variance of the continued engagement variable among non-SMTs.

#### *Research Question 7*

Another multiple regression analysis was used to determine if attributions of success predicted continued engagement across all participants in all talent domains. This regression model used gender and the two original attribution composites as independent variables, and continued engagement as the dependent variable. This regression equation was not statistically significant ( $F(2, 41) = .44, p \approx .65$ ), and it remained non-significant when the two-item resource composite was substituted for the first.

#### *Summary of Results*

Using the constant comparative method, the qualitative analysis identified 12 categories that described the various ways in which Davidson Fellows were impacted by the award. These categories highlighted the predominantly positive impact the award had on the participants across a variety of domains. A small minority of participants reported that the award served to increase their perception of pressure and responsibility, or simply had little to no impact on their lives. An outline of the impact categories can be found in Table 4.

With regard to the quantitative results, descriptive statistics revealed that the majority of participants (70.5%) were still clearly engaged in the field in which they received the award, with SMTs showing more evidence of continued engagement than non-SMTs, and females evidencing more continued engagement than males. Overall, male and female participants did not differ significantly in their endorsement of aptitude-based or resource-based attributions of success. However, among SMT participants, males had significantly higher scores on the aptitude composite, while females had significantly higher scores on the two-item resource composite. Despite these differences, these attributional patterns were not able to predict differences in continued engagement outcomes among SMTs. However, among non-SMTs, the aptitude composite and original resource composite were able to predict 22% of the variance in continued engagement. In the overall sample, attributions of success did not predict continued engagement. Finally, no significant group differences were found with regard to attributions of success across all talent domains, or when comparing SMTs and non-SMTs.

## CHAPTER 5: DISCUSSION

The goal of the current study was to better understand the impact that recognition—in the form of a prestigious, national talent award—has had on the lives of eminently talented young students. Nurturing gifts and talents was one of the original aims of the field of psychology (Seligman & Csikszentmihalyi, 2000), and the rise of positive psychology has highlighted the continued importance of better understanding the impact of positive life events and pursuits. It was hoped that the present study could provide insights into the impact of recognition among this population, as well as guidance related to effective ways to nurture talent and encourage continued engagement among eminent youth and adolescents.

This section will discuss the findings of the current study in the context of the extant literature. First, the background information and demographics of the sample of Davidson Fellows will be discussed. Then, the overall impact of the award winning experience will be examined. Next, information related to the continued engagement of the participants in their respective award fields will be discussed, and compared to the findings of other studies of talent award winners. Then, the attributional data related to participants' explanations of their success will be interpreted, including the consequences of attributional style on participants' continued engagement. Finally, limitations of the present study will be presented. Implications for research and practice will be discussed throughout the section.

### Comments on the Sample

Several aspects of both the current participants and the available population of Davidson Fellows are worth noting. The parents and guardians of the participants in this sample tended to be very well-educated compared to the general population. All participants' parents/guardians completed high school, and 91% reported that each of their parents/guardians had at least a Bachelor's degree. Furthermore, 58% of all participants had at least one parent/guardian with a Doctoral degree, and 20% of



participants reported that all parents/guardians had a Doctoral degree. In the United States, it is estimated that only 1% of individuals have a Ph.D. (Benbow et al., 2000). The fact that high-achieving children have high-achieving parents is not particularly surprising, but it does invite speculation concerning the role that parental education plays in the achievements of their children. In particular, the role of parental encouragement and emotional and financial support have been highlighted in the talent development process (e.g., Bloom, 1985; Csikszentmihalyi et al., 1993), and both are likely to be influenced by parents' own attitudes towards achievement.

The role of support in the talent development of the participants might also have been influenced by other family variables, such as family size and income level. Almost 22% of the participants were only children, and another 54% reported having only one other sibling. Data from the U.S. Census Bureau (2008) indicated that in 2004, 21.2% of children were living with no siblings in their household, a number very similar to that reported by participants in the current study. However, the Census Bureau reported that 38.7% of children were living with just one other sibling, compared with 54% in the current sample. A full 40% of children in the U.S. were found to be living with two or more siblings, compared with only 24% in the current sample. Having fewer siblings allows for more attention to be focused on talent development. Bloom (1985) found that the individuals in his gifted sample often came from families in which child talent development was of central importance. Indeed, several research studies have found that gifted individuals tend to come from small families of one or no siblings (see review by Olszewski, Kulieke, & Buescher, 1987).

Financial support has also been indicated to play an important role in talent development. In Bloom's (1985) sample, he found that families often devoted large amounts of money to their children's talent development, such as by hiring elite teachers, coaches, and mentors. Csikszentmihalyi et al. (1993) pointed out that higher family incomes allow children to focus on talent development rather than having to work part-

time jobs. In the current study, the average annual family income, as estimated by the participants, was approximately \$100,000. While the impact of financial support was not specifically measured, this level of income would certainly enable families of Davidson Fellows to provide these students with the resources needed to develop their talents and pursue their interests, up to and including completion of their Davidson projects. At the same time, however, it is notable that the highest annual income reported was \$250,000. Thus, while many families in the sample could be described as prosperous, none could be said to be exceedingly wealthy.

