Developmental Pathways in Underachievement

by

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Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy in the Department of
Psychology & Neuroscience in the Graduate School
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ABSTRACT

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Abstract

Despite decades of research attention given to academic underachievement, longitudinal and developmental investigation of this phenomenon has been sparse. To address this shortcoming, the current study used a longitudinal, person-centered approach to identify latent subgroups of growth in the joint development of underachievement and four motivational beliefs (self-concept, task importance, psychological cost value, and self-worth) from first through sixth grade. Two types of underachievement latent classes emerged: one characterized by sustained underachievement and the other by growing underachievement (an Achievement class was also consistently found). Sustained, chronic underachievement was not associated with declines in self-concept or task importance, but was related to moderately lower levels of psychological cost value and self-worth, and was also related to lower middle school academic achievement. Growing underachievement was associated with lower and declining self-concept and task importance. Although differential class membership by gifted status was hypothesized, no such effects were found. Gender effects were found for the Task Importance and Self-Worth models in the hypothesized direction, but this effect was not as robust as in prior research. Findings from the current study build on prior research highlighting heterogeneity among underachieving students.

Dedication

This dissertation is dedicated with love and deep gratitude to two very important people.

...to my husband, Erik. Your patience, love, and support has sustained me throughout this journey, and I am forever grateful. None of this would be possible without you!

...to Francia Barksdale. You touched the lives of so many gifted students over the course of your career, but most importantly, you inspired in me a profound passion for giftedness. I am so proud to follow in your footsteps.

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Acknowledgements

This dissertation would not have been possible without support from so many individuals. First and foremost, I need to thank my husband Erik for his unending patience and constant encouragement. Being the spouse of an academic is never easy, and he has done much more than his fair share of laundry and dishes over the past year and a half. I am so lucky to have found such a wonderful partner.

I am forever indebted to my family for supporting me on this long road. To my mother, who instilled in me a love of learning, and has always been my biggest advocate. To my dad, who graciously funded my college education and always supported me in my decision to keep furthering my education (even if he did always want me to just get a job!). And to my brother Michael, for always keeping me humble and teaching me that giftedness is so much more than grades. My “Raleigh family” also deserves my gratitude for being so patient during the many vacations when I had to bring my work with me.

I am fortunate to have such a wonderful panel of experts on my dissertation committee, all of whom helped me to shape this dissertation. I am especially grateful to Madeline Carrig for her patience in helping me to develop my statistical skills, and for cheerfully answering all of my questions. I would like to thank Martha Putallaz for teaching me that it is the *questions* that guide secondary data analysis, not the data – that

advice has proved invaluable. Finally, I am incredibly fortunate to have had Lisa Linnenbrink-Garcia as my mentor for the past five years. She always held the bar high and pushed me toward excellence, but provided the support and training for me to reach those goals. I am proud to be her student.

Two other scholars warrant my gratitude. I am deeply grateful to Jason Osborne for teaching the educational psychology class that inspired me to change my undergraduate major and my career path, and for providing “tough love” when I needed it most. I am also thankful to Makeba Wilbourn for inspiring my love of developmental theory and introducing me to dynamic systems theory, both of which opened my eyes to taking a developmental approach to the study of giftedness and underachievement.

My graduate school peers have always given me invaluable encouragement and support, especially the members of the Developmental Writing Group (Molly, Amy, Megan, Alison and Alissa – my cheerleaders!). I owe special thanks to Molly Stroud Weeks and Amy Dent for their statistical insights. My labmates, both past and present, have also helped me immensely (Stephanie Wormington for her Oreo chocolate truffles and Mplus syntax problem-solving, Michael Barger for artistic encouragement, and Adar Ben-Eliyahu for blazing the trail before me).

Finally, this dissertation would not be possible without access to Childhood and Beyond Study dataset. The Childhood and Beyond study was funded through a grant

from the National Institute for Child Health and Human Development (Grant HD 17553) to Jacquelynne S. Eccles, Allan Wigfield, Phyllis Blumenfeld and Rena Harold. I am deeply grateful to the CAB researchers, especially Jacquelynne Eccles, for their generosity in allowing me access to these data.

1. Introduction

Academic underachievement is a significant concern in education.

Underachieving in school has been linked to long-term outcomes such as continued underachievement, lower post-secondary education, and lower-status jobs (McCall, Evahn, & Kratzer, 1992). There are also unique risks associated with underachievement among academically gifted students. For example, high-ability underachieving students and students who are perceived as being unmotivated are at risk for being overlooked in the gifted identification process, and therefore may miss out on educational services that are needed to develop talent (Endepohls-Ulpe & Ruf, 2005). Underachievement represents a loss for all students, but perhaps more so for gifted students with unfulfilled expert achievements, missed scientific discoveries, and undeveloped talent (Gowan, 1955). For these reasons, understanding the causes and development of underachievement has long been considered a priority for educational researchers (Renzulli, Reid, & Gubbins, 1992).

Despite the importance of studying underachievement, significant challenges abound. Underachievement is a difficult construct to both conceptualize and measure (Lau & Chan, 2001a; Reis & McCoach, 2000). The most widely-used definition posits that underachievement is a “severe discrepancy between expected achievement...and actual achievement” (Reis & McCoach, 2000, p. 157). However, there is no clear agreement among researchers regarding how expected achievement, actual achievement

or the discrepancy itself should be measured, or what constitutes a severe discrepancy. Further, although the aforementioned definition states that underachievement is a chronic, persistent problem, the vast majority of prior research has focused on measuring underachievement and its determinants at a single point in time.

Much of this research has also equated underachievement with an absence of motivation. In this perspective, researchers posit that underachievement, especially among gifted students, stems from a general lack of motivation or value for academics (Ford, Alber, & Heward, 2005; Van Boxtel & Monks, 1992), often brought on by an unchallenging academic curriculum (Gohm, Humphreys, & Yao, 1998; Kanevsky & Keighley, 2003; Neihart, 2006; Rea, 2000; Reis & McCoach, 2000). Although motivation is indeed a factor in underachievement, it is likely more than a simple lack of motivation (Dai, Moon, & Feldhusen, 1998; Lau & Chan, 2001b). Using terms such as “motivated” and “unmotivated” assumes that motivation falls along a single dimension, a perspective that fails to capture the complexity of modern motivational theories (Linnenbrink & Pintrich, 2002). There is a need to move beyond a conceptualization of underachievement as stemming from a simple loss of motivation. In doing so, it is possible to begin to explore the rich motivational processes that synergistically combine to undermine or support the fulfillment of academic potential.

Prior research on underachievement is largely characterized by a mean-level comparison approach to investigate differences in motivational beliefs between

achieving and underachieving students at a single point in time. A review of this literature suggests that both value-based and competence-based beliefs are important in understanding underachievement. Underachieving gifted students report lower levels of satisfaction with school and teachers (Colangelo, Kerr, Christensen, & Maxey, 1993; Lupart & Pyryt, 1996; McCoach & Siegle, 2003) and lower perceived value for academics (Baslanti & McCoach, 2006; Emerick, 1992; McCoach & Siegle, 2003). Findings regarding academic self-concept, or one's judgment of academic competence, have been mixed. Some underachieving gifted students report lower academic self-concept than achieving gifted students (Davis & Connell, 1985; Lau & Chan, 2001b; Van Boxtel & Monks, 1992), yet other studies find no differences (Lupart & Pyryt, 1996; McCoach & Siegle, 2003; Vlahovic-Stetic, Vidovic, & Arambasic, 1999).

Although this comparative research has highlighted important motivational constructs for future research, the aforementioned mixed findings highlight some of the limitations to a mean-level approach. Forming groups of this nature (achieving vs. underachieving) collapses many types of underachieving students into a single category, assuming relative homogeneity within each group. For instance, the assumption is made that characteristics of underachievement are similar at all stages of development. In reality, there are likely many unique types of underachieving students: students with large and small ability-achievement discrepancies, as well as students who have been entrenched in an underachieving pattern for years and students who have only recently

begun to underachieve. Further, examination of underachievement at a single time point does not address questions regarding the development of underachievement. In summary, a mean-level approach cannot fully inform our understanding of either the nature of underachievement over time (stable or unstable) or the mechanisms of change that underlie fluctuations in underachievement.

A conceptual understanding of underachievement can be enriched by shifting away from a focus on mean-level differences between underachieving and achieving students at a single time point toward the examination of different developmental trajectories of underachievement across time (Eccles & Alfeld, 2007; Simonton, 2009). As a complex phenomenon, underachievement is likely multiply-determined, with no single cause driving the behavior. Rather, there are potentially multiple pathways in underachievement. Utilizing a multiple pathways approach, attention can be turned from looking for mean-level group differences to exploring the existence of individual trajectories or pathways to various outcomes (Bråten & Olaussen, 2005; Pintrich, 2000, 2003; Shell & Husman, 2008). This redirects the focus from variables (does underachievement increase across middle childhood?) to patterns of change or individual trajectories (are there unique patterns of growth, or latent classes, in underachievement across middle childhood?). Although the majority of research on multiple pathways has focused on supporting pathways to achievement, this approach can also be used to examine multiple trajectories in underachievement. Further,

longitudinal work can also begin to isolate factors that may differentially predict changes in underachievement for different groups of students, such as gifted and typical students.

Though underachievement is certainly not limited to gifted students (Carr, Borkowski, & Maxwell, 1991; McCall, Beach, & Lau, 2000), the unique educational experiences that gifted students encounter suggest that the psychological processes underlying gifted underachievement are likely unique. For instance, gifted students are likely to encounter contextual factors such as being identified as gifted, receiving frequent ability-focused praise, receiving high expectations from parents and teachers, and experiencing ability-grouped classes or accelerated education. These factors, coupled with the student's heightened intellectual ability, likely make the development of underachievement among the gifted unique from those processes leading to underachievement among typical students. Thus in the current study, I highlighted where differential processes may be expected for gifted and typical students.

The current study used a longitudinal, person-centered approach to understanding underachievement. Specifically, the purpose of the current study was to understand both the antecedents and consequences of concurrent development in underachievement and motivational beliefs spanning elementary school. A further goal of the current study was to examine differences in development of underachievement between gifted and typical students. While underachievement can affect students at all

ability levels, it is possible that the underlying processes involved may vary between gifted and typical students. A greater understanding of these differences and similarities can help in tailoring prevention and intervention efforts.

2. Theoretical Background

The current study of underachievement is grounded in several theories. The emergence and existence of underachievement is frequently examined in light of hypothesized academic predictors, including students' academic beliefs. Prior findings regarding correlates of underachievement can be organized within an Expectancy-Value framework (Eccles et al., 1983), in which achievement is largely determined by students' perceptions of academic competence (expectancies) and perceived value for academics (task value). One particular aspect of task value, students' perceptions of costs associated with engaging in a task, relates closely to another theoretical perspective: the self-worth theory of achievement motivation (Covington, 1984, 1992, 2009). This theory posits that students are motivated to protect self-worth by approaching success and avoiding failure.

Integrating across these theoretical perspectives, the proposed developmental model of underachievement (see Figure 1) posits that child characteristics (gender, gifted status) influence the intertwined growth of underachievement and student motivational beliefs (self-concept, perceived importance/value, psychological cost value, and self-worth) through middle childhood, and that these processes and student demographic predictors also affect later achievement. In other words, the full model examines predictors, concurrent processes, and outcomes of trajectories in underachievement. In this conceptual model, processes are hypothesized to function uniquely for gifted and

typical students (for example, underachievement may be more noticeable among gifted students and therefore be coupled with steeper decreases in academic self-concept).

In order to provide more detail on the proposed developmental model of underachievement, it is first necessary to discuss several conceptual and measurement issues in underachievement and to propose a developmental conception of underachievement. I also review prior findings on gender differences in underachievement. Next, I provide an overview of the two theoretical perspectives important in understanding developmental changes in motivation: Expectancy-Value Theory and the Self-worth Theory of Achievement Motivation. Finally, I discuss how an integration of these motivation theories can be used to understand how underachievement develops, and how this development may uniquely occur for gifted and typical students.

2.2 Theoretical Issues in Underachievement

Underachievement occurs when a student's level of actual achievement falls below what would be expected, given the student's level of ability (Reis & McCoach, 2000). If that ability is exceptional, a discrepancy between ability and achievement constitutes gifted underachievement. This core theme of an ability-achievement discrepancy is echoed in the most common definition of underachievement:

Underachievers are students who exhibit a severe discrepancy between expected achievement (as measured by standardized achievement test scores or cognitive or intellectual ability assessments) and actual achievement (as measured by class grades and teacher evaluations). To be classified as an underachiever, the

discrepancy between expected and actual achievement must not be the direct result of a diagnosed learning disability and must persist over an extended period of time...Ideally, the researcher would standardize both the predictor and the criterion variables and would identify as underachievers those students whose actual achievement is at least one standard deviation below their expected achievement level. In reality, the standardization of classroom grades may be neither feasible nor meaningful (Reis & McCoach, 2000, p. 157).

Three important themes can be extracted from this definition. First, the idea of a discrepancy between expected achievement and actual achievement distinguishes underachievement from related constructs and similar phenomena including ability, achievement, low achievement, and learning disabilities. Second, the definition proposes that underachievement is characterized by a “severe discrepancy” between a student’s academic ability and achievement, which suggests that decisions are necessary regarding the degree of discrepancy that can warrant an underachievement classification. Third, underachievement is chronic in that it must be persist for a certain amount of time; however, no clear guidelines exist regarding how much time must pass for the chronic threshold to be met. Each of these themes will now be discussed in greater detail.

2.2.1 Distinguishing Underachievement from Related Constructs

In defining underachievement, and particularly in seeking a developmental operationalization of underachievement, it is critical to establish definitional clarity and distinguish underachievement from related constructs and similar phenomena. Although the idea of underachievement conceptually depends upon both ability and

achievement, underachievement is its own distinct construct. Further, underachievement is separate from both learning disabilities and low achievement.

2.2.1.1 Underachievement vs. ability and achievement

Any discrepancy-based measure is reliant upon the two constructs from which it derives (Edwards, 2001). Underachievement is a byproduct of both academic ability (capability to perform at a given level) and academic achievement (what the student accomplishes or produces). Exceptional ability constitutes giftedness (Gagné, 2005; Horowitz, 2004; Runco, 2005). A student's ability, or potential, determines what the student should be capable of attaining academically. However, achievement does not always match ability, even for gifted individuals. Although eminent achievement certainly requires exceptional ability (Cox, 1926; Gagné, 2005; Ziegler & Heller, 2000), exceptional ability is not a guarantee of later success (Gagné, 2005; Terman & Oden, 1959). Underachievement, therefore, lies at the heart of this discrepancy between what an individual can achieve and what they actually achieve or produce.

This distinction between ability, achievement, and underachievement is useful in understanding an individual's academic development in greater richness. Measuring academic achievement alone is informative in understanding what the student successfully learns (exam grades), produces (assignment or project grades) or some combination of both learning and production. However, incorporating knowledge of

what the student is capable of (ability) adds richness to our understanding of where the student is performing relative to what they are capable of performing.

For example, consider two students who both end the sixth grade with a 'D' in English. If one student scored in the 60th percentile on a standardized test in verbal ability at the start of the semester, the near-failing grade would not be as surprising as it would be for a second student who also received a 'D', but scored in the 99th percentile on the same standardized test. Arguably, different factors likely predicted the end-of-semester grade itself (adaptive motivational beliefs could have predicted the first student's maximum effort, while maladaptive motivational beliefs, such as low perceived value for reading, could have predicted the second student's minimal level of effort). When only considering achievement, one would assume that both students have the same "score" (a grade of D). However, only the second student is *under-achieving*. Outcomes may also differ between these two scenarios. The first student's perceptions of reading competence may decline, while the second student may maintain a sense that he is still good at reading and could do it if he desired. This example provides support for the notion that underachievement is distinct from both higher-order constructs (ability and achievement).

2.2.1.2 Underachievement vs. learning disabilities

Although some work has explored relations between externalizing behavior problems and underachievement (Hinshaw, 1992), students with severe emotional

problems, attention deficit disorders, and learning disabilities are typically excluded from the definition of underachievement (Albaili, 2003; Reis & McCoach, 2000). The ability-achievement gap in students with learning disabilities refers to a discrepancy between fluid ability or processing speed and performance as measured by knowledge test or standardized achievement test (Swanson, 2011), and is likely better conceptualized as an ability-learning discrepancy. In contrast, the ability-achievement gap in underachieving students refers to the gap between ability or knowledge (as measured by ability test or standardized achievement test) and actual achievement (as measured by grades or another measure of academic productivity). Therefore, underachievement can be considered as an ability-productivity discrepancy, rather than an ability-learning discrepancy.

2.2.1.3 Underachievement vs. low achievement

Underachievement is also distinct from low achievement, in which there is very little discrepancy between ability and performance. Although some prior work has used these terms interchangeably (Rayneri, Gerber, & Wiley, 2003), maintaining conceptual distinction between the two constructs is critical. Prior research in reading achievement has made a similar distinction between below age-level reading performance from performance that is both below age-level and below what would be predicted for the student's intelligence (Rutter, 1975). By definition, underachievement is a level of academic attainment that is under or below what the individual is capable of attaining.

While the actual level of achievement in underachievement may be objectively low (i.e., a low grade point average), it must be beneath what is to be expected for that individual to be considered underachievement. Thus, the defining characteristic of underachievement is the discrepancy between what the student can achieve and what is actually achieved. This distinction is particularly important when considering underachievement among gifted students, whose actual level of achievement may be moderate or even high, even if they are underachieving.

The distinction between low achievement and underachievement is also important when measuring underachievement longitudinally. Recent work has identified a downward trajectory in achievement as “underachievement” (Hodis, Meyer, McClure, Weir, & Walkey, 2011). However, this does not consider the possibility that a decline in achievement would be expected as schooling becomes increasingly difficult and as grading becomes harsher. Again, it is critical to account for student ability in examining underachievement, especially longitudinally, in order to correctly identify underachievement as an ability-achievement discrepancy.