#### Impact of Recognition

Overall, participants in this study reported that the impact of receiving a Davidson Fellowship was overwhelmingly positive. This of course is not surprising, given that the prestigious award is meant to impact students positively. What is interesting, however, is the myriad ways in which participants were affected by the award. Several of the categories that were created can be grouped into broad areas of impact that will facilitate a discussion of the award's influence on participants' lives.

Two of the impact categories—Financial Support and Opened Doors—described direct and instrumental effects on participants' educational and career pursuits. Neither of these consequences is surprising—providing financial support for college, of course, is one of the primary aims of the Fellowship—but it is reassuring to observe that these effects are being perceived. With regard to the scholarship funds provided by the Fellowship, several participants noted that the funds had an impact beyond just dollars and cents, as they allowed students to attend college with less financial worry and to focus their attention on their studies rather than on loan applications or a part-time job. Within the Opened Doors category, many students noted that the Fellowship gave them access to opportunities they might not have had otherwise, such as working in a research laboratory. That the prestige of the Fellowship was able to help secure these opportunities is no small matter, as it may have contributed to the likelihood of students staying

engaged in their talent field. In their follow-up study of the 1983 Westinghouse winners, Subotnik and Steiner (1993) found that nearly all participants reported that winning the award did not impact how they were treated academically when they arrived at college. The authors noted that some participants perceived this as discouraging, and found that participants who stayed engaged in the field of science had to overcome obstacles such as lack of undergraduate research opportunities. Compared to the findings of Subotnik and Steiner, Davidson Fellows did not report feeling the same discouraging lack of recognition when they arrived at college, and many appear to have been given access to unique opportunities as a result of their accomplishments. In fact, no participants in the current study mentioned having to overcome obstacles at their university in order to stay engaged in their talent field. However, participants in the current study were not directly asked about such barriers, and it is possible that more in-depth interviews might reveal obstacles to continued engagement.

Several participants noted that receiving the Fellowship affected them on a personal level. This personal impact was reflected in the categories of Personal Satisfaction, Validation, Recognition by Others, Reinforcement/Encouragement, Increased Confidence, and Increased Pressure/Responsibility. Responses in these categories were overwhelmingly positive; many students experienced a sense of pride at having won the award, or felt that their efforts and abilities were validated by the experience. Others found that the recognition of the award begat recognition by others, such as teachers, parents, and peers. Several participants perceived the award as a form of positive reinforcement, and felt encouraged to continue in their talent field. Participants also noted that the award increased their sense of academic, artistic, or personal confidence. These two latter findings speak to the ability of the award to foster continued engagement in the field in which the award was received. Participant responses in both categories alluded to continued involvement in their talent field, which highlights two distinct ways in which the award fosters continued engagement: providing external

encouragement and instilling a sense of increased confidence in one's abilities. Statements such as "I'm no longer afraid to take poetry seriously" underscore the tremendous impact that recognition can have on a talented youth's educational and career pursuits. Because previous follow-up studies of talent award winners (Feist, 2006; Subotnik & Steiner, 1993) did not directly assess the personal impact of these awards, it is unclear if other talent award winners experienced the same range and/or extent of positive experiences and emotions.

It is notable that for two of the participants, the personal impact of the award was not unequivocally positive, as described in the Increased Pressure/Responsibility category. One participant described feeling a responsibility to himself and the award-granting institution to make the most of the opportunity. The other participant echoed this sentiment by saying that she felt pressure to follow-up the award and to justify her status as a prodigious talent. She also noted that it was easy to "feel like a failure in prodigy terms." While any negative impact of the award is unlikely to be intended, it appears that individuals who work with gifted and talented students may want to consider that one potential impact of recognition is feeling increased pressure or responsibility to perform. Any further detrimental effects, such as burnout or feelings of anxiety or depression, were not reported.

Previous research on talent award winners (Feist, 2006; Subotnik, 1988; Subotnik & Steiner, 1993) makes no mention of feelings of increased responsibility, pressure, or burnout, even among participants no longer engaged in their talent field. For instance, Subotnik and Steiner (1993) investigated reasons for attrition among 1983 Westinghouse winners who were no longer engaged in science—which included dissatisfaction with science instruction, interest in other fields, and feeling that the lifestyle of a scientist was unappealing—and found no mention of pressure to succeed leading to disengagement. Future research might examine experiences of increased pressure or responsibility in TAWs more closely, and investigate potential methods for minimizing this impact.

Finally, several participants described receiving significant impact not from the award itself, but rather as a result of incidental aspects of the Fellowship experience. This included meaningful connections that were made at the awards reception in Washington, D.C., as well as gains that participants experienced while applying and being evaluated for the Fellowship. These two impact categories—Meaningful Connections and Process Gains—speak to the wide variety of sources that contributed to the impact of being recognized as a Davidson Fellow.

Not all participants reported experiencing a significant impact as a result of receiving the award. The Little to No Impact category highlights that some students specifically mentioned that the award did not have an impact on their personal, professional, artistic, or academic lives. However, only two participants reported no significant aspects of impact across all these domains. Within this category, it was more common to report a significant impact in one area and note minimal or nonexistent impact in another. While previous research with talent award winners has not directly investigated the existence (or lack) of personal impact of recognition, there is a precedent for finding a lack of academic impact, as Subotnik and Steiner (1993) found that the vast majority of 1983 Westinghouse winners reported that the award did not impact how they were treated academically when they arrived at college. In the current study, noting a lack of professional or academic impact was the exception rather than the norm, as several students felt the Fellowship opened doors for them. However, the current participants were not directly asked if the Fellowship affected how they were treated by their undergraduate institutions, which precludes a direct comparison to the findings of Subotnik and Steiner (1993).

The Little to No Impact category appears to speak to the range of reactions participants had to the award across different life domains, as well as to the idiosyncratic ways in which impact was perceived. For instance, the student who shared that they were asked to compose something for a violist who was impressed by the Fellowship

perceived this as a limited professional impact, though another participant may have viewed this as more significant. Overall, the current sample of TAWs described numerous ways in which the award had a significant and positive impact on their lives, which speaks to the importance of these types of awards in gifted education and talent development.

#### Continued Engagement

Overall, participants indicated that they were still engaged in the fields of study in which they received their Fellowship. Over two-thirds of participants (70.5%) were clearly still engaged in the field in which they won the Fellowship, and nearly 82% of participants were at least still considering continued engagement in their award field. Among award winners in the fields of science, math, and technology, 78.6% of participants clearly demonstrated continued engagement. These results compare favorably with other follow-up studies of young talent award winners (see Table 7). For instance, a study of the 1983 Westinghouse winners found that 75.5% of the participants could still be categorized as scientists or mathematicians based on their employment or course of study eight years after the award (Subotnik & Steiner, 1993). In another follow-up study of Westinghouse winners, Feist (2006) found that 79% of participants pursued careers in scientific or mathematic disciplines.

Table 7. Comparison of Continued Engagement Findings with Previous Studies of TAWs

Study	Talent Domains Included	Percentage of Sample with Clearly Demonstrated Continued Engagement
Subotnik & Steiner, 1993	Science and mathematics	75.5%
Feist, 2006	Science and mathematics	79%
Current study	SMT	78.6%
Current study	SMT and non-SMT	70.5%

With regard to gender, however, the results of the current study differ significantly from those found in follow-up studies of Westinghouse winners. In the current study, 100% of SMT females reported clearly demonstrated continued engagement, compared with only 68% of SMT males. By comparison, Subotnik and Steiner (1993) found that that continued engagement was greater among male participants (82% vs. 66%). Feist (2006) also found that males were more likely to still be engaged in science or math upon follow-up. Despite the small sample size (there were only nine SMT females in the sample), these continued engagement results are notably different than those from other studies of SMTs. One reason for this may be generational differences between the samples. Subotnik and Steiner's (1993) study surveyed individuals who received awards in 1983, while Feist's (2006) study surveyed TAWs from 1965, 1975, 1985, and 1995. All participants in the current study received awards in 2001 or after, and changing societal attitudes regarding women in the fields of science and math may account for the reversal of continued engagement trends. Over the past decade, several initiatives have sought improve the recruitment, retention, and representation of women in the fields of science, math, technology, and engineering—such as the Extraordinary Women Engineers project (National Science Foundation, 2005) and the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology Development (CAWMSET; 2000)—and it is possible that efforts such as these may have contributed to the high degree of continued engagement among female SMTs in the current study.

Because the Westinghouse award is limited to the fields of science and mathematics, there exists no comparison group of young talent award winners in non-SMT fields. In the present study, however, it was observed that a higher percentage of SMTs than non-SMTs (78.6% vs. 56.3%) reported clearly demonstrated continued engagement. However, a much larger proportion of non-SMT participants indicated that, despite not committing fully to their award field, were at least still considering continued

engagement in that field. As a result, when comparing participants who had either clearly demonstrated continued engagement or were at least still considering a career in their talent field, the groups were very similar (82.2% of SMTs compared to 81.3% of non-SMTs). Non-SMT award winners, then, appeared to be less certain of their future career and educational goals, but tended not to rule out continued engagement in their award field.

One possible explanation for the difference in continued engagement between SMTs and non-SMTs could be that award winners in non-SMT fields have more diverse interests or talents than those in the fields of science, math, or technology, and are thus more hesitant to fully endorse their award field as their chosen vocation. Another explanation for this finding may relate to the types of careers associated with the talent domains in question. When discussing the difference between talent domains, Csikszentmihalyi et al. (1993) noted that talent fields differ tremendously in terms of their potential payoffs. For instance, success in science and math can often lead to prestigious and financially rewarding careers in fields such as medicine and engineering. Conversely, potential career outcomes are not as clear in fields such as music and literature. An awareness and appreciation for these practical differences may account for the tendency for non-SMT award winners to exhibit less firm commitments to their talent fields than SMT participants.

Future research on talent award winners could investigate these hypotheses directly. For instance, vocational assessments or interest inventories may reveal that non-SMTs have less circumscribed educational and career interests than their SMT counterparts. In-depth interviews could also explore this hypothesis, and would also allow researchers to learn more about the attitudes TAWs hold toward their talent fields. Do TAWs perceive the same differences between careers in the arts and careers in science as those highlighted by Csikszentmihalyi et al. (1993)? In order to directly



measure the impact of receiving a prestigious talent award on educational and career outcomes, future studies could also use a comparison group of gifted, non-TAW students.