2.2.2 Size of Ability-Achievement Discrepancy

The idea of a severe discrepancy is the second theme arising from the Reis and McCoach (2000) definition of underachievement, and this concept poses two challenges for researchers. First, the word “severe” implicitly suggests the use of cutoff scores in order to determine what degree of discrepancy is sufficient to be considered

underachievement. The use of one standard deviation in discrepancy between ability and achievement has been a popular cutoff level with single time-point studies (e.g., Lau & Chan, 2001a; Reis & McCoach, 2000). However, dichotomizing a continuous variable can result in reduced variance (Edwards, 2001). Thus, the cutoff score results in a conceptual Type I error if too generous (identifying students as underachieving when they are not) or a conceptual Type II error if too conservative (failing to identify underachieving students as such). Second, using cutoffs assumes that a given degree of discrepancy between potential and actual achievement is equally detrimental across individuals. A cutoff of one standard deviation difference between ability and achievement assumes that that amount of discrepancy constitutes the same level of underachievement in an individual with an IQ of 180 and an individual with an IQ of 100. Instead, it is possible that a given degree of underachievement is more harmful for high ability students, as expectations for these students are often quite high (Rimm, 2011). Underachievement appears to be more noticeable to parents and teachers when there is a large discrepancy, as opposed to just low achievement (McCall et al., 2000), which could result in more detrimental outcomes.

The use of cut-off scores in defining underachievement has resulted in a wealth of studies that take a mean-level approach to the study of underachievement. In this type of research, achieving students are compared with underachieving students on a variety of indicators, or dichotomous underachievement status (underachieving or

achieving) is predicted from a set of characteristics (McCoach & Siegle, 2003). These groups are formed either by teacher nomination (e.g., asking teachers to select students as underachieving, Lau & Chan, 2001), or by utilizing information derived from measures of ability and achievement to group students into those with a severe ability-achievement discrepancy (underachieving students) and those without a severe discrepancy (achieving students). Although this research has provided insight into constructs that warrant further investigation, moving beyond a dichotomized view of underachievement can help to move the field toward an exploration of processes and mechanisms involved in underachievement (McCall et al., 2000). Put simply, “it has yet to be shown that a categorical definition of underachievement is theoretically and empirically superior to a continuous definition of underachievement” (Preckel, Holling, & Vock, 2006, p. 404).

2.2.3 Chronicity of Underachievement

The chronic aspect of underachievement is the third and final theme emerging from the definition of underachievement proposed by Reis and McCoach (2000), and has also been included in other definitions (Mandel & Marcus, 1988). This aspect of underachievement has been largely overlooked in prior research. Many prior studies have examined underachievement as dichotomized ability-achievement discrepancy at a single time point (e.g., Albaili, 2003; Lau & Chan, 2001a, b; McCoach & Siegle, 2003; Rayneri, Gerber, & Wiley, 2003), and some select research has also examined predictors

in degree of ability-achievement discrepancy (Preckel et al., 2006). Mean-level difference research has provided insight into potential constructs that warrant further empirical investigation, such as students' perceptions of competence and value for academics. However, it does not fully inform an understanding of the reciprocal or dynamic interactions among predictors, underachievement, and outcomes that have been promoted as goals for future research in underachievement (Reis & McCoach, 2000). Conceptually and practically, underachievement is necessarily chronic because a single event of ability-achievement discrepancy may not necessarily warrant the use of educational interventions.

There are two manners in which the chronic, longitudinal component of underachievement can be incorporated into an operationalization of the phenomenon. First, underachievement can be *examined* longitudinally, either as a predictor or outcome. In this method, students are classified as underachieving or achieving at a given time point and tracked over time to determine if achievement remains poor, gets worse, or improves. Similarly, a dichotomous classification of achievement or underachievement can be predicted from earlier longitudinal factors. Secondly, underachievement can be *identified* longitudinally by using patterns of growth or decline in the achievement to identify patterns of underachievement and achievement within students. This second method more directly targets the chronic nature of underachievement, and is proposed for the current study.

Some prior research on underachievement has incorporated a longitudinal perspective by examining longitudinal predictors of single time-point underachievement (Asendorpf, Denissen, & van Aken, 2008; Juvonen, Wang, & Espinoza, 2011; Timmermans, van Lier, & Koot, 2009) or the longitudinal outcomes of single time point underachievement (McCall, 1994; McCall et al., 1992; Peterson, 2000, 2001). However, underachievement is arguably not simply the final destination at the end of a pathway, nor is it just the precursor to long-term outcomes. Rather, underachievement is a dynamic process unto itself. In examining predictors and outcomes of underachievement, it is necessary to conceptualize and measure underachievement as a phenomenon that grows and develops. Then it becomes possible to predict not only who underachieves, but also when students begin to underachieve, to what degree they do so, and what the rate of growth or decline in underachievement is across time. Outcomes of this dynamic underachievement would reflect outcomes that occur not because of a single time point sample of underachievement, but outcomes that occur because of one's unique trajectory of underachievement.

2.2.4 Domain-Specificity in Underachievement

To date, little theoretical attention has been paid to issue of whether underachievement is a global (e.g., spanning academic domains) or domain-specific phenomenon. An examination of prior research reveals a split between global measures

of underachievement (Lau & Chan, 2001a, 2001b; McCoach & Siegle, 2003; Peterson & Colangelo, 1996; Preckel, Holling, & Vock, 2006) and domain-specific measures in mathematics (Boehnke, 2008; Phillipson, 2008; Phillipson & Tse, 2007; Ziegler & Stoeger, 2010) and reading (Bow, 1988; Carr, Borkowski, & Maxwell, 1991; Dobbins & Tafa, 1991). Notably, work by McCall and colleagues (2000) found that underachievement becomes less general and more subject-specific across elementary school. For this reason, narrowing both conceptualization and measurement to the domain level appears preferable to a global measurement of underachievement.

For example, a domain-specific operationalization of underachievement can allow for better measurement of the ability-achievement discrepancy. For instance, one study defined underachievement by identifying the discrepancy between IQ and overall grade point average (McCoach & Siegle, 2003). However, this operationalization assumes that the degree of underachievement is uniform across domains (i.e., an equal degree of underachievement in math, reading, science, etc.), when that may not be the case. Narrowing the focus to a specific domain can allow for better measurement of the phenomenon, an approach that has also been adopted in motivation research (Bong & Skaalvik, 2003; Martin, 2008; Trautwein, Ludtke, Schnyder, & Niggli, 2006; Wigfield, 1997).

2.3 Proposed Developmental Definition of Underachievement

Given the previous discussion about important themes in underachievement, both the conceptualization and measurement of underachievement can be improved through the adoption of a domain-specific, developmental measurement. By examining degree of underachievement, rather than attempting to determine the necessary size of a discrepancy to warrant an underachievement label, it will be possible to understand how underachievement can develop across time. Next, examining degree of ability-achievement discrepancy, rather than creating cutoffs, can allow for the exploration of changes in this discrepancy over time (as opposed to asking if a student moves from achievement to underachievement across time). Finally, the chronic aspect of underachievement is better captured when measuring this degree in discrepancy over time. Therefore, taking a developmental approach to the measurement of underachievement, I define underachievement as the *sustained or growing discrepancy between a student's expected achievement and actual achievement in a given domain*. It is not the size of the discrepancy at any given time point that qualifies a student as underachieving, but rather the process as a whole that may ultimately undermine talent development (Snyder & Linnenbrink-Garcia, under revision).

This conceptualization of underachievement as a developmental phenomenon may be better understood by situating it within a broader developmental theory: dynamic systems theory (Thelen, 1989, 1992, 2005; Thelen & Smith, 1994; van Geert,

1994). Dynamic systems theory posits that development is change that arises out of complex interactions between multiple systems at multiple timescales within nested layers of context (Middleton & Toluk, 2009; van Geert & Fischer, 2009). One key tenet of the theory is that variability (both within individuals and across contexts) is especially informative for understanding the dynamics of development as a whole (Smith & Thelen, 2003; van Geert, 1994). Given the considerable levels of heterogeneity across a variety of constructs between underachieving and achieving students (McCoach & Siegle, 2003, 2008; Reis & McCoach, 2000), this perspective may be particularly helpful in understanding how underachievement develops.

Within such a framework, research questions are redirected from determining if a student is underachieving or not to the patterns of stability and flux in underachievement across time and between individuals (see McCall et al., 2000 for a similar approach). A dynamic systems approach focuses on the effects of early causes on later outcomes like underachievement through non-linear mechanisms. In other words, this perspective is well-suited to examine how a student's early behavior affects later underachievement behavior (as opposed to only exploring temporally proximate causes).

A longitudinal method of identifying underachievement has several benefits. First, it does not rely upon a single aggregate measure of achievement to determine "chronic" behavior. In contrast, the actual longitudinal fluctuations in deviations from

one's expected achievement are examined. Again, a dynamic systems perspective is focused on the relative stability of behaviors across time rather than identifying permanent characteristics inherent to individuals. In identifying underachievement longitudinally, it is important to note that fluctuations in stability are not necessarily indicative of poor measurement, but may reflect the true unstable nature of underachievement.

In the current study, this developmental approach is particularly integrated into the measurement of underachievement itself, such that it is the growing or sustained discrepancy between ability and achievement that constitutes underachievement. Prior research has also heavily relied on statistical means of measuring underachievement (such as ability scores and course grades), though a few notable exceptions have used teacher nominations of who is achieving vs. underachieving at a given time (Lau & Chan, 2001a) or a combination of statistical methods and teacher nomination (Carr et al., 1991). These statistical methods for calculating underachievement may not sufficiently capture the nature of the underachievement phenomenon as well as an observer, such as the student's teacher. Although prior work has used teacher data to measure underachievement (Lau & Chan, 2001a), this work relied on a dichotomous nomination process where teachers were asked to provide a list of names of students they believed to be underachieving. In the current study, I utilize teacher ratings of *degree* of underachievement in a given domain, rather than simply teacher nomination of who is

underachieving or achieving. By conceptualizing underachievement as a continuous measure, it is possible to examine shifts in severity of underachievement across time in a more sensitive manner.

2.4 Gender Differences in Underachievement

Gender effects are robust in underachievement research; however, explanation for the phenomenon remains largely unexplored. In studies that investigate single time-point underachievement, male students are significantly more likely to underachieve than female students (Colangelo, Kerr, Christensen, & Maxey, 1993; Matthews & McBee, 2007; McCall et al., 2000), with one study reporting that male underachieving students outnumbered female underachieving students at a 3:1 ratio (McCoach & Siegle, 2003). It has been tentatively suggested that this effect may be due to female students' ability to disguise underachievement and escape teacher attention, such that their degree of underachievement is not severe enough to be captured by the use of cutoff scores that form groups of achieving and underachieving students (Colangelo et al., 1993).

Taking a developmental approach, the gender effect in underachievement is less clear. In one cross-sectional study, both male and female students were equally represented in underachievement in elementary school, but the gender difference emerged in middle school and remained stable throughout high school (Lupart & Pyryt, 1996). However, research sampling from both middle and high school students found no gender differences in degree of underachievement (Preckel et al., 2006).

Retrospective reports from former underachieving students differed by gender (Peterson, 2001). Female students generally achieved during elementary school, and did not begin underachieving until middle school. In contrast, male students reported underachieving much earlier, during elementary school. These mixed findings highlight the difficulty in examining gender differences from a cross-sectional or single time point perspective, and are another example of how shifting away from a cutoff toward exploration of degrees of underachievement can help to illuminate puzzles in the current literature; by examining degree of underachievement between male and female students, it may become clearer if female students simply underachieve to a lesser degree or if they do not underachieve at all. By modeling underachievement within a longitudinal framework, it is possible to explore differential trajectories by both gender and gifted status, and bridge a gap between two similar puzzles in the literature.

2.5 Predictors of Underachievement from Achievement Motivation

Overall, prior research comparing achieving and underachieving students suggests that two major motivational constructs, perceptions of academic competence and perceived value for academics, are important motivational factors involved in underachievement for both gifted students (Baslanti & McCoach, 2006; Emerick, 1992; McCoach & Siegle, 2003) and typical students (Carr et al., 1991). Motivational beliefs such as self-worth and the role of effort in achievement have also been identified as

distinguishing factors between achieving and underachieving typical-ability students (Carr et al., 1991).

Accordingly, I draw on two broad theories in achievement motivation to guide the present study. Both expectancy-value theory (Eccles et al., 1983) and self-worth theory (Covington, 1992, 2009) are relevant to prior research on underachievement and are powerful theories that may explain how underachievement develops across the school years. Throughout this section, I highlight how differential processes for gifted and typical students may be expected, due to various factors (for example, gifted students may be more likely to be unchallenged in school, and to receive harsher feedback for not living up to potential).

Modern expectancy-value theory (Eccles et al., 1983) is a theoretical perspective that can be particularly helpful in understanding both competence-related and value-related beliefs in both achievement and by extension, underachievement. Expectancies describe one's belief about the probability of success on a given task, either in the immediate future or long-term (Eccles et al., 1983; Eccles & Wigfield, 2002). These expectations for success are influenced by the individual's perceptions of ability, perceptions of task difficulty, and goals. In turn, expectancies are positively related to several academic outcomes such as degree of effort, persistence, academic choices, and achievement (Wigfield & Eccles, 2000) and similarly, may also relate to

underachievement. If a student has low expectancies for success, it is unlikely that he or she will engage in the task, which may lead to underachievement.

Related to expectancies for success are students' perceptions of competence, referring to one's evaluative perceptions of the self (Harter, 1988; Marsh, Byrne, & Shavelson, 1988). Self-concept is argued to be directly related to underachievement, as one's perceptions of competence are reciprocally tied to achievement (Guay, Marsh, & Boivin, 2003). Although it has been widely hypothesized that underachieving students suffer from low academic self-concept and there is some empirical research to support this hypothesis (Davis & Connell, 1985; Lau & Chan, 2001; Van Boxtel & Monks, 1992), a number of studies find no difference in academic self-concept between achieving and underachieving gifted students (Lupart & Pyryt, 1996; McCoach & Siegle, 2003; Vlahovic-Stetic, Vidovic, & Arambasic, 1999) or between underachieving and non-achieving students (McCall et al., 2000).

By examining underachievement as a dynamic, developing phenomenon, it is possible to investigate how concurrent shifts in academic self-concept relate to underachievement. Just as achievement and academic self-concept are reciprocally related (Guay, Marsh, & Boivin, 2003), the same may also be true for self-concept and underachievement (Reis & McCoach, 2000). Specifically, early underachievement may predict declines in academic self-concept, which in turn drive underachievement in an ongoing cycle. A longitudinal exploration of concurrent shifts in both academic self-

concept and underachievement allows for the examination of how closely the growth processes for the two constructs are related, or if the relations vary by gifted status. The negative dynamic between underachievement and academic self-concept may be accelerated for gifted students, particularly if they feel as if they have not lived up to expectations set forth for them, given their high academic potential.

The second component of expectancy-value theory is subjective task value, which refers to the perceived value that a student attaches to achieving success on a task (Eccles, 2005; Eccles et al., 1983). Task value can be further differentiated into intrinsic value, attainment value, utility value, and cost value. Intrinsic value is the personal enjoyment or pleasure that one derives from engaging in a task. Attainment value describes the personal importance of doing well on a task, and to what degree success on a task provides self-fulfillment and a sense of meaning. Utility value describes the importance of a task relating to future goals and plans and is predictive of later task engagement, aspirations, and achievement (Eccles, 2005; Eccles et al., 1983; Hulleman, Durik, Schweigert, & Harackiewicz, 2008). Attainment and utility value are often measured as task importance, especially in longitudinal work that measures task value from the early elementary years through middle school or high school (Archambault, Eccles, & Vida, 2010), as these factors are not entirely distinct in the early elementary school years (Wigfield & Eccles, 1992).

Prior research on underachievement also suggests that low perceptions of value for academics makes a substantial contribution to underachievement, particularly for gifted students (Baslanti & McCoach, 2006; Eccles & Alfeld, 2007; Emerick, 1992; Fredricks, Alfeld, & Eccles, 2010; McCoach & Siegle, 2003). However, this prior research has been mixed with regard to the type of value being measured (varying from specific aspects of task value, such as attainment value, to value for academics in a more general sense) and has not yet examined the concurrent development of task value beliefs and underachievement. Therefore, examining shifts in task value alongside underachievement, rather than just achievement, can inform our understanding of how underachievement may arise. High task value is more probable for the student who exerts effort to attain the same grade that another student attains with very little effort; what value comes from easily-attained success? Following this logic, declines in task value may relate to more pronounced growth in underachievement among gifted students, given the likelihood of these students being more likely to encounter lack of academic challenge in the classroom.

Task value also includes perceptions of cost, which refer to the perceived drawbacks and negative consequences of engaging in a task. Specifically, psychological cost value refers to the affective consequences of engaging in a task and failing, such as a decline in self-worth (Battle & Wigfield, 2003; Eccles, 1987, 2005; Eccles et al., 1983). Perceiving a high cost for a given activity negatively predicts engagement in that activity

(Eccles, 2005). Some students may become worried or anxious about the negative consequences of doing poorly or underachieving in academics. Severity of underachievement in gifted middle and high school students has been found to correlate with both worries about confronting academic challenge and fear of failure (Preckel et al., 2006).

The idea of psychological cost complements a self-worth perspective on achievement, in which students seek to maintain a sense of worth, or feeling good about themselves as a whole person. This idea is elaborated in the self-worth theory of achievement motivation (Covington, 1992, 2009), which posits that individuals are motivated to seek academic success and avoid academic failure in order to maintain and protect a sense of self-worth. Self-worth is an affective, emotional evaluation of one's worth as a person, and individuals are highly driven to maintain a sense of self-worth, both internally and to prove their worth to others (Pyszczynski, Greenberg, Solomon, Arndt, & Schimel, 2004). One's sense of worth is affected most by experiencing success and failure in domains that are regarded as central to the self (Crocker & Wolfe, 2001; Pelham, 1995).