#### Attributions of Success

Research on attributions for academic success in the general population has suggested that attributions differ with regard to gender and subject area. Specifically, within domains in which men have traditionally been thought to perform better, such as science and mathematics, boys exhibit a greater tendency to attribute success to stable, internal factors, such as ability (Ryckman & Peckham, 1987; Stipek & Gralinski, 1991). This pattern has also been observed among gifted students (Assouline et al., 2006) and talent award winners (Subotnik, 1988).

The present study provided further evidence of this phenomenon. Among SMT participants, males showed significantly higher levels of endorsement of ability-related attributions of success than females. Thus, even among a group of highly accomplished young scientists and mathematicians, females were less likely than their male TAW counterparts to endorse the role of ability in their accomplishments. It should be noted, however, that as a group the female SMTs displayed positive endorsement of ability as an attribution of success, just to a lesser extent than male SMTs.

Previous research has also suggested that girls tend to attribute success in these subject areas to unstable, internal factors, such as effort, and that this pattern holds even for gifted girls (Assouline et al., 2006) and young talent award winners (Subotnik, 1988). The current study did not allow for an exact replication of these results, as effort was not included as an attributional choice in the follow-up survey. However, the resource composite used in this study did assess for attributions to unstable, external factors, such as parental/guardian encouragement and having sufficient resources needed to complete one's project. As expected, female SMTs had significantly greater endorsement of the external, unstable factors of sufficient resources and parental/guardian encouragement. Both of these factors have been identified as playing key roles in the development of

talented youth and adolescents (e.g., Bloom, 1985; Csikszentmihalyi et al., 1993). As a result, it is likely that both male and female SMTs experienced extensive parental encouragement and were provided with sufficient resources to complete their projects. Indeed, male SMTs as a group did identify the importance of these external factors in their success, but not to the same degree as their female counterparts.

One possible explanation for these attributional differences among SMTs is that even the most accomplished students are not immune to the effects of social biases and beliefs regarding gender influences on innate ability in the fields of science, mathematics, and technology (Heller & Ziegler, 1996). That is, because traditionally men have been thought to outperform women in these fields, male participants may have been conditioned to attribute their success to their innate, gender-based ability. At the same time, female participants may have internalized social or cultural messages related to gender-based ability in these fields, and as a result may have been reluctant to endorse ability-related attributions to a strong degree. The latter scenario is particularly distressing, as messages of gender-based abilities are likely to have significant implications for girls and women interested in traditionally “male” fields. If even the most talented and recognized females, such as Davidson Fellows, cannot escape these biases, it may suggest continued problems with retention of talented women in these fields.

#### *Consequences of Attributions*

Attribution theory posits the way in which individuals attribute their successes and failures will influence their expectations for future success, thus affecting their achievement motivation and likelihood of future engagement (Schunk et al., 2008; Weiner, 1974). Attribution research has indicated that the stability of an attributional source is closely linked to future expectations for success on similar tasks (Schunk et al., 2008). Stable attributional sources are thought to increase the likelihood of future

engagement, whereas attributions to unstable sources are likely to decrease continued engagement (Weiner, 1974; 1986).

In the current study, the aptitude composite represented attributions to stable sources (intelligence and ability), while the resource composites represented attributions to unstable sources, including having sufficient resources and the encouragement of one's parents or guardians. As discussed above, gender and group differences were found with regard to endorsement of these composites. However, the predictive ability of these attributional differences was largely lacking in the current study.

Among the sample as a whole, attributions of success did not predict continued engagement. Attributional style also failed to predict continued engagement among SMT participants. Thus, even though significant differences were found between the attribution styles of SMT males and SMT females, these attributional differences did not appear to impact continued engagement. This result runs contrary to the fears of Heller and Ziegler (1996; 2001), who proposed that girls' attributions of their success to unstable factors could lead to disengagement from these areas of study. It is possible that because of the elite level of achievement attained by female Davidson Fellows, attributional style holds less sway over their continued engagement. However, the small sample size of the current study limits the ability to make broad generalizations about the lack of consequences of attributions for success within this population. Instead, it may be that the current study did not have adequate power to detect the predictive ability of attributions. Range restriction within the SMT sample likely also made it difficult to detect significant differences, as the vast majority of the SMT sample (22 of 28 participants) received the highest continued engagement score. Creating additional continued engagement categories might have addressed the problem of range restriction. However, the four categories that were used in study were judged to be as internally homogenous and externally heterogeneous as possible—there existed no conceptual basis for creating additional categories based on the continued engagement data that was collected. Future

studies of continued engagement among TAWs might encounter less range restriction if they recruit larger sample sizes, allow more time to pass between the award and follow-up, and collect more detailed information on which to make determinations about continued engagement.

Among non-SMTs, attributions of success were predictive of continued engagement in a manner consistent with attribution theory—increased endorsement of the aptitude composite was significantly associated with continued engagement, while decreased endorsement of the original resource composite was associated with continued engagement, though not to a significant level. Why was this effect detected for non-SMTs and not SMTs? Once again, the realities of pursuing a career in each field may have played a factor. Because career success in non-SMT fields like music and literature is more elusive than in science or mathematics, belief in one's ability may be more vital to continued engagement. As a result, the aptitude composite may have been a more powerful predictor of continued engagement in non-SMT participants. In addition, Csikszentmihalyi et al. (2003) found that high school students who viewed their artistic pursuits as important to their future goals were more likely to become highly engaged in artistic fields. While these attitudes were not directly assessed in the present study, viewing one's pursuits as important to one's future goals is a characteristic that is thought to be more common among individuals with higher endorsement of stable attributions, such as those represented by the aptitude composite.