Underachievement among typical students may be due to difficulties related to self-worth, such that a student may withhold full effort in order to avoid others suspecting low ability if failure occurs (Covington, 1992; Thompson, 1997). Similarly, some gifted students may also be motivated to avoid the perception that they lack talent

or giftedness (Rimm, 2008). These concerns relate to perceived psychological cost from expectancy-value theory (Eccles et al., 1983). Some gifted students may attach even greater importance to high ability and achievement than typical students, as the “gifted” label could be even more highly coveted than a label of simply “smart”. Thus, academic success and failure may influence gifted students’ self-worth to a greater degree than for typical students. Although somewhat counter-intuitive, if a student perceives a high level of psychological cost for engaging in a given activity, the student may *intentionally* underachieve (fail on purpose) to protect self-worth. Thus, growth in both perceived psychological cost and in perceptions of self-worth may develop concurrently with underachievement. Further, these concerns about achievement may be exacerbated among gifted students. Academic failure, whether intentional or unintentional, represents a threat to the gifted label and thus, to the self. Therefore, self-worth may decrease at a greater accelerated rate for gifted students than for typical students as underachievement develops.

In summary, the development of underachievement is likely incredibly complex, consisting of closely-linked, dynamic interactions between the student and the broader educational context. However, the examination of long-term, developmental changes in underachievement and motivational beliefs (as well as potential antecedents and consequences of these trajectories) can inform a broad understanding of general

developmental changes in underachievement. This research, then, can be used to inform future, more targeted, research on underachievement.

Drawing from both expectancy-value theory and the self-worth theory of achievement motivation, several motivational beliefs are likely critical factors in the development of underachievement across middle childhood: self-concept, perceptions of task value, psychological cost value, and global self-worth. These relations are proposed to vary by gifted status, given prior research. Finally, the development of underachievement and concurrent motivational beliefs likely exerts negative influence on later academic outcomes, such as later academic achievement.

2.6 Current Study

The current study seeks to address gaps in the existing literature on underachievement by investigating underachievement as a growth trajectory, rather than a phenomenon that occurs in a snapshot in time (Barab & Plucker, 2002; Dai, Moon, & Feldhusen, 1998; Dai & Renzulli, 2008; Eccles & Alfeld, 2007; Simonton, 1999, 2001). Specifically, the current study employs longitudinal data from a large secondary dataset to examine the concurrent development of underachievement and student motivational beliefs across middle childhood. This shift to a person-centered approach, rather than a variable-centered approach, asks if there are different sub-groups (latent classes) of students whose development in underachievement and motivational beliefs is distinctly unique. In the current study, gifted status and gender are examined as potential predictors of these unique classes of development. Finally, it is expected that these different classes of development will differentially relate to later academic achievement in middle school.

Although small-scale dynamics of underachievement development cannot be specifically tested, it was expected that findings from the current study can highlight particular constructs and timepoints for future investigation. Several important gaps in prior research were addressed in the current study, and are described in greater detail in this section. First, the measurement of underachievement was not only a continuous

scale, but was also done in a manner that allowed for longitudinal investigation.

Keeping with the proposed definition of underachievement as a sustained or growing discrepancy between a student's expected achievement and actual achievement in a given domain, yearly teacher ratings of student underperformance (ranging from a rating of working to maximum potential to working far below ability) in reading were used to measure underachievement in the study. It was quite likely that patterns of underachievement and motivational beliefs varied across different academic domains; thus, this narrowed focus to reading (rather than academics in general) was helpful in clarifying the measurement of underachievement and predictors. Further, the method of using teacher ratings allowed for a more direct measurement of the ability-achievement discrepancy by asking about the discrepancy itself.

By measuring teacher ratings of underachievement on a yearly basis, it was possible to identify underachievement as a trajectory, rather than just a single time point difference in ability and achievement. Advances in statistical methodologies have made it possible to identify groups of students who share similar trajectories of underachievement, such as achieving and underachieving trajectories. Exploration and identification of these latent classes of growth have been popular in educational psychology research. Recent examples include the identification of different growths in the development of strategy usage in arithmetic (Carr & Alexeev, 2011), in perceptions

of competence and value for reading and English (Archambault et al., 2010), and in reading ability (Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008).

In applying this methodology to the current study, it was not a teacher rating at a given year that defined underachievement, but rather the trajectory as a whole across first through sixth grade that constituted underachievement. This method better captured the chronic nature of underachievement, which has been proposed as an important aspect of the phenomenon (Reis & McCoach, 2000). Prior research using this method has claimed to identify an underachieving trajectory based on declining achievement (Hodis et al., 2011). However, as previously discussed, a downward trajectory cannot assumed to be true underachievement, as researchers cannot rule out the possibility that the students are still exerting maximum effort but simply encountering more difficult curricula and assignments. Therefore, the measurement of underachievement in the current study captured the chronic nature of underachievement and also more directly measured the ability-achievement discrepancy, which is a critical component of underachievement.

Measuring underachievement longitudinally alongside growth in motivational beliefs allowed for the exploration of how the two processes develop concurrently. For example, given the mixed findings on whether achieving and underachieving students differ on academic self-concept, longitudinal research has been recommended as a way

to clarify how underachievement interacts with academic self-concept (Reis & McCoach, 2000). In the current study, both an expectancy-value perspective and self-worth perspective guided the choice of four important motivational beliefs to examine alongside growth in underachievement: reading self-concept, task importance for reading, psychological cost associated with reading, and global self-worth.

The current study also broadened the timeframe of investigation to explore growth of underachievement starting in early elementary school. Prior research has been primarily limited to the middle school years, as that has been thought to be when underachievement begins (Lupart & Pyryt, 1996; Peterson & Colangelo, 1996). However, retrospective reports from adults who underachieved have identified the elementary school years as an important period (Peterson, 2001), and additional empirical work has also uncovered underachievement in elementary school (McCall et al., 2000). By examining concurrent growth in underachievement and student motivational beliefs from first through sixth grade, as well as the relation of these trajectories with later academic outcomes such as achievement in middle school, the current study built on prior research by providing a more complete picture of how underachievement changes throughout these important years.

Finally, the current study extended prior research by investigating potential differential processes in underachievement for gifted and typical students as well as by

gender. Although a few studies have examined differences in gifted and typical students with regard to underachievement (Vlahovic-Stetic, Vidovic, & Arambasic, 1999; Ziv, Rimon, & Doni, 1977), the majority of studies have focused exclusively on gifted (Baslanti & McCoach, 2006; Colangelo et al., 1993; Lau & Chan, 2001b; Lupart & Pyryt, 1996; Peterson, 2001) or typical (Carr et al., 1991) underachieving students. Other studies have measured underachievement more broadly, making no distinctions between the gifted and typical students (e.g., McCall et al., 2000). Thus, understanding predictors and outcomes of developing underachievement remained as a gap in the literature for both typical and gifted students.

Three major research questions guided the analyses in the current study. First, what is the nature of development in underachievement alongside four important student motivational beliefs (reading self-concept, reading task value, psychological cost for reading, and global self-worth), and can this joint development be captured by underlying latent classes of change (RQ.1a-d)? Next, does membership in these latent classes vary by both gender and gifted status, as well as the interaction between gender and gifted status (RQ.2)? Finally, how do these different latent classes of change influence later academic achievement in middle school (RQ.3)? Specific hypotheses for each of these research questions are discussed below, and are summarized in Table 1.

2.6.1 Development of Underachievement and Motivational Beliefs (RQ.1a-d)

Relatively new methods in statistics reflect a move toward person-centered approaches to development in which there may be unspecified groups of individuals whose change over time is more similar within a group than between groups (Nagin, 1999). That is, the growth curves (slopes for trajectories) are not being sampled from one population, but from different populations. In this person-centered approach, the question is not what the relations between underachievement and motivational beliefs look like over time, but rather if there are distinct subgroups of students whose changes are unique, as if they are being sampled from another population. Although the data utilized in the current study could not be used directly test the complex, small-scale interactions between children and the academic environment posited by dynamic systems theory, this theoretical perspective was used to frame the broader conceptualization of inter- and intra-individual differences over time, as well as the examination of both proximate and distal causes.

I hypothesized that sufficiently large variation exists in the patterns of change in underachievement across time among the sample to suggest the existence of unique latent classes in types of change. Specifically, two to three latent classes were expected with regard to how underachievement changes over time: (1) an “achievement” trajectory, in which the intercept level of underachievement is low (indicating no initial

underachievement) and the slope is close to zero (indicating no growth in degree of underachievement) and (2) an underachievement trajectory, in which the intercept level of underachievement is low and the slope is positive (indicating increasing growth in underachievement). Alternatively, (3) an underachievement trajectory was also thought to potentially exist, in which there would be a high intercept level of underachievement and a positive or zero slope (representing either an increased growth in underachievement or stable underachievement). In this trajectory, underachievement exists from the start of schooling and either grows larger or remains stable. Importantly, these predictions referred to expected types of underachievement growth within the classes; however, because the analyses were conducted with both underachievement and a parallel motivational process, the class structure was determined by growth in *both* processes.

Underachievement trajectories, by nature, were thought to be associated with declines in positive motivational self-beliefs (reading self-concept, reading importance, and global self-worth), and increases in maladaptive self-beliefs (psychological cost value for reading), given the premises of both Expectancy-Value Theory and Self-Worth Theory. Because class determination was based on the joint development in underachievement and each motivational belief, it was also possible that the multiple

classes would vary by motivational belief (such as two classes with the similar trajectories in underachievement but differing trajectories in motivation).

2.6.2 Predicting Latent Class Membership from Gifted Status and Gender (RQ.2)

In Research Question 2, I asked if gifted and typical students, as well as male and female students, would differentially be assigned to the latent class trajectories of underachievement and motivational beliefs. A main effect of gender on class membership was expected, such that male students were expected to be more likely to be in underachievement latent classes than achievement latent classes, given prior research (Colangelo et al., 1993; Matthews & McBee, 2007; McCall et al., 2000; McCoach & Siegle, 2003; Reis & McCoach, 2000). Some differences by gifted status were also expected, given prior research. Gifted students may sense greater personal failure in not achieving commensurate with academic potential, or may experience sharper declines in perceived value for academics if they are unchallenged in school. Thus, the effect of underachieving for gifted students likely drives greater declines self-concept, perceived importance, and self-worth and greater increases in perceived psychological cost.

Considering both gender and gifted status (gifted $\times$ gender interaction effect), retrospective research suggests that underachievement in gifted male students begins early in elementary school, whereas underachievement in gifted female students began underachieving later, in middle school (Peterson, 2001). Therefore, it was hypothesized

that male students, and especially gifted male students, would have a greater likelihood of being represented in a latent class characterized by greater initial levels of underachievement or steeper growth in underachievement. Although it is possible that gifted female students would be more likely to be represented in a latent class characterized by steeper growth in underachievement (as compared to typical female students), it was not expected that they would exhibit greater degree of underachievement at the start of the trajectories.

2.6.3 Effects of Latent Class Membership on Later Achievement (RQ.3)

Research Question 3 addressed how latent classes of change in underachievement and motivational trajectories related to later academic achievement in middle school. It was hypothesized that underachievement trajectories would negatively relate to later achievement for several reasons. Prior work within an expectancy-value framework has shown empirical support for the link between early achievement and later academic outcomes (Simpkins, Davis-Kean, & Eccles, 2006) (Eccles, Vida, & Barber, 2004), and underachieving in high school is related to later outcomes, such as lower occupational attainment (McCall et al., 1992). Chronic underachievement is thought to undermine a student's ability to develop the proper self-regulated learning skills needed to succeed when curriculum becomes more challenging (Balduf, 2009). There is some evidence that teachers actively provide

support for underachieving students through the elementary school years, but become less likely to do so in late elementary school, around fourth grade, as teachers become more controlling toward underachieving students (McCall et al., 2000). This finding is consistent with early research suggesting that high ability students who do not try are rated more harshly than low ability students who do not try (Covington & Omelich, 1979).

Together, this prior research suggests that chronic underachievement may exert a negative influence on later academic outcomes through multiple means: atrophied development of self-regulated learning skills, declining teacher support, and negative reactions from parents and teachers. Although these specific mechanisms could not be tested in the current study, this prior research provides support for the expected relation between elementary school underachievement and lowered academic achievement in middle school. If multiple latent classes of underachievement existed, it is likely that the class characterized by most chronic underachievement would most strongly relate to subsequent low achievement.

In summary, the current study tested a developmental model in which underachievement itself was measured as a dynamic, growing phenomenon from first grade through sixth grade. The antecedents (gender and gifted status), concurrent processes (students' self-concept for reading, perceived importance for reading, worries

about doing poorly in reading, and global self-worth), and distal outcomes (middle school academic achievement) of these trajectories in underachievement were also incorporated.

3. Method

This longitudinal examination of developmental processes in underachievement was facilitated through access to a large-scale, longitudinal dataset. Data from the Childhood and Beyond Study through the University of Michigan at Ann Arbor (Eccles, Wigfield, Harold, & Blumenfeld, 1993) were selected for use in the current study for several reasons. First, analyses with these data allowed for the exploration of developmental questions of a long-term nature and explore the emergence of underachievement across schooling with a sufficiently large sample. Second, the dataset contains a sub-sample of gifted students, making it possible to examine differential processes for gifted and typical students. Third, motivational constructs of particular relevance to the development of underachievement (student perceptions of competence and value for academics, and teacher ratings of underachievement) were measured. Though these data have been previously analyzed, the proposed questions regarding trajectories of underachievement differential development among gifted students were not yet been addressed.

3.1 Participants

The Childhood and Beyond Study consisted of a cross-sequential, longitudinal design with students, teachers, and parents¹ reporting on various constructs across multiple waves (see Figure 2). The students were originally from ten elementary schools in four school districts in the suburbs of a large city in Michigan. The school systems were in primarily lower-middle to middle-class communities that were described as both urban and suburban. The original Childhood and Beyond sample included 1102 students (571 male, 48.8% and 598 female, 51.2%), divided into three cohorts. In Wave 1, the youngest cohort was in kindergarten ($n=331, 30.0\%$), the middle cohort was in first grade ($n=342, 31.0\%$), and the oldest cohort was in third grade ($n=429, 38.9\%$).

3.1.1 Exclusion Criteria for Final Sample

Several criteria were used to narrow down the final sample for the current study (IQ, pattern of grade progression, and learning disability diagnosis). First, only students with a minimum Slosson Intelligence Test score (Slosson, Nicholson, & Hibpshman, 1991) of 90 were retained for the final sample (1110 students participated in the ability assessment, 113 students were excluded due to IQ below 90 [$n=54$] or missing IQ data [$n=59$]). This reduction in the sample was conducted in order to reduce the likelihood that low ability was confounded with underachievement in teacher reports. Second,

¹ Parent data was also collected from Wave 1 through Wave 4, and again at Wave 6, but these data are not used in the current study.

students were also excluded from the current sample if they repeated a grade ($n=25$) or skipped a grade ($n=4$). The most commonly repeated grade was first grade ($n=14$). Although 40 students participated in multi-grade classrooms (five in second-third classroom, two in fourth-fifth classroom, and 33 in fifth-sixth classroom), these students were retained in the current sample. Students were also excluded if they had received a diagnosis of a learning disability, measured by teacher report ($n=33$), as their underachievement may be a result of a learning disability and thus not considered underachievement by the definition I utilized in this study. No data were available on the type of learning disability. Finally, only students with self-report or teacher data were retained for the final sample ($n=932$).

These exclusion criteria resulted in a final sample of 932 students whose data were used in the current study. This sample was balanced by gender (male $n=465$, 49.9%; female $n=467$, 50.1%). The sample was relatively homogeneous with regard to self-reported ethnicity: White ($n=709$, 76.1%), Asian/Asian-American ($n=20$, 2.1%), Middle Eastern ($n=16$, 1.7%), Indian ($n=10$, 1.1%), Black ($n=8$, 0.9%), Hispanic ($n=4$, 0.4%), Native American ($n=1$, 0.1%), and 164 students who did not report ethnicity ($n=17.6\%$).

3.1.3 Gifted sample

Gifted status in the current study was based on initial IQ scores that were obtained in the first wave of data collection through the administration of the Slosson

Intelligence Test-Revised (1991 edition). Although the Slosson test is not intended as a measure of giftedness, it was preferable to the use of measuring gifted status based on a school-provided gifted label for several reasons. First, the IQ scores were obtained in the first wave of data collection, before students participated in the student survey portion of the study. Second, because Michigan did not have a state mandate for identifying gifted students, it was possible that students in certain schools could have been overlooked as gifted, and not been identified as such even if they were gifted. Third, other behaviors apart from cognitive ability often influence educators' likelihood of identifying students as gifted, such as staying on task with schoolwork and completing work despite distractions (Curby, Rudasill, Rimm-Kaufman, & Konold, 2008). Students who are perceived to be lacking motivation are also at a risk to be overlooked in the gifted identification process (Endepohls-Ulpe & Ruf, 2005). Therefore, although utilizing IQ as an indicator of giftedness has received criticism, it is more appropriate for use in the current study.

The Slosson IQ test demonstrates acceptable levels of stability in test-retest studies over a one-year period (Williams, Eaves, Woods-Groves, & Mariano, 2007), and IQ in general remains fairly stable across the lifespan (Deary, Whalley, Lemmon, Crawford, & Starr, 2000). Prior research has utilized Slosson IQ scores to measure giftedness (Fuchs-Beauchamp, Karnes, & Johnson, 1993; Moon, Swift, & Shallenberger,

2002). A score of 130 for Wave 1 Slosson IQ scores was used to identify students as gifted, as this IQ score has been traditionally utilized as a cut point for giftedness, given that it indicates that students are scoring past the top two standard deviations on a normed measure, placing students in the top 2-3% of ability for their age (Ostatnikova, 2011; Stålnacke & Smedler, 2011). This grouping for the current study resulted in 173 gifted students (18.6% of the final sample). It was preferable to use a more population-based criterion for giftedness (i.e., a score that reflects the top 2-3% of students in the population (rather than the top 2-3% of students in the sample). The gifted sample differed from the typical sample on gender, $\chi^2 (1, N=932) = 11.0, p < .001$. Male students were overrepresented in the gifted sample (adjusted standardized residual = 3.3). Table 2 shows the distribution of gender by the gifted and typical samples, as well as percentages for each group.