From a positive psychology perspective, it was hoped that the present study could provide insights into effective ways to nurture talent and encourage continued engagement among eminent youth and adolescents. Investigating attributions and their consequences was one aspect of this approach. By studying the types of attributions that lead to continued engagement, it was hoped that psychology could better help talented individuals to reach their full potential. At least within non-SMT fields, it appears that

encouraging talented students to recognize the impact of their ability on their success might promote continued engagement in these fields.

#### Limitations of the Study

One limitation of the current study was the small number of participants, particularly in regard to the quantitative research questions. The number of participants in this study may have been too low to detect meaningful group differences in the statistical analyses. While 45% of the available population of Davidson Fellows responded to the survey, the total population is a small group to begin with. Future studies may benefit from the greater numbers of eligible participants, as new Fellowships are awarded each year. If new responses are added to the current dataset, some of the analyses that were not statistically significant could become so.

The survey that was used in the present study also has some limitations. One potential shortcoming is that the survey item that assesses attributions of success (item 12) does not include effort as one of the factors that participants are asked to rate. Effort and ability were two of the original components of Weiner's (1974) 2x2 attributional model, and as a result many previous studies compared these two factors directly. Unfortunately, such a comparison was not possible in the present study. However, effort is only one type of unstable attribution of success, and the survey asks participants to rate numerous other unstable attributional sources. Because the stability of attributions is generally regarded to be the dimension most related to continued engagement in tasks, activities, and domains of study (Schunk et al., 2008), this theory was still able to be applied and tested with a population of talent award winners.

Another limitation of the survey is that item 12 is not ideally phrased to measure individual attributions of success. Specifically, the item does not explicitly ask participants to base their answers on their experience and their beliefs about what factors contributed to earning the Fellowship. Instead, the item asks, "In your opinion, which of the following are necessary to earn a Davidson Fellowship?" As a result, some

participants may have responded to this item in a manner that does not exclusively represent their attributions for their own success, and instead reflects factors that the participant felt may have contributed to the success of other winners. However, it is reasonable to assume that most participants would have based their responses on their own experience and personal beliefs, which would reflect their own attributions for winning the Fellowship.

It is also notable that the survey used in the study did not explicitly ask participants about negative aspects of impact. Instead, the open-ended questions that were used for the qualitative analysis simply asked participants to describe the impact of the award in various domains. It is possible that if the survey had asked specifically about negative aspects of impact, a greater number of participants would have discussed negative features of receiving the award.

Another limitation is that the current study did not include a comparison group of gifted students who were not TAWs. As a result, it is not possible to conclude that winning a Davidson Fellowship has a measurable influence on continued engagement. However, research on the SMPY population provides some basis for comparison—with regard to retention in the fields of science and math, over 52% of these students had earned at least one postsecondary degree in math or science at the time of follow-up (Benbow et al., 2000). In the current study, as well as the research on Westinghouse winners, a greater proportion of TAWs demonstrated continued engagement, but continued engagement was assessed differently across all these studies.

Finally, because of the differing monetary amounts of the Davidson Fellows Scholarships, there was a risk that the survey responses could be biased in certain ways. For instance, it was possible that Fellows who were awarded the highest scholarship amount (\$50,000) could have been overrepresented in the sample. However, this was not found to be the case, as the sample closely resembled the award population with respect to the proportion of individuals receiving each scholarship amount (see Table 1). It was

also possible that Fellows who received \$50,000 scholarships would have been more likely to report continued engagement in their talent field, but no significant correlation was found between award amount and continued engagement. In fact, no demographic variable (gender, age, family income) was found to correlate significantly with continued engagement (see Table 8). However, it is possible that participants who received \$50,000 scholarships may have felt compelled to say more positive things about the Fellowship and its impact on their lives, which would have impacted the qualitative data. At the same time, all participants may have felt at least somewhat inclined or obligated to report positive aspects of impact, as all participants received some amount of financial award as part of the Fellowship.

Table 8. Two-tailed Pearson Correlations between Continued Engagement and Demographic Variables

Demographic Variable	Continued Engagement	<i>p</i> -value
Age	0.18	0.25
Award Amount	0.01	0.95
Family Income	-0.14	0.44
Gender	0.25	0.10

### Conclusion

The Davidson Fellows Scholarship has been shown to impact talented young individuals in a variety of ways. The overwhelming majority of responses in the current study indicated that winning the award was a positive experience that had meaningful academic, artistic, professional, and personal repercussions. These results highlight the role that talent award competitions play in opening doors for talented individuals to continue developing their gifts, as well as providing personally meaningful recognition

and reinforcement to these talented young people. While not specifically asked, several participants specifically highlighted the direct role the Davidson Fellows Scholarship played in providing encouragement and fostering continued engagement. Indeed, most participants were found to still be engaged in the field in which they received their award, and this proportion was similar to that reported in previous studies of talent award winners. In contrast to previous studies of talent award winners (e.g., Feist, 2006; Subotnik & Steiner, 1993), however, continued engagement among female SMTs was more common than among male SMTs, which may reflect changing societal attitudes regarding the presence of women in the fields of science, math, and technology.