3.2 Procedures

Recruitment for the Childhood and Beyond study began with letters and permission forms sent home with children (Eccles, Wigfield, Harold, & Blumenfeld, 1993). Out of all the parents contacted, 79% of parents agreed to allow their child to participate in the study. In the first year (Wave 1 in 1987), data collection began with teachers. Students also participated in cognitive testing at this initial wave. Data collection with students began in Wave 2 (1988). Teachers and students participated in

Waves 2 through 4 (1988-1990). Due to a gap in grant funding, Wave 5 was delayed until 1994. At this time, the original sample was re-contacted and 84% of the original sample participated in the fifth wave. In summary, teacher data is available for Waves 1 through 4 (first grade through sixth grade) and student data is available for Waves 2 through 6 (first grade² through sixth grade for motivational beliefs, and seventh and eighth grade for middle school GPA). Table 3 provides a summary of availability of measures across grades. Assessments were conducted in the spring semester of each year of data collection. During the elementary school years, administration of the student surveys took place in the classroom. In Waves 1 and 2, research assistants read all items aloud to the children as they completed the survey. Beginning in Wave 3, students in third grade and above read the survey to themselves. Student surveys were administered in three twenty-minute sessions.

3.3 Measures

3.3.1 Teacher-rated underachievement

In Waves 1 through 4 (first grade through sixth grade), teachers were asked, “How well is this child performing in reading compared to how well you believe s/he could?” Responses ranged from 1 (far below ability) to 7 (to maximum of ability). This item was reverse-coded for the current study, such that higher scores indicate greater

² Teacher data are also available for kindergarten, but was not used in the current study.

underachievement. Data for teacher-rated underachievement in kindergarten were available. However, these data were not included in analyses for the current study, as underachievement in kindergarten did not make sense conceptually, and was potentially based on ratings of good behavior. In order to maintain conceptual consistency across grade levels, analysis of underachievement was limited to first through sixth grade.

3.3.2 Student motivational beliefs

Data collection with students began in the second wave, when students were in first grade. Student data on motivational self-beliefs from Wave 2 through Wave 4 were used in the current study. The data were collapsed across cohorts in order to use grade level as the measure of time, resulting in six time points of student data (first grade through sixth grade). Prior research with the Childhood and Beyond data has also collapsed across cohorts to examine patterns of change using grade level as the measure of time (Archambault et al., 2010; Durik, Vida, & Eccles, 2006; Fredricks & Eccles, 2002; Jacobs et al., 2002).

Several precautions were taken to ensure that the younger participants (those in early elementary school) understood the survey items (Eccles et al., 1993). First, the items were piloted on 100 first and second grade students. Verbal descriptions of the Likert scale anchors and midpoints were included for all items (e.g., 1 was labeled with

“not at all good”, 4 with “okay”, and 7 with “very good”). Visual scaffolds, including stars or bars of increasing size, were also added to the Likert scale points to assist the children in responding to each item. Students heard each item read aloud as they completed the questionnaire.

The following four motivational constructs are described in detail for the current study: reading self-concept, task importance for reading, psychological cost value for reading, and global self-worth. A complete list of items for all student measures is presented in Appendix A. Greater detail about each measure is provided in the subsections below.

3.3.3.1 Perceived competence for reading

Self-concept for reading was measured using student self-report from first through sixth grade. This scale consisted of five items that are averaged together to form a composite measure of reading self-concept. Greater scores reflect higher reading self-concept. Sample items include, “How good at reading are you?” (1=not at all good, 7=very good) and “How well do you expect to do in reading this year?” (1=not well, 7=very well). Internal reliabilities from first through sixth grade were acceptable ($\alpha_{\text{first}} = .75$, $\alpha_{\text{second}} = .75$, $\alpha_{\text{third}} = .85$, $\alpha_{\text{fourth}} = .87$, $\alpha_{\text{fifth}} = .90$, $\alpha_{\text{sixth}} = .87$).

3.3.3.2 Perceived task importance for reading

Students reported on perceived importance for reading from first grade through sixth grade. Items for attainment value and utility value were combined into a single subscale to measure task importance (e.g., Archambault et al, 2010; Fredricks & Eccles, 2002). Reading importance was measured by two items in Wave 2 of data collection, and by four items in Waves 3 and 4. Sample items used at all waves include, “How useful is what you learn in reading?” (1=not at all useful; 7=very useful) and “For me, being good at reading is...” (1=not at all important, 7=very important). Prior research with these data examining growth trajectories in math importance (Fredricks & Eccles, 2002) and reading importance (Archambault et al., 2010) have collapsed across cohorts, despite the measurement difference in items between Wave 2 and subsequent waves. Therefore, a reading importance score was computed using data from students who completed at least two items. Scores on reading importance items were averaged to form a composite measure of reading importance, with higher scale scores reflective of greater perceived reading importance. Alphas were acceptable from second grade through sixth grade, ($\alpha_{\text{second}} = .63$, $\alpha_{\text{third}} = .73$, $\alpha_{\text{fourth}} = .69$, $\alpha_{\text{fifth}} = .80$, $\alpha_{\text{sixth}} = .77$). Although alphas at first grade were quite low ($\alpha_{\text{first}} = .35$), prior research with these data has used this measure at first grade with no detrimental effects (Fredricks & Eccles, 2002; Archambault et al., 2010).

3.3.3.3 Perceived psychological cost value for reading

A single item: “How much do you worry about doing badly in reading?” (1=a little, 7=a lot) was collected from student self-report from students from first through sixth grade. Although this item was not explicitly labeled as measuring psychological cost value by CAB Study researchers, it reflects the conceptual nature of cost value in that it asks students about psychological costs associated with engaging in reading.

3.3.3.4 Global self-worth

Students reported on perceptions of global self-worth from first through sixth grade using the Harter (1982) General Self-worth scale. Self-worth was measured by three items in Wave 2 of data collection, and by seven items in Waves 3 and 4. Similar to reading importance, this measure was collapsed across cohorts to measure changes across grades, despite the difference in the number of items between waves. Therefore, a self-worth score was computed using data from students who completed at least three items. Sample items used at all waves include: “Some kids aren’t very happy with the way they do things, but others think the way they do things is fine” and “Some kids are happy being the way they are but other kids wish they were different” (reversed). Students responded to all items using a four-point Likert scale designed to reduce response bias (1=really true for me, 2=sort of true for me, 3=sort of true for me, 4=really true for me). Items were averaged to form a composite score, with higher scores reflective of greater perceived self-worth. Although internal consistency at first grade

was low ($\alpha_{\text{first}} = .39$) alphas from second through sixth grade were acceptable ($\alpha_{\text{second}} = .63$, $\alpha_{\text{third}} = .69$, $\alpha_{\text{fourth}} = .75$, $\alpha_{\text{fifth}} = .76$, $\alpha_{\text{sixth}} = .75$).

3.3.3 Academic achievement

Students reported on academic achievement in seventh and eighth grade, and these reports were used to calculate overall grade point average for middle school. Students were asked, “On your last semester report card, how many (A’s, B’s, C’s, D’s, and E’s/F’s did you get?”. These grade reports were converted into a 4.0 grade point average (GPA) by CAB Study researchers. Grade point averages for seventh and eighth grade were averaged to compute a GPA for middle school.³ If GPA was only available for one of the grades, that value was retained as the middle school GPA score.

³ Self-report data for high school GPA were available but this variable highly correlated with middle school GPA (Pearson $r = .75$, $p < .001$) and therefore, it was not possible to include both GPA indicators in a single analysis. Middle school GPA was selected as the more proximal distal outcome for the current study, due to the study’s exploratory nature. Future research with these data will examine if the latent classes also differentially predict high school GPA.

4. Results

A person-centered approach was used to understand how underachievement developed alongside four important student motivational beliefs. Specifically, latent class growth analysis (LCGA; Nagin, 1999) was employed to determine if latent classes of growth in parallel processes (underachievement with student motivational beliefs) existed in the data. The influence of gender and gifted status on those classes was tested, as well as the interaction between gender and gifted status.¹ A distal outcome, middle school GPA, was also included in the model to test if latent class membership predicted later academic achievement.

The three primary research questions were examined through testing four latent class growth curve analyses (LCGAs). Each model included growth trajectories of

¹ I had initially proposed to also examine maternal academic beliefs (maternal expectancies for student success in reading, maternal contingency of self-worth on child success in reading, and maternal beliefs in academic ability as biologically determined) as predictors of the latent classes of growth. However, maternal data were only available for 341 of the students in the sample (as compared to 932 students when maternal data were excluded). Although sample sizes of approximately 300 are sufficient for a variety of structural equation models, there was not sufficient power for the use of parallel-process LCGA with several covariates and a distal outcome. Having conducted the analyses with both the larger (student and teacher variables) and smaller (student, teacher, and parent variables) samples, it appears that the structure of latent classes is largely similar, but the effects are stronger and clearer with the larger sample. Analyses with the smaller sample also showed evidence of latent classes (primarily an Achievement and Sustained Underachievement class), but the effects were weaker. With maternal data included alongside Gifted, Gender, and Gifted $\times$ Gender, only one of my four models appeared to work (Underachievement and Psychological Cost Value), and the only finding regarding the effect of maternal beliefs was that moms who held higher expectations for their child's success resulted in the child belonging to an achievement class (a finding that is not of great contribution to the field, as it has been robustly found in prior research, including prior studies with the CAB dataset). With the maternal variables removed, I was still able to examine gifted status and gender as predictors of these latent classes of growth, but with improved statistical power ($n=932$).

underachievement and a concurrent motivational process, as well as antecedents (gender and gifted status) and consequences (later GPA) of these growth trajectories. Overall, Figure 3 shows that four complete models were analyzed (Underachievement with Self-Concept [U-SC], Underachievement with Task Importance [U-TI], Underachievement with Psychological Cost Value [U-PCV], and Underachievement with Self-Worth [U-SW]).

In reality, all of these factors (predictors of underachievement, underachievement trajectories, concurrent processes, and outcomes) are all tightly linked and multiply-reciprocated across multiple timescales. Given the limitations of statistical modeling and availability of longitudinal data, only a subset of these processes were tested in the current study: concurrent growth in underachievement and motivational beliefs, as well as predictors of the trajectories and outcomes of the trajectories.² This approach, in which the most comprehensive model possible is estimated at once, is preferable to a piece-wise approach to answering individual questions. Importantly, it must be noted that the goal of the study was not to test competing models (e.g., is a model with Self-worth a better fit to the data than a model

² Although the four proposed models do not examine the inter-relations of growth processes in student motivational beliefs, prior research with these data has addressed this issue (see Archambault et al., 2010 for an exploration of concurrent growth in competence and value beliefs for reading from first through twelfth grade). Therefore, this was not tested in the current study.

with Task Importance?), but rather to examine how these motivational self-beliefs develop alongside changes in underachievement across time.

4.1 Descriptive Overview of the Data

Table 4 provides a summary of means and standard deviations for all outcome variables (underachievement and the four motivational constructs in first grade through sixth grade, as well as middle school achievement). Spearman and Pearson correlations between both gender and gifted status and all outcome variables are shown in Table 5. Due to the cohort-sequential design, not all students had data at each grade level. Therefore, both the descriptive statistics and the correlations are for sample data, whereas the analyses using structural equation modeling are based on estimated data from the sample data.

4.2 Latent Class Growth Analysis

Structural equation modeling (SEM) was used to analyze developmental processes in underachievement and student motivational beliefs in the current study. The Childhood and Beyond data satisfied several assumptions required to analyze complex growth processes through a SEM framework. First, the final sample size (over 900) is sufficiently large, as a minimum sample size of 100 is recommended for growth curve analysis (Curran, Obeidat, & Losardo, 2010). Next, underachievement and motivational beliefs were measured at six time points (first through sixth grade), which

both improves statistical power and can allow for the exploration of growth patterns beyond linear growth, including quadratic effects (Curran et al., 2010). All analyses were conducted using Mplus Version 6.1 (L. K. Muthén & B. O. Muthén, 2004), a form of statistical software designed to analyze structural equation models.

In traditional latent growth curve analysis, the underlying, latent constructs of intercept (e.g., where do students begin in underachievement at first grade?) and slope (e.g., what is the nature of change in underachievement from first to sixth grade?) are not directly observable. Estimates of these latent intercepts and slopes are obtained through measurement of observed indicators over time. Traditional latent growth curve analysis assumes that individuals' trajectories are sampled from a single underlying population; that is, slopes are normally distributed (some students show no growth, others increase, others decrease, etc.). However, this assumption may not hold true for all datasets.

In the past decade a new statistical technique called growth mixture modeling (GMM; B.O Muthén & L. K. Muthén, 2000; B. O. Muthén, 2004) has been developed that relaxes this assumption of normally-distributed growth factors. GMM allows for the possibility that individuals may be sampled from different populations of growth factors. These different populations may be represented through latent classes of growth. For example, some groups in datasets are clearly observed (gender, treatment

vs. control groups, etc.). However, there may also be unobserved groups, and it is these unobserved groups that can be modeled through GMM. Put in the context of the current study, likely latent classes could include achieving and underachieving trajectories. That is, some students' trajectories of underachievement (and motivational beliefs) may be so unique that it is as if they are being sampled from a separate population, and thus constitute a distinct class of growth.

In both traditional latent growth curve analysis and GMM, it is possible to model growth in more than one construct simultaneously by using a parallel process growth model (Curran et al., 2010). Within the GMM framework, latent classes are explored within the parallel, concurrent growth of two processes (in the current study, underachievement and each of the four student motivational beliefs). The growth processes are connected at the latent level and the determination of number of classes is based on patterns of growth in both constructs, rather than just one.

A specific type of GMM, latent class growth analysis (LCGA; Nagin, 1999; Roeder, Lynch, & Nagin, 1999) was used in the current study. In GMM, within-class variation in growth parameters is estimated. In LCGA, the variance of these growth parameters in each class is set to zero, thereby estimating only a mean trajectory within each class. LCGA is often recommended as a parsimonious approach to exploring heterogeneity in development across time, and for exploratory modeling. Due to the

exploratory nature of the current study, LCGA was selected as the method of analysis, rather than GMM, for this reason.

4.3 Cohort Effects and Missing Data

Because members of a cohort may be more similar to each other than to members of different cohorts (Shadish, Cook, & Campbell, 2002), it is advisable to check for cohort differences that may affect analyses. Chi-square analyses were used to examine cohort differences in the model covariates (gender and gifted status). Gender did not differ across the three cohorts, $\chi^2(1, N=932) = .91, p = .63$. The distribution of gifted students differed significantly by cohort, $\chi^2(1, N=932) = 25.89, p < .001$ (there were a greater number of gifted students in the oldest cohort than would be expected by chance, adjusted standardized residual³ [ASR] = 5.0).

However, this uneven distribution of gifted students across cohorts does not necessarily imply that the patterns of growth or developmental processes vary across cohort. In traditional latent growth curve analyses, it is necessary to test for invariance in growth parameters (e.g., mean of the latent slope variable) across cohorts. This invariance test is only meaningful when the growth curves are assumed to be drawn from a single population, as in traditional growth curve analysis. In a growth mixture modeling approach, it is assumed that some trajectories are being drawn from different

³ ASR values are interpreted similarly to z-scores; values over 1.96 are statistically significant at the $p < .05$ level.

populations. Therefore, a test for growth invariance across cohorts would not be informative. In order to account for the possibility that cohort membership might influence latent class membership, the latent class variable and the growth parameters in both processes (underachievement and the parallel motivation process) were regressed on two dummy-coded variables for cohort membership.⁴

The use of a cohort-sequential design, by nature, introduces missing data in longitudinal analyses (for example, students in each cohort were not measured at all six grades). Missing data for the growth variables (underachievement and student motivational beliefs) were accounted for through the use of Full Information Maximum Likelihood (FIML), which has been found to be a more successful method of dealing with missing data compared to methods such as listwise deletion (Enders & Bandalos, 2001; Wothke, 2000). Missing data are not allowed on the covariates in latent class growth analyses (in the current study, covariates included gender, gifted status, the interaction between gender and gifted status, and the two dummy-coded cohort variables); however, there were no missing data on the covariates in the current study.

⁴ For simplicity, these two dummy codes are not shown in figures, but will be interpreted in-text. The youngest cohort was used as the reference group.

4.4 Identification of Latent Classes of Growth in Underachievement and Motivational Beliefs

The determination of latent growth curve classes is influenced by the incorporation of both covariates and distal outcomes (Huang, Brecht, Hara, & Hser, 2010). Therefore, it is recommended that planned covariates and distal outcomes are included in models when determining the appropriate number of latent classes. In all of the analyses, both theoretically important covariates (gender, gifted status, and the gender $\times$ gifted interaction) and the two dummy-coded cohort variables were included. The distal outcome, middle school GPA, was also included in all analyses.

Although no concrete guidelines exist for the determination of number of latent classes for a given model, there are a variety of fit indices that can be used together to inform final decisions (Nagin, 2005). The Akaike Information Criteria (AIC), Bayesian Information Criterion (BIC), sample-size adjusted Bayesian Information Criterion (ABIC), and the Lo-Mendell-Rubin Likelihood Ratio Test (LMR-LRT; Lo, Mendell, & Rubin, 2001) are measures of relative fit that are examined when comparing different class solutions (for instance, comparing a two-class solution against a one-class solution, or a three-class solution against a two-class solution).⁵ The AIC, BIC, and ABIC all decrease as greater numbers of classes are considered, and researchers must identify the

⁵ Although some researchers utilize declines in the log-likelihood ratio (LLR) as another method to determine the optimum number of classes, this is generally discouraged, based on simulation research (Nylund et al., 2007).

point at which the decrease begins to plateau (or in some cases, values increase slightly).