One finding that has not appeared to change over time, however, is the way in which attributions of success can vary by gender. As expected, male SMTs demonstrated higher endorsement of aptitude-based attributions of success, while female SMTs demonstrated higher endorsement of resource-based attributions of success. However, within the SMT population, these differences in attributions of success did not predict continued engagement. Because of the small sample size of the current study, it cannot be concluded that these significant attributional differences within this population are not of consequence. However, any impact that they might have on continued engagement or any other aspect of participants' lives was not detected in the present study. Among the non-SMT population, attributional patterns with regard to aptitude- and resource-based attributions of success were predictive of continued engagement. While characteristic differences between SMT and non-SMT fields of study may account for this difference, this finding at the very least confirms the influence that attributions of success can have on continued engagement. Further investigation of this phenomenon may clarify if this influence is mediated or moderated by talent field or other variables or aspects of individual difference.



## REFERENCES

- Amabile, T.M. (1983). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, *45*, 357-376.
- Amabile, T.M., Phillips, E., & Collins, M.A. (1994). Person and environment in talent development: The case of creativity. In N. Colangelo, S.G. Assouline, & D.L. Ambroson (Eds.), *Talent Development: Proceedings from the 1993 Henry B. and Jocelyn Wallace National Research Symposium on Talent Development* (pp. 265-279). Dayton, OH: Ohio Psychology Press.
- Assouline, S.G., Colangelo, N., Ihrig, D., & Forstadt, L. (2006). Attributions of academic success and failure by intellectually gifted students. *Gifted Child Quarterly*, *50*, 283-294.
- Benbow, C. P., Lubinski, D., Shea, D. L., & Eftekhari-Sanjani, H. E. (2000). Sex differences in mathematical reasoning ability at age 13: Their status 20 years later. *Psychological Science*, *11*, 474-480.
- Bloom, B. (1985). *Developing talent in young people*. New York: Ballantine.
- Bogie, C.E., & Buckhalt, J.A. (1987). Reactions to failure and success among gifted, average, and EMR students. *Gifted Child Quarterly*, *31*, 70-74.
- Brody, L.E., & Stanley, J.C. (2005). Youths who reason exceptionally well mathematically and/or verbally: Using the MVT:D<sup>4</sup> model to develop their talents. In R.J. Sternberg & J. Davidson (Eds.), *Conceptions of giftedness* (pp. 20-37). New York: Cambridge University Press.
- Clark, R.D., & Rice, G.A. (1982). Family constellations and eminence: The birth orders of Nobel Prize winners. *Journal of Psychology: Interdisciplinary and Applied*, *110*, 281-287.
- Colangelo, N., Assouline, S.G., & Gross, M.U.M. (2004). *A nation deceived: How schools hold back America's brightest students: Volume I*. Iowa City, IA: University of Iowa.
- Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development (CAWMSET). (2000). *Land of plenty: Diversity as America's competitive edge in science, engineering and technology*. Retrieved February 7, 2010, from <http://www.nsf.gov/pubs/2000/cawmset0409/cawmset0409.pdf>.
- Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: HarperCollins.
- Csikszentmihalyi, M., Rathunde, K.R., Whalen, S., & Wong, M. (1993). *Talented teenagers: The roots of success and failure*. New York, NY: Cambridge University Press.
- Dai, D.Y., Moon, S.M., & Feldhusen, J.F. (1998). Achievement motivation and gifted students: A social cognitive perspective. *Educational Psychologist*, *33*, 45-63.

- Davidson Institute for Talent Development. (2008). *Davidson Fellows Scholarships*. Retrieved September 7, 2008, from <http://www.davidsongifted.org>.
- Dweck, C.S. (1986). Motivational processes affecting learning. *American Psychologist*, *41*, 1040-1048.
- Dweck, C.S. (2002). Beliefs that make smart people dumb. In R.J. Sternberg (Ed.), *Why smart people can be so stupid* (pp. 24-41). New Haven, CT: Yale University Press.
- Ericsson, K.A., Krampe, R.T., & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, *100*, 363-406.
- Ericsson, K.A., & Lehmann, A.C. (1996). Expert and exceptional performance: Evidence of maximal adaptation to task constraints. *Annual Review of Psychology*, *47*, 273-305.
- Feist, G.J. (2006). The development of scientific talent in Westinghouse finalists and members of the National Academy of Sciences. *Journal of Adult Development*, *13*, 23-35.
- Fretz, B. R. (1985). Counseling psychology. In E. M. Altmaier & M. E. Meyer (Eds.), *Applied specialties in psychology* (pp. 45-73). New York: Random House.
- Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory: Strategies for qualitative research*. Chicago: Aldine.
- Greenspan, D.A., Solomon, B., & Gardner, H. (2004). The development of talent in different domains. In L.V. Shavinina & M. Ferrari (Eds.), *Beyond knowledge: Extracognitive aspects of developing high ability* (pp. 119-135). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.
- Heller, K.A., & Ziegler, A. (1996). Gender differences in mathematics and the sciences: Can attributional retraining improve the performance of gifted females? *Gifted Child Quarterly*, *40*, 200-210.
- Heller, K.A., & Ziegler, A. (2001). Attributional retraining: A classroom-integrated model for nurturing talents in mathematics and the sciences. In N. Colangelo & S.G. Assouline (Eds.), *Talent Development IV: Proceedings from the 1998 Henry B. and Jocelyn Wallace National Research Symposium on Talent Development* (pp. 205-217). Scottsdale, AZ: Great Potential Press.
- Huber, J.C. (2000). A statistical analysis of special cases of creativity. *Journal of Creative Behavior*, *34*, 203-225.
- Lincoln, Y.S., & Guba, E.G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications.
- Lopez, S.J., Magyar-Moe, J.L., Petersen, S.E., Ryder, J.A., Krieschok, T.S., O'Byrne, K.K., et al. (2006). Counseling psychology's focus on positive aspects of human functioning. *The Counseling Psychologist*, *34*, 205-227.
- Maslow, A.H. (1968). *Toward a psychology of being* (2<sup>nd</sup> ed.). Princeton, NJ: D. Van Nostrand Company.

- McNabb, T. (2003). Motivational issues: Potential to performance. In N. Colangelo & G.A. Davis (Eds.), *Handbook of gifted education* (3<sup>rd</sup> ed., pp. 417-423). Boston: Allyn & Bacon.
- National Science Foundation. (2005). *Extraordinary Women Engineers final report*. Retrieved February 7, 2010, from [http://www.eweek.org/site/news/Eweek/EWE\\_Needs\\_Asses.pdf](http://www.eweek.org/site/news/Eweek/EWE_Needs_Asses.pdf).
- Olszewski, P., Kulieke, M. & Buescher, T. (1987). The influence of the family environment on the development of talent: A literature review. *Journal for the Education of the Gifted*, 11, 6-28.
- Rothenberg, A., & Wyshak, G. (2005). Family background and genius II: Nobel laureates in science. *Canadian Journal of Psychiatry*, 50, 918-925.
- Ryckman, D.B., & Peckham, P. (1987). Gender differences in attributions for success and failure. *Journal of Educational Research*, 81, 120-125.
- Schunk, D.H., Pintrich, P.R., & Meece, J.L. (2008). *Motivation in education: Theory, research and applications* (3<sup>rd</sup> ed.). Upper Saddle River, NJ: Pearson.
- Seligman, M.E.P. (1999). The president's address. *American Psychologist*, 54, 559-562.
- Seligman, M.E.P. (2002). *Authentic happiness*. New York: Free Press.
- Seligman, M.E.P. (2003). Positive psychology: Fundamental assumptions. *The Psychologist*, 16, 126-127.
- Seligman, M.E.P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, 55, 5-14.
- Seligman, M.E.P., & Pawelski, J.O. (2003). Positive psychology: FAQs. *Psychological Inquiry*, 14, 159-163.
- Society for Science & the Public. (2008). Intel Science Talent Search. Retrieved April 13, 2008, from <http://www.societyforscience.org/sts/>.
- Stipek, D.J., & Gralinski, J.H. (1991). Gender differences in children's achievement-related beliefs and emotional responses to success and failure in mathematics. *Journal of Educational Psychology*, 83, 361-371.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Thousand Oaks, CA: Sage Publications.
- Subotnik, R.F. (1988). The motivation to experiment: A study of gifted adolescents' attitudes toward scientific research. *Journal for the Education of the Gifted*, 11, 19-35.
- Subotnik, R.F., & Steiner, C.L. (1993). Adult manifestations of adolescent talent in science. *Roeper Review*, 15, 164-69.
- Therivel, W.A. (1999). Why Mozart and not Salieri. *Creativity Research Journal*, 12, 67-76.

- U.S. Census Bureau. (2008). *Living arrangements of children: 2004*. Washington, DC: Author.
- U.S. Department of Health, Education, and Welfare. (1972). *Education of the gifted and talented*. Washington, DC: Author.
- Von Karolyi, C., Ramos-Ford, V., & Gardner, H. (2003). Multiple intelligences: A perspective on giftedness. In N. Colangelo & G.A. Davis (Eds.), *Handbook of gifted education* (3<sup>rd</sup> ed., pp. 100-112). Boston, MA: Allyn and Bacon.
- Wantman, L.K. (1986). Promoting excellence: A study of the families of origin of Nobel prize winners (Doctoral dissertation, Temple University, 1986). *Dissertation Abstracts International*, 47, 1776-1777.
- Weiner, B. (1974). *Achievement motivation and attribution theory*. Morgantown, NJ: General Learning Corporation.
- Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review*, 92, 548-573.
- Weiner, B. (1986). *An attributional theory of motivation and emotion*. New York: Springer-Verlag.
- Winner, E. (1996). *Gifted children: Myths and realities*. New York: Basic Books.
- Winner, E. (2000). The origins and ends of giftedness. *American Psychologist*, 55, 159-169.

APPENDIX: DAVIDSON FELLOWS FOLLOW-UP SURVEY

A: Are/were you a Davidson Young Scholar?

- 1=yes
- 2=no

1: Please indicate your gender:

- 1=Male
- 2=Female

2: What is your age in years?

3: Please indicate your date of birth: use the MMDDYYYY format with no punctuation.