The LMR-LRT is used to determine if there is statistically significant improvement in model fit with the addition of a latent class (for example, in comparing a three-class solution against a two-class solution).

Within a given class solution, several other fit indices must be considered. The entropy value for each class solution ranges from 0 to 1, with 0 indicating total randomness and 1 indicating perfect classification (Celeux & Soromenho, 1996).

Entropy values closer to 1 are desirable. Estimated posterior probabilities are used to determine if classes can be distinguished from each other (Nagin, 1999). Further, it is generally recommended that no class should contain fewer than 10% of the sample in order to reduce the likelihood that classes can be both interpretable and generalizable for future research. Importantly, the determination of classes for the final solution should also be guided by theoretical expectations, as parsimony is a critical aspect of conducting research that informs theory and future research.

Each of the four student motivational beliefs served as the concurrent process alongside the underachievement trajectories. Quadratic terms were included to allow for the estimation of non-linear trajectories for underachievement and each of the motivational constructs with the exception of task importance.⁶ In each of the four

⁶ A quadratic growth term was originally included for both underachievement and task importance in the Task Importance model. However, the estimated means for task importance at first grade and second grade

analyses, five observed covariate variables were included: gifted status (coded as 0=typical, 1=gifted), gender (coded as 0=male, 1=female), a Gifted $\times$ Gender interaction term, and two dummy-codes representing cohort status. Both the latent class variable (c) and each of the latent growth variables (intercept, slope, and quadratic term) for both parallel processes (underachievement and the motivation variable) were regressed onto each of the covariates. Residuals for temporally related time points for both underachievement and the parallel process (i.e., first grade and second grade, second grade and third grade, etc.) were allowed to correlate. Figure 3 shows the general path diagram for the LGCA that was used for each of the four models.

In Research Question 1, I asked if the joint development in underachievement and four motivational beliefs (reading self-concept, reading importance, psychological cost for reading, and self-worth) could be characterized by underlying group trajectories known as latent growth classes. It was hypothesized that at least two classes would be identified in each of the four models, based primarily on the expectations for trends for underachievement: an achievement class (in which students showed little underachievement and relatively little change over time) and an underachievement class (in which underachievement increased over time). Specific hypotheses for each of the

were around 9.0, despite the actual scale ranging from 1.0-7.0 (this occurred at the one-class, two-class, three-class, and four-class solutions). Out-of-bounds estimated means can occur due to poor fit, such as the inclusion or exclusion of a quadratic term (B. Muthén, personal communication). Once the quadratic term for task importance was removed, the estimated means returned to within normal bounds. This problem did not occur for any of the other models, and quadratic terms were retained for those models.

four models (underachievement alongside concurrent development in a specific motivational belief) are described in greater detail in the subsections below. For each of the four models, an increasing number of classes were tested in order to determine the number of classes that best fit the data. Patterns in both processes (underachievement and motivational belief) for the final class structure in each model are also described in the subsections below.⁷

4.4.1 Underachievement and reading self-concept (RQ1.a)

It was hypothesized that reading self-concept would share parallel (but opposite) patterns of growth in underachievement; that is, an achievement-type class (with relatively high self-concept) and an underachievement-type class (with low or declining academic self-concept). With covariates and distal outcome included, a parallel-process LCGA was conducted with underachievement and reading self-concept measured yearly from first grade through sixth grade. Fit indices for the one-class, two-class, and three-class solution are presented in Table 6. A four-class solution was attempted; however, convergence was only obtained at the local maxima (no true convergence was obtained), despite the allowance of more than 4,000 random start values. Therefore,

⁷ Although it is possible to test for differences in growth parameters (intercept, slope) across classes within a given model using model constraints and the BIC, I was not able to do this in the current study due to the inclusion of covariates in the model, which would make it difficult and impractical to interpret. For instance, the intercept would represent the starting value in a construct when all growth parameters were at zero (in the current study, this would represent a non-gifted male student in the youngest cohort). For this reason, any differences in growth parameters between classes are discussed with caution, given that these differences cannot be tested for degree of statistical significance.

findings for a four-class solution for the U-SC model were deemed not trustworthy and are not presented.

Looking across several fit indices, there were declines in the AIC, BIC, and ABIC fit indices while moving from a one-class solution to a two-class solution and a three-class solution. Although it is difficult to find a true plateau given that the four class solution did not converge, declines in the fit indices when moving from a two-class to a three-class solution were smaller than the declines when moving from a one-class to a two-class solution. The LMR-LRT indicated a statistically significant improvement in model fit for the two-class solution (as compared to the one-class solution), but not for the three-class solution. Given this conflicting information, information from the other fit indices was considered to choose between the two-class and three-class solution.

Classification fit for the two-class solution was good (entropy value of 0.75 and estimated posterior probabilities along the diagonal were 0.95 and 0.84). When plotted, this solution produced an Achievement class (approximately 80% of sample) and a Sustained Underachievement class (approximately 20% of sample). Both classes showed similar, slight declines in reading self-concept. Classification fit for the three-class solution was also reasonable (entropy value of 0.73 and estimated posterior probabilities along the diagonal ranging from 0.83 to 0.91, see Table 7). No fewer than 10% of the sample was classified into a single-class in the three-class solution. In the three-class

solution, an additional underachievement class emerged (Growing Underachievement). Therefore, given the more theoretically interesting class structure in the three-class solution that was obtained without any apparent loss in fit, this three-class solution was selected as the final model.

The three-class solution in the U-SC model was characterized by three distinct trajectories of underachievement (see Figure 4). First, an Achievement class comprised the majority of the sample (66.7%). In this class, students were rated as working close to the maximum level of ability across all grade levels, and experienced a moderate decline in reading self-concept of approximately 1 point on the 7 point scale across the grades. In the next class, Sustained Underachievement (12.0% of the sample), students began underachieving at a greater degree than students in the other two classes, and maintained this level of underachievement across the grades. Interestingly, students in this Sustained Underachievement class shared a very similar reading self-concept trajectory as students in the Achievement class. Finally, the third class in this model was best characterized as a Growing Underachievement class (21.3% of the sample). These students shared a similar start level in underachievement as students in the Achievement class, but gradually increased in underachievement across the years. Students in the Growing Underachievement class had moderately lower reading self-

concept initially, and showed a decline in self-concept at about the same rate as the students in the other two classes.

4.4.2 Underachievement and task importance (RQ.1b)

The same class determination procedure was repeated with underachievement and task importance (U-TI model). Fit indices for the one-class through four-class solutions are presented in Table 8. Declines in the AIC and ABIC plateau between the three-class and four-class solutions, and the increase in BIC between the three-class and four-class solution reinforces the better fit in the three-class solution. The four-class solution was not selected because one of the four classes contained just under ten per cent of the sample, and of greatest concern, one of the dummy-coded cohort variables was a statistically significant predictor of class membership ($OR = 2.01, p < .001$). Specifically, this suggests that the latent classes were being derived from some effect of cohort (oldest cohort), and not on actual development in underachievement and reading importance. No effects of cohort membership were observed for the three-class solution.

In choosing between the two-class and three-class solutions, several fit indices were considered. Although the LMR-LRT only indicated a significant improvement in model fit for the two-class and not the three-class solution, both entropy and the estimated posterior probabilities were good for both solutions (.94 and .84 for the two-class solution, and ranging from .80 to .93 in the three-class solution, see Table 9 for all

estimated posterior probabilities in the three-class solution). Ultimately, the three-class solution was selected because of the emergence of the Growing Underachievement class, similar to the Underachievement-Self Concept model, with no ascertainable loss in fit.

The shapes of the underachievement trajectories across the three latent classes in the Underachievement-Reading Importance model were quite similar to the Underachievement-Self Concept model (see Figure 5).⁸ The greatest number of students (73.3%) were classified into an Achievement class in which students were rated as working close to their potential across the grades. These students reported a moderate decline in reading importance. A Sustained Underachievement class also emerged (13.2% of sample) where students maintained moderately high levels of underachievement. Curiously, these students shared a similar trajectory in reading importance as those in the Achievement class, and this pattern reflects what was found for these two classes in the Underachievement-Self Concept model. Finally, a Growing Underachievement class (13.5% of sample) was again characterized by a similar starting point in underachievement as students in the Achievement class, and increasing underachievement over time. This class was also characterized by lower early ratings of

⁸ As will be discussed later in the Results section, this similar pattern of underachievement class trajectories across the two models (U-SC and U-TI) should not be interpreted to mean that the same individuals are being classified into similar classes across the models. This similarity is better interpreted as similar *patterns* of change across the two models, rather than similar *classification* across models.

task importance that declined over time (quite similar to the self-concept trajectory in the Growing Underachievement class in the U-SC model).

4.4.3 Underachievement and psychological cost value for reading (RQ.1c)

A four class solution for the Underachievement and Psychological Cost Value for Reading model (U-PCV) did not converge on global maxima, but fit indices for the one-class, two-class, and three-class solutions are presented in Table 10. As with the U-SC model, it is difficult to judge a true plateau for the declines in AIC, BIC, and ABIC; however, both the BIC and ABIC showed smaller declines moving from the two-class to the three-class solutions. The LMR-LRT was just at statistical significance for an improvement in model fit moving to the three-class solution. Although entropy was better in the two-class solution (.75 versus .69 in the three-class solution), estimated posterior probabilities were good for both solutions (.85 and .94 for the two-class solution; range from .80 to .87 in the three-class solution [see Table 11]). As with the U-SC and U-TI models, the two-class solution contained an Achievement and Sustained Underachievement class (both characterized by very similarly-shaped curvilinear growth in psychological cost value). Moving to the three-class solution, however, allowed for the emergence of an interesting third class. Unlike the previous two models (in which a Growing Underachievement class appeared), a second Achievement class was found. Based on acceptable fit in the three-class solution and the addition of this

interesting class, the three-class solution was selected as the final solution for the U-PCV model (see Figure 6).

A large Achievement class comprised most of the sample (60.1%). This class was characterized by a trajectory of psychological cost value for reading that increased in a curvilinear manner across the grades by about two points on the seven point scale, peaked at third grade, and decreased slightly by sixth grade (Achievement-Growing-Cost class). The second Achievement class contained fewer students (26.9% of sample) and in this class, students reported high levels of psychological cost value across the grades. This class was labeled the Achievement-High-Stable-Cost class. Because the trajectories in underachievement were so similar, the different class classification was likely due to the very different trajectories in psychological cost. Finally, a Sustained Underachievement class also emerged (13.0% of sample). This class shared a similar-shaped trajectory in psychological cost as the Achievement-High-Stable-Cost class, although level of cost value for the Sustained Underachievement class increased at a greater rate, and was higher at the midway peak.

4.4.4 Underachievement and global self-worth (RQ.1d)

A one-class, two-class, and three-class solution for the Underachievement and Self-Worth model (U-SW) converged, and the fit indices are presented in Table 12. Both the AIC and BIC showed reduced declines at the three-class solution, and the BIC even

increased, indicating that the two-class solution had the best fit. The LMR-LRT was in concordance, with a significant improvement ($p < .001$) in model fit for the two-class, but not the three-class ($p = .50$) solution. In the three-class solution, both entropy (.65) and estimated posterior probabilities (.87, .79, and .77) were below typically acceptable levels. In contrast, the two-class solution had good entropy (.77) and estimated posterior probabilities (.86 and .95, see Table 13). The two-class solution was selected as the final model (see Figure 7). As seen in the other three previous models (U-SC, U-TI, and U-PCV), the two-class solution contained an Achievement class (83.2% of sample) and a Sustained Underachievement class (16.8% of sample). Both latent classes shared similarly-shaped trajectories in global self-worth, which remained moderately high (between a 2.0 and a 3.0 on a 4 point Likert scale) across the grades. As hypothesized, the Sustained Underachievement class was characterized by lower levels of self-worth.

4.5 Influence of Gender and Gifted Status on Latent Classes

As previously described, three covariates of interest were included in each of the four models (Gender, Gifted, and a Gender $\times$ Gifted interaction term) and these covariates were used to predict latent class membership in each of the four models. Because class membership is a (latent) categorical variable, logistic or multinomial regression was used to predict the likelihood of being classified into the different classes.

Logistic regression was used for the two-class solution (Underachievement and Self-Worth) and multinomial regression was used for three-class solutions (all remaining models). For each covariate, an odds ratio is given. The odds ratios for class membership can be interpreted as the probability of being in a given class as compared to the reference class (in other words, the probability of an event divided by the probability of the non-event). For each of the four models, odds ratios are interpreted with reference to membership in a specific reference class. Overall, it was hypothesized that male students would be more likely to be classified into any underachievement classes, gifted students would be more likely to be classified into underachievement classes with steeper growth (although this type of class was not found, the Sustained class is the most similar to this hypothesized growth), and that gifted male students would be the most likely to be classified into steep growth (Sustained) underachievement classes (Gender by Gifted interaction).

The Underachievement and Reading Self-Concept three-class model (U-SC) was examined to determine if any of the covariates (Gender, Gifted, or Gender $\times$ Gifted, as well as cohort status) predicted latent class membership through multinomial regression. The Achievement class served as the reference class. Contrary to my hypothesis, none of the covariates were statistically significantly related to membership in the Growing Underachievement class or the Sustained Underachievement class with

reference to the Achievement class. In particular, when comparing the Growing Underachievement class against the Achievement class, none of the odds ratios reached a level of statistical significance for Gifted ($OR = 2.28, p = .21$), Gender ($OR = 1.04, p = .56$), Gifted $\times$ Gender interaction ($OR = 0.13, p = .21$), dummy-code for the middle cohort ($OR = 1.04, p = .44$), or the dummy-code for the oldest cohort ($OR = 3.07, p = .42$). In comparing the Sustained Underachievement class against the Achievement class, similar non-significance was found for Gifted ($OR = 1.15, p = .33$), Gender ($OR = 0.69, p = .94$), Gifted $\times$ Gender interaction ($OR = 0.63, p = .34$), dummy-code for the middle cohort ($OR = 0.53, p = .95$), or the dummy-code for the oldest cohort ($OR = 0.68, p = .16$).

The Achievement class was also used as the reference class for the Underachievement and Reading-Importance model. Gender was the only statistically significant predictor of latent class membership in the expected direction. Specifically, the odds for a female student being classified in the Growing Underachievement class (as compared to the Achievement class) were 38% lower than the odds of a male student being classified in the Growing Underachievement class ($OR = 0.38, p = .002$). Similarly, the odds for a female student being classified in the Sustained Underachievement class (compared to the Achievement class) were 60% lower, although did not reach conventional levels of statistical significance, than the odds for a male student to be classified in the Sustained Underachievement class ($OR = 0.60, p = .08$). In the first

comparison with the Growing Underachievement vs. Achievement class, the other covariates were not significant: Gifted ($OR = 0.57, p = .57$), Gender $\times$ Gifted interaction ($OR = 7.51, p = .14$), dummy-code for the middle cohort ($OR = 1.43, p = .84$), and dummy-code for the oldest cohort ($OR = 2.79, p = .29$). The same was true for comparing the Sustained Underachievement class against the Achievement class: Gifted ($OR = .98, p = .62$), Gender $\times$ Gifted interaction ($OR = 0.95, p = .18$), dummy-code for the middle cohort ($OR = .60, p = .65$), and dummy-code for the oldest cohort ($OR = 0.86, p = .27$).

Because there were two achievement classes in the Underachievement and Psychological Cost Value, the class with the majority of students (Achievement and Growing Cost class, 60.1% of sample) was selected as the reference class. Comparing this Achievement class with the Achievement and High Stable Cost class, none of the covariates reached statistical significance: Gifted ($OR = 1.01, p = .21$), Gender ($OR = 1.72, p = .75$), Gifted $\times$ Gender interaction ($OR = 0.92, p = .95$), middle cohort ($OR = 0.44, p = .20$), and oldest cohort ($OR = 0.64, p = .58$). This was also true for comparing the Sustained Underachievement class against the largest Achievement class: Gifted ($OR = 0.56, p = .99$), Gender ($OR = 0.64, p = .17$), Gifted $\times$ Gender interaction ($OR = 1.13, p = .95$), middle cohort ($OR = 0.64, p = .40$), and oldest cohort ($OR = 1.34, p = .31$).

Finally, a logistic regression was used to determine if covariates were associated with membership for the two classes found in the Underachievement and Self-worth

model (U-SW). Gender was a marginally significant predictor of latent class membership. Consistent with hypothesis and prior literature on underachievement, the odds for a female student to be classified into the Sustained Underachievement class were 55% lower than the odds for a male student to be classified into the Sustained Underachievement class (OR = 0.55, $p = .07$). Being in the middle cohort was also marginally related to being classified in the Sustained Underachievement class (OR = 0.53, $p = .07$). All other covariates did not reach statistical significance: Gifted (OR = .93, $p = .87$), Gender $\times$ Gifted (OR = 0.95, $p = .95$) and dummy-code for oldest cohort (OR = 1.01, $p = .95$).

In summary, neither Gifted nor the Gifted $\times$ Gender interaction related to latent class membership across the four models. Gender was the only covariate that reached a level of conventional statistical ($p < .05$) or marginal ($p < .10$) significance in predicting class membership, but this effect was not found robustly across the models (it was marginally related to being in the Sustained Underachievement classes, as compared to Achievement classes, in the U-TI and U-SW models, and significantly related to being in the Growing Underachievement class as compared to the Achievement class in the U-TI model).

4.6 Distal Effects of Latent Class Membership on Later Academic Achievement (RQ.3)

In Research Question 3, it was hypothesized that latent class membership, if characterized by either growing or sustained underachievement, would negatively relate to later academic achievement in middle school. As described previously, the distal outcome of each of the LCGAs (middle school GPA) was already included in the model when the number of classes were determined. Middle school GPA was also regressed directly on the covariates of interest (Gender, Gifted, and Gender $\times$ Gifted) to control for their influence. In the Wald test, two models are compared: one model in which the means of the distal outcome are held equivalent across classes, and another model in which the means are allowed to vary across classes. The Wald test can also be used for planned comparisons to test if the means of specific classes vary. If the Wald test is statistically significant, it indicates that the model allowing means to vary results in a statistically significant better fit than the model with constraints, and thus class membership is related to the distal outcome. Estimated means for middle school GPA in each class for all four models are presented in Table 14.

The omnibus Wald test for the three-class solution in the Underachievement and Reading Self-Concept model (U-SC) was statistically significant, Wald $\chi^2(2) = 21.11, p < .001$, indicating that middle school GPA varied across the three classes. A series of pairwise comparisons was used to determine which classes were significantly different

from each other. As would be expected, middle school GPA was significantly higher in the Achievement class than in the Sustained Underachievement class, Wald $\chi^2(1) = 20.08$, $p < .001$. However, students in the Achievement class did not report higher middle school GPA than students in the Growing Underachievement class, Wald $\chi^2(1) = 1.81$, $p = .18$. Middle school GPA was also not significantly different between the Sustained and Growing Underachievement classes, $\chi^2(1) = 2.19$, $p = .14$.

Middle school GPA also varied across classes in the Underachievement-Task Importance (U-TI) model, Wald $\chi^2(2) = 18.10$, $p < .001$. As was the case in the U-SC model, middle school GPA varied significantly between the Achievement class and the Sustained Underachievement class, Wald $\chi^2(1) = 17.99$, $p < .001$, but was not different between the Achievement class and the Growing Underachievement class, Wald $\chi^2(1) = 0.02$, $p = .89$. Yet in contrast with the U-SC model, middle school GPA was significantly lower in the Sustained Underachievement class than in the Growing Underachievement class, Wald $\chi^2(1) = 4.01$, $p < .05$.

The omnibus test for differences in middle school GPA across classes for the Underachievement and Psychological Cost Value model (U-PCV) was also statistically significant, Wald $\chi^2(2) = 21.92$, $p < .001$. As would be expected, middle school GPA in the Sustained Underachievement class was significantly lower than in both achievement classes. Specifically, it differed from both the Achievement-Growing-Cost class, Wald

$\chi^2(1) = 21.76, p < .001$, and the Achievement-High-Stable-Cost class, Wald $\chi^2(1) = 12.19, p < .001$. There was no statistically significant difference in GPA between the two Achievement classes, Wald $\chi^2(1) = 0.203, p = .65$.

The final model tested was the two-class Underachievement and Self-worth (U-SC) model. As expected, the Wald test revealed a statistically significant difference in middle school GPA between the Achievement class and the Sustained Underachievement class, Wald $\chi^2(1) = 21.56, p < .001$.

4.7 Consistency of Underachievement Class Type Across Models

Each of the four models presented contained Underachievement as the first parallel process, and several similar patterns in underachievement classes emerged across the models. Specifically, an Achievement class was observed in all four models (with two Achievement classes in the U-PCV model, each characterized by a distinct parallel trajectory in psychological cost value). A Sustained Underachievement class was also identified in each of the four models, and a Growing Underachievement class was detected in the U-SC and U-TI models. Given the relative consistency in patterns of underachievement, were the same individuals classified as belonging to similar classes of underachievement across the four models? Although this question is possible to answer, it must be emphasized that perfect classification across the four models (for instance, the same individual being classified into the Sustained Underachievement class

in every model) should not be expected, as the class structure in each model is determined not only by the variation in trajectories of underachievement, but also variation in trajectories of the parallel motivational process. Further, the class membership assigned to each individual was the *most likely* class membership based on the model, and conducting further analyses with these classifications results in the undesirable introduction of error. In person-centered approaches to studying development, the goal is primarily to identify different trajectories, rather than to necessarily assign specific classification types to individuals within a given sample (Bergman & El-Khoury, 1999). Rephrased in the context of the current study, the goal was to identify long-term developmental patterns in underachievement and concurrent motivational processes, rather than identify specific students as belonging to a specific sub-type of development.

With these cautions in mind, it was still possible to examine classification consistency across the four models. The Achievement class appeared to be the most consistent; out of the 831 students who were classified into an Achievement class in any of the four models (including either of the Achievement classes in the U-PCV model), 578 (69.6%) of these students were in this class in all four models. The Sustained class was relatively consistent, with 68 (43.6%) students consistently classified into this class in all four models out of the 156 students who were classified into this type in any of the

models. When the Sustained classes in only the U-SC and U-TI models were considered (as these two models contained the same three-class structure with regard to underachievement development), the consistency was greater, at 73.3% (88 in both models out of the 120 who were classified as Sustained in the U-SC model). Finally, the Growing Underachievement type appeared to be the least consistent across models. Of the 120 students classified into this type in the U-TI model, only 55 (45.8%) were also classified into this type in the U-SC model.

Therefore, there were moderate levels of consistent classification among the three types of underachievement classes (Achievement, Sustained Underachievement, and Growing Underachievement). This should not be used to conclude that there are different types of underachieving students who share similar motivational trajectories (i.e., that individuals classified as Growing Underachievement have declines in both self-concept and importance). However, parallel *patterns* across the models can be interpreted and discussed (i.e., that a growing underachievement pattern is associated with declines in self-concept and declines in importance, but that these may not happen concurrently for the same individuals).

5. General Discussion

Examination of underachievement from a developmental perspective informs motivational theory as well as educational practice. By moving the study of academic underachievement beyond the confines of middle school to the broader lens of childhood through adolescence, we can better understand the student level factors that develop alongside underachievement, as well as understand how this joint development relates to later academic outcomes. In the current study, I utilized a longitudinal, person-centered approach to identify latent, unobserved classes of growth in reading underachievement and four important motivational processes (reading self-concept, reading importance, psychological cost value for reading, and global self-worth). Gender and gifted status were hypothesized to differentially predict membership in the latent classes (with gifted students in classes with steeper underachievement growth, male students more likely in any underachievement classes, and male gifted students more likely in steeper-growth underachievement classes). In turn, the latent classes characterized by steep or chronic underachievement growth were predicted to negatively relate to later academic achievement in middle school. Latent classes were detected, and partial support was found for some hypothesized predictors of class membership. These findings are discussed in greater detail below.

5.1 Latent Classes of Development in Underachievement and Concurrent Motivational Beliefs

A person-centered, multiple pathways approach (Bråten & Olaussen, 2005; Pintrich, 2000, 2003; Shell & Husman, 2008) was utilized in the current study to understand how students may follow different developmental trajectories throughout middle childhood with regard to underachievement and the development of motivational beliefs. Latent classes of joint development were identified in each of the four models, lending support to the idea that there is great heterogeneity among students in general and among underachieving students as a subset (McCoach & Siegle, 2003, 2008; Reis & McCoach, 2000). Findings from the current study add to this understanding of heterogeneity by identifying differential patterns of growth over time, rather than examining variation at a single time point. Again, the goal of the current study was not to classify students within this sample into the latent growth classes, but rather to understand and describe different patterns of change that existed in the sample. Although common findings in underachievement development across models were identified for some classes, this should not be interpreted as the same students being classified into each latent class across models, but rather viewed as similar patterns of growth that may be examined in conjunction with the parallel motivational beliefs.

Certain patterns of development in underachievement were quite similar across the four models. As hypothesized, an Achievement class was consistently found across all four models (although curiously, there were two types of Achievement classes in the model with psychological cost value for reading), and this type of class encompassed the largest number of students. Two different types of underachievement trajectories were also identified, consistent with prior research suggesting heterogeneity among gifted students (Reis & McCoach, 2000). The most consistent of these types, a Sustained Underachievement class, was identified in all four models. In this type of development, moderate-high underachievement began in first grade and remained stable through sixth grade. A Growing Underachievement class emerged in two of the models (with Self-Concept and Task Importance), in which underachievement was low in first grade but increased over time. Interestingly, although the growing type of development was most closely related to the original hypothesis for underachievement development, it did not emerge as consistently as the sustained type (which was also hypothesized, but not predicted to be as common).

Moderate degrees of consistency in the Sustained Underachievement classes and Achievement classes across models allow for the cautious integration of findings in describing how motivational beliefs develop concurrently with underachievement. It was hypothesized that growing underachievement would be associated with declines in

adaptive motivational beliefs (self-concept, task importance, self-worth) and increases in maladaptive beliefs (psychological cost value). Given this hypothesis, it would logically follow that a sustained underachievement pattern would also be characterized by lower levels of or declines in motivational beliefs. Yet this does not appear to be the case for all motivational beliefs. The Sustained Underachievement pattern was associated with similar mild declines in self-concept and task importance as the Achievement patterns. This modest decline in self-concept and importance is consistent with prior research that finds a general decline in academic perceptions of competence and value throughout schooling (Fredricks & Eccles, 2002; Jacobs et al., 2002; Wigfield et al., 1997). It also corresponds with prior research finding no differences in academic self-concept between achieving and underachieving students (Lupart & Pyryt, 1996; McCoach & Siegle, 2003; Vlahovic-Stetic, Vidovic, & Arambasic, 1999); however, the lack of differences for task importance are surprising, given the robust finding in prior research that underachieving students value academics less than their achieving peers (Baslanti & McCoach, 2006; Eccles & Alfeld, 2007; Emerick, 1992; Fredricks, Alfeld, & Eccles, 2010; McCoach & Siegle, 2003). Because the current study measured *domain* importance, rather than just perceived value for academics, it is possible that value could remain high for reading as an activity, but not for the type of reading that is done in schools,

helping to explain the lack of difference in perceived importance between the Sustained Underachievement pattern and the Achievement pattern.

Although the Sustained Underachievement and Achievement patterns shared similar trajectories in self-concept and task importance, moderate differences in self-worth and psychological cost value emerged in the U-PCV and U-SW models. Though both the Sustained Underachievement pattern and the Achievement pattern were characterized by similarly-shaped trajectories in psychological cost value and self-worth, the levels of both were lower for the Sustained pattern by about one half to a full point difference on a 7 point scale and 4 point scale, respectively. This suggests that although a stable, chronic pattern of underachievement is not associated with maladaptive levels or change in self-concept or task importance, it is related to detriments in worrying about doing well in the domain and overall levels of self-worth, consistent with what would be hypothesized given the self-worth theory of achievement motivation (Covington, 1992; 2009). Specifically, achieving below potential over a period of several years is associated with greater worry about performing well in a domain, as well as lower perceptions of global self-worth. While no causal inferences can be drawn from these associations, especially given that these differences in psychological cost value and self-worth are apparent from first grade, it does suggest that self-worth related

constructs play a role in underachievement (either as a driving force behind underachievement or as an after-effect).

The curvilinear shape characterizing the trajectories of psychological cost value for both the Sustained Underachievement and Achievement patterns may be explained by contextual shifts that occur during elementary school. Around the middle of elementary school, the focus in reading begins to shift from learning how to read, to using reading as a tool to learn in other domains, in the form of word problems in mathematics or other examples (Chall, 1996). This transition in the role of reading could explain the peaked value of psychological cost value for students in the Achievement-Growing-Cost class and the Sustained Underachievement class, and as students become more comfortable with this transition, worrying about doing poorly in reading begins to decrease once again through sixth grade. Although it is not clear if this contributes to the heightened worries associated with the Sustained Underachievement class, it is a potential explanation.

These differences in psychological cost value and self-worth (between Sustained Underachievement and Achievement), however, do not imply that all underachieving students share this pattern of motivational beliefs. A unique type of underachievement growth was found in two of the models (U-SC and U-TI). In this Growing Underachievement class, underachievement emerged gradually over time; level of

underachievement in this pattern was very similar to the Achievement pattern in first grade (working close to potential), but more similar to the Sustained Underachievement pattern by sixth grade (working below potential). This emerging underachievement was associated with lower initial values in self-concept and task importance that declined over time. Because this latent class did not emerge in the Psychological Cost Value or Self-worth models, I was not able to investigate whether students in this type of growing underachievement trajectory also suffered from decreased self-worth or increased psychological cost value.

Some select research positing the existence of a “selective consumer” type of underachieving student (Delisle, 1992; Figg, Rogers, McCormick & Low, 2012; Neumeister & Hebert, 2003) may help explain the differences between the motivational beliefs associated with the Sustained Underachievement and Growing Underachievement classes in the current study. A selectively consuming student only engages in academic subjects that they find interesting, and is believed to be able to disengage from other subjects without suffering the harmful effects of lowered academic self-concept or reduced self-worth (see Kanevsky & Keighley, 2003 for a similar perspective on the “honor” in underachievement). Selectively consuming students are indistinguishable from achieving peers on measures of academic self-concept (Figg et al., 2012) at a single time point. The Sustained Underachievement pattern identified in the

current study shows some similarity to this description; being classified into this type of trajectory does not appear to be associated with low levels of self-concept or perceived task importance.

In contrast, the Growing Underachievement pattern was associated with hypothesized levels of both self-concept and task importance (lower levels that also declined over time). The trajectories of reading self-concept and reading importance associated with the Growing Underachievement latent class provide insight into how the development of underachievement relates to motivational beliefs. Interestingly, it was this Growing Underachievement latent class (seen in two of the four models) that was associated with both lower initial levels of and declines in self-concept and perceived importance. Certainly, it cannot be determined from the current study if lower initial motivational beliefs are causally related to growth in underachievement over time. However, by comparing the Growing Underachievement class with the Sustained Underachievement class, it appears that it may be the *change* in underachievement across time, rather than the absolute level of underachievement itself, that is associated with lower and declining self-concept and task importance. Perhaps students who have underachieved from the very start are not as aware of their failure to work up to their potential, whereas students who begin underachieving to a greater degree over time are aware of this change, and competence and value beliefs shift.

However, because this Growing pattern was also associated with lower initial levels of self-concept and importance, the opposite may be true, such that it is the motivational beliefs that begin the growth in underachievement. Future research is needed to better explain these potentially reciprocal processes (c.f. Guay et al., 2003 for an exploration of the reciprocal relations between achievement and academic self-concept) . Regardless of causal direction between growth in underachievement, self-concept, and perceptions of task importance, it is clear that there is great conceptual benefit in moving beyond a mean-level difference approach to investigate underachievement and concurrent motivational beliefs concurrently.

In contrast with the hypothesis that any achievement-type class would be associated with largely positive motivational beliefs, this was not entirely true for the U-PCV model. An interesting, smaller Achievement class emerged that was characterized by high and stable perceptions of psychological cost value for reading. This type of class can be explained by prior research on *defensive pessimism* (Norem & Cantor, 1986a, b) in which individuals use anxiety or worries as a way to self-motivate and drive achievement. No difference in middle school GPA was observed between this class and the Achievement class characterized by curvilinear psychological cost value that peaked around third and fourth grade, suggesting that this strategy may prove effective for some individuals, at least by middle school (but could be detrimental later, as school

becomes increasingly harder). Although utilizing anxiety to drive effort and performance is generally adaptive, this strategy has also been found to be related to low levels of mastery goal orientation and high levels of performance-avoidance goal orientation (Yamawaki, Tschanz, & Feick, 2004), suggesting that it may not be uniformly adaptive. Indeed, some research suggests that defensive pessimism is negatively related to both academic self-regulation and academic engagement (Martin, Marsh, & Debus, 2003). Because this class structure could only be observed in one model (U-PCV), it was unable to be examined in the context of the other three motivational variables. Regardless, this class finding underscores the importance of taking a person-centered approach to development, as it is evident that not all students who achieve share a similar motivational make-up and there are likely multiple pathways involved in successful academic achievement (Pintrich, 2000).

5.2 Antecedents and Consequences of Latent Class Membership

This longitudinal approach also allowed for the exploration of how different latent classes of underachievement related to later important outcomes, such as middle school academic achievement (GPA). As hypothesized, the most chronic type of underachievement (Sustained Underachievement) was associated with lower middle school GPA across all four models (estimated mean values ranging from 2.70 to 2.78 on a 4.0 scale). GPA for this class was statistically significantly different from Achievement

classes in all of the models. Indeed, chronic underachievement has long-term consequences (McCall et al., 1992). But do different types of underachievement predict different outcomes? Comparing middle school GPA in the Sustained Underachievement class and the Growing Underachievement class in the two models where both classes emerged (U-SC and U-TI), the Sustained class only related to lower academic achievement in the U-TI model. Because this finding was not robustly found in the current study, it appears there is insufficient evidence to definitively conclude that one type of underachievement is more detrimental than the other. However, this does suggest that the portrait of a selective consumer may not be fully applicable to the Sustained Underachievement pattern found in the current study, as this latent class was consistently associated with lower middle school achievement across all four models, but the selective consumer type of underachievement is not believed to experience negative effects in academic achievement (Delisle, 1992).

When considering the long-term relation between membership in latent classes of underachievement and later academic achievement, it is important to recall that the distal outcome in the current study was only in middle school, and is fairly proximal in relation to when the trajectories themselves were measured. The inclusion of a more distal outcome, such as high school GPA, may be better suited to examine consequences of latent class membership. It is possible that the students in the Growing

Underachievement class may not show decreased academic achievement until high school, given their increasing growth in underachievement and simultaneous decrease in self-concept and task importance. These students may share equally low achievement with their peers in the Sustained Underachievement class if achievement is assessed later. Future research is needed to investigate these possibilities. Drawing from the dynamic systems theory literature, it is possible that a sleeper effect may exist, in which the effect of development on an outcome builds slowly over time and is observed later (Lewis, 2004).

Future research will also need to consider additional potential predictors of latent class membership, as few reached levels of statistical significance in the current study. Hypothesized predictors in the current study included gender, gifted status, and the interaction of gender and giftedness, but none of these predictors was robustly found to differently predict latent class membership across the four models. These findings are discussed in greater detail below.