4: Please indicate your race/ethnicity:

- 1=Asian
- 2=American Indian/Alaska Native
- 3=Black/African-American
- 4=Hispanic/Latino/Latina
- 5=Native Hawaiian or Other Pacific Islander
- 6=White
- 7=Multiracial

5: In which state do you currently reside?

6: For which category did you receive your award?

- 1=Literature
- 2=Mathematics
- 3=Music
- 4=Outside the Box
- 5=Philosophy
- 6=Science
- 7=Technology

7: What was the amount of your award?

- 1=\$50,000
- 2=\$25,000
- 3=\$10,000
- 4=Honorable Mention

8: Please select the areas you are strong in, other than the one in which you received your award. (Select all that apply)

- 8a: Astronomy
- 8b: Biology
- 8c: Chemistry
- 8d: Computers/Technology
- 8e: Dance
- 8f: History
- 8g: Languages
- 8h: Mathematics
- 8i: Music
- 8j: Philosophy
- 8k: Physics
- 8l: Psychology/Sociology
- 8m: Sports
- 8n: Visual Arts

8o: Writing—fiction  
 8p: Writing—non-fiction

9: What is your favorite academic or artistic area?

1=Astronomy  
 2=Biology  
 3=Chemistry  
 4=Computers/Technology  
 5=Dance  
 6=History  
 7=Languages  
 8=Mathematics  
 9=Music  
 10=Philosophy  
 11=Physics  
 12=Psychology/Sociology  
 13=Visual arts  
 14=Writing – fiction  
 15=Writing - non-fiction  
 9a: Other. Please Specify

9b: Please describe in as much detail as possible what your life was/is like in elementary school (or home school between the ages of 5 and 12).

9c: Please describe in as much detail as possible what your life was/is like in middle and high school (or home school between the ages of 12 and 18). If you have not yet attended a middle or high school, leave blank.

10: Please describe what you have enjoyed most from earning the Fellowship (ex., meeting other Fellows, traveling to D.C., the scholarship funds, etc.) and why.

11a: Please describe the impact of the Fellowship on you academically or artistically.

11b: Please describe the impact of the Fellowship on you personally.

11c: Please describe the impact of the Fellowship on you professionally. (If not applicable, just leave blank)

12. In your opinion, which of the following are necessary to earn a Davidson Fellowship? (All responses are on the scale: 1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree)

12a: Intrinsic Motivation  
 12b: Extrinsic Motivation  
 12c: Parental/Guardian Encouragement  
 12d: Sufficient Resources  
 12e: Connection to a college or university  
 12f: A Mentor  
 12g: High general intelligence (IQ)  
 12h: High ability in a specific area  
 12i: A strong self-confidence  
 12j: The ability to focus on a single task  
 12k: The ability to multitask  
 12l: The ability to take criticism

12n: Other. Please Specify.

12o: Which of the above do you believe is the most important and why?

13: Please list any awards, honors, publicity, scholarships, grants, employment, etc. you have earned since earning the Fellowship.

14: How many of the items mentioned in the previous question would you attribute, at least partially, to earning the Fellowship? Please describe why.

15: What is your marital status?

- 1=Never married
- 2=Married
- 3=Separated
- 4=Divorced
- 5=Widowed

16: How many children do you have?

- 0=0
- 1=1
- 2=2
- 3=3
- 4=4
- 5=5 or more

17: In what household setting do you currently live?

- 1=With your parents or guardians
- 2=With other relatives
- 3=In an apartment or house other than with parents or relatives
- 4=Somewhere else

18: Please estimate parents' household income at the time you received the Fellowship. (Round to nearest thousand dollars with no punctuation)

19a: What is your Parent 1's/Guardian 1's highest level of education?

- 1=Elementary school
- 2=Middle school/Junior high
- 3=GED
- 4=High school diploma
- 5=Some college
- 6=Two-year technical-vocational training/AA degree
- 7=Bachelors
- 8=Masters or equivalent
- 9=Advanced professional degree
- 10=Doctorate degree

19b: Sex of Parent 1/Guardian 1:

- 1=male
- 2=female

20: What is/was your Parent 1's/Guardian 1's occupation?

21a: What is your Parent 2's/Guardian 2's highest level of education?

- 1=Elementary school



- 2=Middle school/Junior high
- 3=GED
- 4=High school diploma
- 5=Some college
- 6=Two-year technical-vocational training/AA degree
- 7=Bachelors
- 8=Masters or equivalent
- 9=Advanced professional degree
- 10=Doctorate degree

22b: Sex of Parent 2/Guardian 2:

- 1=male
- 2=female

22: What is/was your Parent 2's/Guardian 2's occupation?

23a: What is your current status?

- 1=Attending middle school
- 2=Attending high school
- 3=Attending undergraduate university or college
- 4=Attending graduate school
- 5=Employed
- 6=Two-year technical-vocational training/AA degree
- 7=Military service
- 8=Other: Please explain

23b: How many siblings do you have?

- 0=0
- 1=1
- 2=2
- 3=3
- 4=4
- 5=5
- 6=more than 5

23c: Overall, how would you rate your current satisfaction with your life?

- 1=Very dissatisfied
- 2=Dissatisfied
- 3=Satisfied
- 4=Very satisfied

23d: What are your educational and career goals?

23e: Is there anything else you would like to tell us about your family that may help us better understand your family structure?