A wealth of prior research has found that male students are more likely to be classified as underachieving than female students (Colangelo et al., 1993; Matthews & McBee, 2007; McCall et al., 2000; McCoach & Siegle, 2003). While the effects of gender identified in the current study were in the hypothesized direction (female students less likely to be classified as underachieving in the Sustained Underachievement class in the

U-TI and U-SW models, and in the Growing Underachievement class in the U-TI model), it was not found for all underachievement latent classes in all models. A few possibilities may explain this non-robust finding. First, it could be that gender differences in underachievement do not emerge during the time period in which trajectories are measured (first grade through sixth grade). Although retrospective work suggests that underachievement among male students begins in the early elementary school years (Peterson, 2001), other research finds that male underachieving students do not outnumber female underachieving students until middle school (Lupart & Pyryt, 1996). Second, it could also be the parallel development in task importance alongside Sustained and Growing Underachievement in the U-TI model, or the lower self-worth in the U-SW model, that is capturing a greater proportion of male students, rather than simply the underachievement trajectories (recall that latent class structures were determined by joint development in both processes across all models). Prior research with these data suggest that female students report valuing reading and English to a greater degree, but do not find similar gender differences in reading self-concept (Durik et al., 2006).

The gender effect found in the current study was not moderated by gifted status and more importantly, no main effect of gifted status was found in any of the models. Differential processes (specifically, trajectories with steeper growth in underachievement

and declines in adaptive motivational beliefs) were proposed for gifted students, and were not found. However, this finding is still important for informing the field about how underachievement develops in gifted students, such that gifted students are just as likely to be classified into both a Sustained and Growing type of underachievement class, and are not more likely to be in an Achievement class simply because they have high academic ability.

There are a few possible explanations for why gifted status did not emerge as a statistically significant predictor of latent class membership in the current study. First, it may be that the estimation of within-class variation (as in a GMM approach, as opposed to a LCGA approach where a single trajectory is estimated for each class) is needed in order to detect gifted effects. Described within the context of a current study, which employed LCGA, single trajectories for underachievement and each motivational construct were estimated within each class. However, allowing variation around each within-class trajectory (as is done in GMM) may allow gender effects to be detected. Second, although giftedness (IQ) was assessed at baseline, it is likely a construct that continues to exert influence throughout the student's schooling. Future research should consider investigating how giftedness and identified gifted status interact with teacher perceptions and student motivational beliefs across time.

Third, it is also possible that differences by gifted status were not detected because of how giftedness was measured. Although the use of an IQ measure was preferable to relying on teacher-reported gifted status because the formal identification could depend on other variables such as motivation or good behavior (and therefore potentially exclude students who are gifted and underachieving), IQ is certainly not the best or only measure of giftedness (Nicpon & Pfeiffer, 2011). Similarly, it may be that a continuous underachievement variable is needed in order to detect differences in the upper ranges of IQ. In other words, it's certainly possible that all students above 130 IQ are not identical, and that moving to a continuous measurement of the degree of giftedness would allow for smaller differences to be detected in these upper ranges. However, the current measurement of naming students above 130 as gifted allowed for an exploratory look at the potential for differential processes in underachievement and motivation. Future research should examine if differential processes by gifted and typical students are dependent upon the way in which giftedness is conceptualized and measured.

5.3 Underachievement from a Developmental and Person-Centered Approach

The current study has implications for how development is considered in the study of underachievement, and especially how this type of research is enhanced through a person-centered perspective. Long-term underachievement shows both

stability and fluctuation, as evidenced by the Sustained and Growing Underachievement classes. This highlights the strength of using a person-centered approach, as a variable-centered approach would look to characterize the entire sample by single trajectory (and examine fluctuations around that single trajectory). In this person-centered growth approach, various sub-types of growth may be examined. In the current study, a one-class solution was estimated for each of the four models as an initial step in determining the number of classes for each model. In all of these one-class models, the single trajectory for underachievement (that was attempting to best explain all of the variation in trajectories of underachievement across the sample) was an Achievement-type class. In other words, the majority of the sample hung closely to the “working to maximum of ability” end of the scale throughout elementary school. But when investigating the heterogeneity in growth patterns, underachievement classes emerged. Trajectories characterized by underachievement are not just variations around an achievement-type trajectory, but are different enough to be thought of as being sampled from a wholly different population of trajectories. In short, underachieving students have very unique development.

Because some underachievement classes originated in first grade, it would be interesting to consider extending research to kindergarten, so long as careful attention is paid to what underachievement at this age would mean conceptually. Although the

transition from elementary school to middle school is a difficult shift for adolescents that results in decreasing achievement motivation and achievement (Eccles et al., 1993), it is also possible that the transition from kindergarten to first grade represents a similar maladaptive shift for some students. Prior research suggests that the transitions both from preschool to kindergarten (Rimm-Kaufman, Pianta, & Cox, 2000) and from kindergarten to first grade (Entwisle & Alexander, 1998) can be difficult periods for some students. Greater attention is needed into these early years during which underachievement can begin, as evidenced in the current study.

Overall, the current study builds on prior research in several important ways. First, the proposed chronic aspect of underachievement is measured by identifying whole trajectories as underachievement, rather than just the ability-achievement discrepancy at a single point in time. Second, trajectories in underachievement, not just achievement, are used to examine how underachievement develops across time (as decreases in achievement cannot be assumed to constitute underachievement). Third, building on prior research examining mean-level differences in motivational beliefs between achieving and underachieving students, the concurrent development in underachievement and important motivational beliefs are examined. Finally, the timeframe of exploration is expanded to include early elementary school, in order to

investigate how underachievement may both originate from this early time period and relate to outcomes later in adolescence, in middle school.

5.4 Implications for Measurement and Education

The current study has important implications for how underachievement is conceptualized and measured. Certainly, underachieving trajectories were identified based on very long-term patterns across six years. Although shorter “periods” of underachievement were identified in some classes, such as the Growing Underachievement classes identified in the U-SC and U-TI models where students were not underachieving a great deal in the beginning grades, these students still underachieved for several years toward the end of elementary school. This raises an interesting question regarding chronicity in underachievement. How chronic must the ability-achievement discrepancy be to constitute underachievement? In the current study, although there were no a priori cutoffs per se regarding duration of time that a student needed to underachieve, the latent classes were identified based on long-term patterns. However, a student who was rated as not living up to potential for just a year would not necessarily be captured in an underachieving latent class in the current study. Certainly, obtaining multiple measurements across time can identify students who exhibit chronic underachievement (that is, not just a single incidence of underperformance). In the current study, those multiple measurements were across

several years, with one measurement per year where the teacher reported on the students' general performance. Yet this method can also be used at a smaller timescale; for example, monthly or weekly assessments might prove informative in identifying students who fall into chronic patterns of underachievement.

The measurement of underachievement in the current study was also unique with regard to the level of measurement (domain specific vs. global).

Underachievement was measured at the domain-specific level (reading), making it possible to narrow the focus of measurement to a single domain and not risk that students showed "mild" underachievement because of severe underachievement in one domain and moderate or no underachievement in another domain. Several other variables were also aligned at this domain-specific level (reading self-concept, reading importance, psychological cost value for reading). But other variables (global self-worth and later academic achievement in middle school) were measured on the global level. Although this measurement was not intentional and was due to both limitations of the dataset and conceptual considerations (i.e., self-worth is on a global level), it provides interesting insight into the interplay between domain-specific and global constructs in underachievement and motivation. That is, different classes of domain-specific underachievement and student motivation still related to differences in later general academic underachievement, suggesting that the constructs do not operate in isolation.

Educational implications related to the prevention of underachievement and interventions with underachieving students can also be considered from the current study findings. In the Sustained Underachievement classes that appeared in each of the models, underachievement began in first grade on almost a full 2-point difference (on a 7 point scale) as compared to the level of underachievement in the Achievement class. This level of underachievement in the Sustained class was largely maintained through sixth grade and this type of pattern was associated with lower subsequent academic achievement in middle school. Therefore, prevention efforts need to be directed as early as possible, as underachievement is not simply a middle school phenomenon that arises in the later elementary school years. However, it must be remembered that the goal of person-centered research is to identify patterns, rather than classify individuals (Bergman & El-Khoury, 1999,); it would be unwise to allow negative expectations about risk of underachievement shape how teachers interact with students, especially given the relative newness of these types of statistical techniques, as recommended by education researchers who employ this person-centered approach to development (Hodis et al., 2011). Instead, it may be more adaptive to be aware that a sustained pattern of underachievement, one which relates to negative achievement outcomes as late as middle school, can begin very early in elementary school.

Prevention efforts can also be aimed throughout the elementary school years in order to prevent the Growing Underachievement pattern observed in two of the models in the current study. Because this pattern was associated with lower initial levels of self-concept and task importance, these beliefs could serve as potential warning signs to educators that students low in self-concept or task importance may be susceptible to emerging underachievement. Other research with underachievement in elementary school (McCall et al., 2000) suggests that teachers initially provide support to students who are underachieving in the early elementary school years in an attempt to alleviate underachievement, but later become frustrated with chronic underachievement and become more controlling, around fourth grade. These types of teacher behaviors were not measured in the current study, but this prior finding is a possible explanation for why it was the Sustained Underachievement pattern, rather than the Growing Underachievement pattern, that was most related to lower levels of academic achievement in middle school. In other words, students with more chronic underachievement may develop a greater reputation for underachievement, which could elicit more controlling behavior from teachers, influencing students to withdraw further.

5.5 Limitations

The findings from the current study should be interpreted with consideration to certain limitations. As is common with long-term longitudinal research, the data from the current study are older (the first wave of data collection began in 1987). Although it is possible that these findings were affected by the timeframe during which the study took place, this effect is lessened by using reading/English as the primary domain, rather than math or science. Historically, female students have been under-represented in mathematics and science, while this has not similarly been observed in reading and English. Therefore, the gender effects observed in the current study are less likely to be influenced by the age of the dataset, but this confound should be considered.

Additionally, two of the constructs in the current study (teacher rated underachievement and psychological cost value for reading) were measured through the use of a single item. Ideally, any construct would be measured using at least three items, which would both allow for measurement of internal consistency and ensure better measurement. Although the single item for teacher-rated underachievement is an improvement upon prior methods (for example, asking teachers to nominate achieving and underachieving students), future research should investigate the validity of teacher-reported degree of underachievement. Importantly, what information do teachers use to

form judgments of how students are working up to their ability or working far below?

How accurate are teachers in assessing students' potential?

The use of teacher ratings in assessing underachievement should also be evaluated within the context of student ethnicity, as it is possible that teacher accuracy may vary as a function of under-represented minority status. The data used in the current study are also from a predominantly White, middle-class sample. It is possible that teachers' expectations for how much potential a student has (in terms of rating degree of underperformance) could be higher for White students (and perhaps also Asian students). Future research with other ethnicities and teacher ratings is warranted in order to address this possibility. Further, the relative ethnic homogeneity in the current study may also be considered a limitation. Prior research on underachievement among other ethnicities has suggested that different processes might be at play (Ford, 1992a, b; Hebert, 2001). Therefore, findings from the current study must be generalized with caution, as it is possible that different trajectories would be at play among under-represented minority students.

Following the measurement theme, the measurement of giftedness may also be critiqued in light of more recent work emphasizing the need to move beyond using only measures of IQ. More recent research has encouraged educators to rely on other indicators of giftedness aside from IQ (Nicpon & Pfeiffer, 2011). Because giftedness was

assessed in the first wave of the study (1987), using IQ scores as an indicator of giftedness is not as popular of a method. However, this measure was still preferable when compared to using actual identification status as the indicator (as this measure may be less likely to include students who exhibit lower levels of achievement motivation or who are underachieving and further, not all of the schools in the study had gifted programs, suggesting that this method of identifying students as gifted would not be consistent throughout the sample).

Finally, the timeframe of investigation in the current study allowed for examination of trajectories in underachievement and concurrent student motivational beliefs, but only through sixth grade. Although the measurement of student motivational beliefs continued through middle school and high school, data from teachers were only collected through Wave 4 (sixth grade). In order to use consistent measurement of underachievement, the trajectories of underachievement measured in the current study ended in sixth grade. Therefore, although the current study addressed a gap in the literature by examining underachievement as early as first grade, it does not allow for exploration of how underachievement itself develops across middle and high school. Given that many researchers implicate middle school and junior high as a period of importance for the development of underachievement (Lupart & Pyryt, 1996,

Peterson & Colangelo, 1996; Reis & McCoach, 2000), the lack of trajectory measurement into middle school may be considered a limitation.

5.6 Future Directions

Several directions for future research arise out of the findings for the current study, and include both additional analyses with the current data, as well as ideas for future data collection and new research. A person-centered approach was used to investigate the heterogeneity among underachieving students but importantly, it was used to investigate heterogeneity in the longitudinal pathways that students take (rather than looking at different subgroups at a single time point). Keeping a person-centered approach in mind, I now discuss several venues for future research (both with these data and with other data).

Findings from the current study provide insight into a multitude of future research questions. First, the current study used LCGA to examine differential trajectories across a wide time span (from first grade through sixth grade, as well as examining effects of these trajectories that affect achievement in middle school). However, this approach may also be useful in identifying underachievement trajectories across a shorter time span, such as multiple timepoints across the timespan of one month or several weeks. By investigating change across multiple timescales (van Geert & Fischer, 2009), it is possible to gain a greater understanding of how underachievement

develops in both the short-term and long-term. Similarly, although the current study focused primarily on a domain-specific approach (with regard to measurement of underachievement in reading and motivational variables, with the exception of global self-worth and later academic achievement), it would be interesting to continue future research investigating the domain-global vs. domain-specific approaches in underachievement. Is a hierarchical model of influence possible, such that domain-specific underachievement affects global outcomes like later achievement (and perhaps also later underachievement)?

A person-centered growth approach can also be applied to future work that investigates the effectiveness of interventions for underachieving students. Current research on academic interventions for underachievement is characterized by a mean-level approach. In a person-centered approach, it is possible to ask if there are certain types of underachieving students (perhaps those characterized by a Growing or Sustained trajectory) that benefit most from intervention efforts. In a known-class GMM, it can be asked if the same class structure (for example, a recovery-from-underachievement class and a non-response class) emerge across different known groups in the sample, such as one group that receives intervention treatment and one that does not. A latent transition analysis (LTA; Lanza, Flaherty, & Collins, 2003) is another way to approach the study of interventions. In this type of analysis, the

likelihood of class-switching is examined, where students may change class membership across time from an underachieving to an achieving latent class.

In summary, findings from the current study provide a broad map of how underachievement jointly develops alongside perceptions of competence and importance, as well as self-worth related processes (perceived psychological cost value and general self-worth). This heterogeneity, as evidenced by the different latent classes across models, provides many directions for future research. Longitudinal exploration at a shorter timescale can continue to explore the chronic nature of underachievement as well as more closely examine the small-scale dynamic interactions between students and multiple systems (educational context, teachers, parents, and peers). Although differential processes by gifted status were not found in the current study, future research should continue to explore the possibility that these differences may exist under certain operationalizations of giftedness, during specific developmental periods, or within particular educational contexts. Finally, this person-centered approach can also be extended to intervention research in underachievement in order to understand how best to alleviate and prevent underachievement from developing.

6. Conclusion

Over sixty years ago, Lewis Terman stressed that questions about both talent development and talent loss are “of such transcendent importance that they should be

investigated by every method that promises the slightest reduction of our present ignorance” (1947, p. 352). Decades later, the mysteries of underachievement among both typical and gifted youth have yet to be solved. Yet the transcendent importance persists. Comparing the Sustained and Growing underachievement trajectories, it is apparent that not all underachievement develops similarly, and importantly, differential growth in underachievement is associated with unique patterns of development in motivational beliefs. Although the acknowledgement of this heterogeneity is not new to the study of underachievement (Reis & McCoach, 2000; McCoach & Siegle, 2010), the current study is the first to investigate this heterogeneity from a developmental perspective by investigating latent classes of growth. The current study represents one such step forward in understanding how development and motivational beliefs develop uniquely for certain students. By embracing the richness in variability and individual differences, we can better understand the complex processes involved in the development of academic underachievement.

Tables

Table 1. Summarized hypotheses for joint development in underachievement and student motivation, and antecedents and consequences of joint development.

Research Question	Hypothesis
<p>RQ1.a –d</p> <p>Can the joint development in underachievement and four important student motivational beliefs (a. reading self-concept, b. reading importance, c. psychological cost for reading, and d. global self-worth) be classified into distinct latent classes of change over time?</p>	<p>Primary hypothesis: Latent classes will emerge (likely one achievement class and one or multiple underachievement classes [emerging underachievement and possibly chronic, stable underachievement])</p> <p>Self-concept: Steeper growth in underachievement will be associated with steeper <i>declines</i> in reading self-concept</p> <p>Importance: Steeper growth in underachievement will be associated with steeper <i>declines</i> in reading importance</p> <p>Psychological cost value: Steeper growth in underachievement will be associated with steeper <i>increases</i> in psychological cost value for reading</p> <p>Self-worth: Steeper growth in underachievement will be associated with steeper <i>declines</i> in self-worth</p>
<p>RQ2</p> <p>Does membership in these latent classes of joint development vary by both gender and gifted status, and the interaction of gender and gifted status?</p>	<p>Gender: Male students will be more likely to be classified into underachievement latent class(es)</p> <p>Gifted: Gifted students will be more likely to be classified into underachievement classes with</p>

	<p>steeper growth in underachievement</p> <p>Gender $\times$ Gifted: Gifted male students will be most likely to be classified into underachievement classes with steeper growth in underachievement</p>
<p>RQ3</p> <p>Do these latent classes relate to later academic achievement in middle school?</p>	<p>Underachievement classes will relate to lower middle school GPA than achievement classes</p> <p>Classes characterized by the most chronic underachievement will be associated with the lowest middle school academic achievement.</p>

Table 2. Proportion of students in gifted and typical group by gender.

		Gender	
		Male	Female
Gifted Status	Typical	359 (47.3% of typical group)	400 (52.7% of typical group)
	Gifted	106 (61.3% of gifted group)	67 (38.7% of typical group)

Table 3. Measurement of constructs in current study after collapsing across cohorts

Construct	Time Point							Middle School
	Baseline (Wave 1)	1 st	2 nd	3 rd	4 th	5 th	6 th	
Teacher Variables								
Reading underachievement		×	×	×	×	×	×	
Student Variables								
Reading Self-Concept		×	×	×	×	×	×	
Task Importance for Reading		×	×	×	×	×	×	
Psychological Cost for Reading		×	×	×	×	×	×	
Self-worth		×	×	×	×	×	×	
Grade Point Average (GPA)								×
Slosson Intelligence Test (Giftedness)	×							

*Note. All measures are domain-specific to reading except Self-worth and GPA.

Table 4. Sample means and standard deviations for underachievement, reading self-concept, reading importance, psychological cost for reading, global self-worth and middle school GPA.

Grade Level	Construct					
	Underachievement	Reading Self-Concept	Reading Importance	Psych. Cost Value for Reading	Global Self-Worth	GPA
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
First	2.23 (1.29)	6.03 (0.98)	5.87 (1.57)	3.47 (2.58)	2.96 (0.77)	---
Second	2.59 (1.35)	5.87 (1.0)	5.93 (1.19)	3.71 (2.60)	3.10 (0.75)	---
Third	2.66 (1.45)	5.63 (1.14)	5.41 (1.12)	3.68 (2.23)	3.22 (0.58)	---
Fourth	2.77 (1.32)	5.41 (1.09)	5.78 (1.12)	4.01 (2.24)	3.07 (0.66)	---
Fifth	2.80 (1.46)	5.39 (1.08)	5.36 (1.06)	4.04 (2.02)	3.08 (0.58)	---
Sixth	2.99 (1.49)	5.46 (1.03)	5.36 (1.0)	3.63 (2.02)	3.10 (0.56)	---
Middle school	---	---	---	---	---	3.32 (0.56)

Note. Underachievement, reading self-concept, task importance, and psychological cost value for reading are all measured on a 1-7 point Likert scale. Global self-worth is measured on a 1-4 Likert point scale, and GPA was calculated on a 4.0 scale.

Table 5. Pearson and Spearman correlations for sample data on gifted status, gender, and all outcome variables.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Gender	--											
2. Gifted	-0.11***	--										
3. UA 1	-0.08	-0.01	--									
4. UA 2	-0.17***	-0.10*	0.41***	--								
5. UA 3	-0.16***	-0.05	0.38***	0.41***	--							
6. UA 4	-0.14**	0.04	0.05	0.11	0.37***	--						
7. UA 5	-0.14*	-0.13*	--	--	0.44***	0.46***	--					
8. UA 6	-0.19**	-0.14*	--	--	0.42***	0.40***	0.46***	--				
9. RSC 1	-0.06	0.03	-0.04	0.04	-0.01	--	--	--	--			
10. RSC 2	0.06	-0.04	-0.04	-0.02	-0.10*	-0.09	--	--	0.20**	--		
11. RSC 3	0.08	0.13**	0.05	-0.08	-0.08	-0.12	--	--	0.15*	0.33***	--	
12. RSC 4	0.11*	0.08	-0.06	-0.17*	-0.20***	-0.15**	-0.16*	-0.20*	--	0.33***	0.47***	--
13. RSC 5	0.20***	0.09	--	--	-0.05	-0.15*	-0.26***	-0.23***	--	--	--	0.57***
14. RSC 6	0.15**	0.03	--	--	-0.12	-0.11	-0.15*	-0.20***	--	--	--	0.49***
15. RTI 1	0.01	-0.01	-0.16*	-0.12	-0.09	--	--	--	0.07	0.08	0.09	--
16. RTI 2	0.08	-0.07	0.01	-0.06	-0.14**	0.03	--	--	-0.02	0.28***	0.14**	0.00
17. RTI 3	0.12**	0.07	0.06	-0.07	-0.05	-0.21**	--	--	0.01	0.23***	0.50***	0.36***
18. RTI 4	0.13**	-0.16***	0.01	-0.02	-0.10	-0.05	-0.22**	0.28***	--	0.23***	0.26***	0.39***
19. RTI 5	0.09	-0.04	--	--	-0.01	-0.08	-0.14*	-0.24***	--	--	--	0.22***
20. RTI 6	0.05	-0.05	--	--	-0.05	-0.03	0.00	-0.20***	--	--	--	0.19**
21. PCV 1	-0.01	-0.01	0.00	0.05	0.01	--	--	--	-0.10	-0.01	-0.06	--
22. PCV 2	0.02	-0.04	0.09	0.14**	0.07	0.03	--	--	-0.14*	-0.03	-0.06	-0.09
23. PCV 3	0.05	-0.07	0.02	0.08	0.09	0.03	--	--	0.00	0.02	0.01	0.00
24. PCV 4	0.00	-0.11*	0.21*	0.10	0.14**	0.17***	0.04	0.04	--	-0.08	-0.08	-0.12**
25. PCV 5	0.00	-0.06	--	--	0.11	0.02	0.09	0.00	--	--	--	-0.06
26. PCV 6	-0.01	-0.07	--	--	0.05	0.11	0.18**	0.08	--	--	--	0.00
27. SW 1	-0.03	0.09	-0.15*	-0.18*	-0.23**	--	--	--	-0.06	-0.10	0.03	--

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
28. SW 2	-0.01	0.06	-0.03	-0.14**	-0.05	0.04	--	--	0.03	0.02	0.14**	0.04
29. SW 3	-0.02	0.02	-0.04	-0.05	-0.04	0.07	--	--	0.14	0.03	0.14**	0.21**
30. SW 4	-0.01	0.00	-0.13	-0.13	-0.19***	-0.06	0.00	-0.09	--	0.11	0.15*	0.13**
31. SW 5	-0.10	-0.05	--	--	-0.31***	-0.04	0.01	-0.11	--	--	--	0.03
32. SW 6	-0.12*	-0.04	--	--	-0.19*	-0.24***	-0.04	-0.09	--	--	--	0.10
33. MS GPA	0.21***	0.18***	-0.19**	-0.23***	-0.37***	-0.21*	--	--	-0.11	-0.01	0.13*	0.12

	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
13. RSC 5	--											
14. RSC 6	0.60***	--										
15. RTI 1	--	--	--									
16. RTI 2	--	--	0.10	--								
17. RTI 3	--	--	0.16*	0.19***	--							
18. RTI 4	0.36***	0.20**	--	0.10	0.37***	--						
19. RTI 5	0.46***	0.31***	--	--	--	0.42***	--					
20. RTI 6	0.33***	0.40***	--	--	--	0.32***	0.46***	--				
21. PCV 1	--	--	-0.03	0.12	0.03	--	--	--	--			
22. PCV 2	--	--	-0.02	0.05	-0.01	-0.06	--	--	0.23***	--		
23. PCV 3	--	--	-0.05	0.02	0.21***	0.16*	--	--	0.24***	0.22***	--	
24. PCV 4	-0.03	-0.13	--	0.17*	-0.06	0.11*	0.12	0.07	--	0.19**	0.23***	--
25. PCV 5	0.01	-0.03	--	--	--	0.09	0.23***	0.09	--	--	--	0.24***
26. PCV 6	0.04	-0.05	--	--	--	0.10	0.10	0.18***	--	--	--	0.23***
27. SW 1	--	--	-0.07	0.02	0.04	--	--	--	-0.15*	-0.17*	-0.08	--
28. SW 2	--	--	-0.01	0.04	0.17***	-0.05	--	--	-0.14*	-0.12**	-0.12*	-0.17*
29. SW 3	--	--	0.05	-0.01	0.10*	0.12	--	--	-0.01	0.02	-0.08	-0.04
30. SW 4	-0.05	-0.05	--	0.14*	0.06	0.01	-0.13	-0.09	--	-0.17*	-0.05	-0.09
31. SW 5	0.01	0.04	--	--	--	0.05	0.04	0.02	--	--	--	-0.04
32. SW 6	0.03	0.07	--	--	--	0.12	0.09	0.05	--	--	--	-0.04
33. MS GPA	--	--	-0.02	-0.05	0.13*	0.01	--	--	-0.01	0.01	-0.04	-0.14

	25.	26.	27.	28.	29.	30.	31.	32.	33.
25. PCV 5	--								
26. PCV 6	0.45***	--							
27. SW 1	--	--	--						
28. SW 2	--	--	0.20**	--					
29. SW 3	--	--	0.16*	0.24***	--				
30. SW 4	-0.02	-0.22**	--	0.23***	0.39***	--			
31. SW 5	0.02	-0.05	--	--	--	0.46***	--		
32. SW 6	-0.03	-0.16**	--	--	--	0.32***	0.45***	--	
33. MS GPA	--	--	0.18*	0.08	0.11*	0.09	--	--	--

Note. "UA 1" through "UA 6" is used to denote underachievement in first grade through underachievement in sixth grade. Other abbreviations used in this table include reading self-concept (RSC), reading task importance (RTI), psychological cost value (PCV), self-worth (SW), and middle school GPA (MS GPA). Correlations with gifted status and outcome variables, with gender and outcome variables, and the correlation between gifted status and gender are Spearman correlations; all other correlations are Pearson correlations. Dashes are used to indicate the absence of correlation values for some outcome variables due to the cohort-sequential design.

Table 6. Fit statistics for the determination of latent classes in the joint development of underachievement and reading self-concept (U-SC).

Class Solution	AIC	BIC	ABIC	LMR-LRT		Entropy	Proportion of sample assigned to each class		
				2LL	<i>p</i> -value		1	2	3
1	15280.6	15585.4	15385.3				1.0 (932)		
2	15072.5	15440.2	15198.8	234.1	< .001	0.75	0.81 (755.8)	0.19 (176.2)	
3*	14970.9	15401.4	15118.8	127.6	0.22	0.73	0.21 (198.9)	0.67 (621.5)	0.12 (111.5)

**Note.* The three-class solution was chosen as the best fitting model. A four-class solution could not converge on global maxima. For the columns under “Proportion of sample assigned to each class”, bot proportions and sample sizes are presented. The first value in each cell represents the proportion of each sample classified into each class, based on the estimated model, and the number in parentheses represents the final estimated class count for each class, based on the model solution.

Table 7. Average latent class probabilities for most likely latent class membership (row) by latent class (column) for joint development in Underachievement and reading Self-Concept (U-SC model).

		Latent Class		
		Growing Under.	Achievement	Sustained Under.
Most Likely	Growing Under.	0.83	0.13	0.04
Latent Class	Achievement	0.06	0.91	0.03
Membership	Sustained Under.	0.05	0.11	0.85

Table 8. Fit statistics for the determination of latent classes in the joint development of underachievement and reading importance (U-TI)

Class Solution	AIC	BIC	ABIC	LMR-LRT		Entropy	Proportion (sample size) of individuals in each class			
				2LL	<i>p</i> -value		1	2	3	4
1	15808.1	16083.9	15902.8				1.0 (932)			
2	15607.4	15941.1	15722.0	224.8	.002	0.74	0.80 (749.1)	0.20 (182.9)		
3*	15512.9	15904.7	15647.4	118.5	.337	0.76	0.14 (125.9)	0.73 (683.3)	0.13 (122.7)	
4	15472.3	15922.2	15626.9	64.5	.106	0.75	0.12 (119.2)	0.09 (79.8)	0.13 (117.4)	0.66 (15.5)

*Note. The three-class solution was selected as the final model.

Table 9. Average latent class probabilities for most likely latent class membership (row) by latent class (column) for joint development in Underachievement and Task Importance (U-TI model).

		Latent Class		
		Growing Under.	Achievement	Sustained Under.
Most Likely	Growing Under.	0.80	0.15	0.06
Latent Class	Achievement	0.04	0.93	0.04
Membership	Sustained Under.	0.04	0.13	0.83

Table 10. Fit statistics for the determination of latent classes in the joint development of underachievement and psychological cost value (U-PCV)

Class Solution	AIC	BIC	ABIC	LMR-LRT		Entropy	Proportion (sample size) of individuals in each class		
				2LL	<i>p</i> -value		1	2	3
1	19056.8	19361.5	19161.5				1.0 (932)		
2	18861.2	19228.8	18987.4	221.6	<.001	0.75	0.15 (144)	0.85 (788)	
3*	18751.3	19181.8	18899.2	135.9	.05	0.69	0.22 (206)	0.65 (609)	0.13 (117)

*Note. The three-class solution was selected as the best-fitting model. A four-class solution could not converge on global maxima.

Table 11. Average latent class probabilities for most likely latent class membership (row) by latent class (column) for joint development in underachievement and psychological cost value (U-PCV).

		Latent Class		
		Achvt. High Stable Cost	Achvt. Growing Cost	Sustained Under.
Most Likely	Achvt. High Stable Cost	0.87	0.09	0.04
Latent Class	Achvt. Growing Cost	0.10	0.87	0.03
Membership	Sustained Under.	0.08	0.12	0.80

Table 12. Fit statistics for the determination of latent classes in the joint development of Underachievement and Global Self-Worth (U-SW).

Class Solution	AIC	BIC	ABIC	LMR-LRT		Entropy	Proportion (sample size) of individuals in each class		
				2LL	<i>p</i> -value		1	2	3
1	13000.2	13304.8	13104.8				1.0 (930)		
2*	12783.4	13150.9	12909.5	242.8	<.001	0.77	0.16 (155.90)	0.83 (774.10)	
3	12728.4	13158.7	12876.1	81.02	.50	0.65	0.64 (594.39)	0.16 (144.66)	0.20(190.95)

*Note. The two-class solution was selected as the best-fitting model. A four-class solution could not converge on global maxima.

Table 13. Average latent class probabilities for most likely latent class membership (row) by latent class (column) for joint development in underachievement and global self-worth (U-SW).

		Latent Class	
		Sustained Under.	Achievement
Most Likely Class Membership	Sustained Under.	0.86	0.14
	Achievement	0.05	0.95

Table 14. Estimated mean values for underachievement and motivational constructs at each grade level and estimated mean values for middle school GPA by latent classes.

Latent Class	Construct	Estimated Mean at Grade Level						Estimated Mean of Distal Outcome
		1 st	2 nd	3 rd	4 th	5 th	6 th	Middle School GPA
Underachievement and Reading Self-Concept (3-class solution)								
Achievement Class	Underachievement	1.91	2.11	2.23	2.25	2.19	2.03	3.20 ^a
	Reading Self-concept	6.61	6.23	5.97	5.73	5.56	5.44	
Sustained Under. Class	Underachievement	4.64	4.48	4.33	4.18	4.05	3.93	2.78 ^b
	Reading Self-concept	6.55	5.98	5.62	5.48	5.54	5.83	
Growing Under. Class	Underachievement	2.23	2.68	3.01	3.21	3.28	3.23	3.01 ^{ab}
	Reading Self-concept	5.46	5.09	4.77	4.50	4.29	4.12	
Underachievement and Task Importance (3-class solution)								
Achievement Class	Underachievement	1.94	2.20	2.33	2.35	2.26	2.04	3.17 ^a
	Task Importance	6.75	6.40	6.06	5.71	5.37	5.02	
Sustained Under. Class	Underachievement	4.65	4.45	4.29	4.16	4.08	4.03	2.75 ^b
	Task Importance	6.28	6.09	5.89	5.69	5.50	5.30	
Growing Under. Class	Underachievement	2.28	2.54	2.82	3.13	3.46	3.81	3.15 ^a
	Task Importance	4.89	4.70	4.50	4.31	4.11	3.92	
Underachievement and Psychological Cost for Reading (3-class solution)								
Achievement, Growing Cost	Underachievement	1.88	2.13	2.30	2.38	2.38	2.29	3.18 ^a
	Psych. Cost for Reading	1.02	2.31	3.05	3.26	2.935	2.07	
Achievement, High Stable	Underachievement	2.15	2.46	2.62	2.64	2.53	2.27	3.14 ^a
	Psych. Cost for	5.14	4.59	4.23	4.07	4.09	4.31	

Cost	Reading							
Sustained	Underachievement	4.76	4.52	4.36	4.29	4.31	4.42	2.70 ^b
Under. Class	Psych. Cost for Reading	1.31	2.98	3.95	4.24	3.84	2.75	
Underachievement and Global Self-Worth (2-class solution)								
Achievement	Underachievement	1.89	2.17	2.34	2.42	2.39	2.26	3.12 ^a
class	Global Self-Worth	2.61	2.94	3.11	3.10	2.94	2.61	
Sustained	Underachievement	4.50	4.29	4.15	4.08	4.08	4.15	2.75 ^b
Under. Class	Global Self-Worth	2.16	2.57	2.80	2.85	2.71	2.38	

Note. Superscripts are used to denote statistically significant estimated mean values for middle school GPA across classes, within each of the four models. For each given model, estimated values with the same superscript are not statistically significantly different from each other.

Figures

Figure 1. Developmental Model of Underachievement.

Data Collection for CAB Year, Grade, and Age

Year	Begin	End	Data Year	Grade	K	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	HS+ 1	HS+ 2	HS+ 3	HS+ 4	HS+ 5	HS+ 6	HS+ 7	HS+ 8
				Age	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	1986	1987	1 ^T		Y	M		O																	
2	1987	1988	2 ^T			Y	M		O																
3	1988	1989	3 ^T				Y	M		O															
4	1989	1990	4 ^T					Y	M		O														
5	1990	1991																							
6	1991	1992																							
7	1992	1993																							
8	1993	1994	5										Y	M		O									
9	1994	1995	6											Y	M		O								
10	1995	1996	7												Y	M		O							
11	1996	1997																							
12	1997	1998	8																M						
13	1998	1999	9																Y		O				

Note: O = Oldest Cohort (Cohort 1)
 M = Middle Cohort (Cohort 2)
 Y = Youngest Cohort (Cohort 3)
 = No data collected

Numbers in bold indicate years that parent interviews were completed
^T indicates years that teacher interviews were completed

Figure 2. Pattern of data collection in the Childhood and Beyond Study from the University of Michigan (image from <http://www.rcgd.isr.umich.edu/cab/>).

Figure 3. Generalized model for Latent Class Growth Analysis.

Note. The variable 'C' in the path diagram represents the categorical latent class variable. This variable, as well as the growth parameters for both parallel processes, were also regressed on two dummy-coded variables representing cohort status, but these paths are not shown in the figure in order to maintain simplicity.

Figure 4. Three-class solution for joint development in underachievement and reading self-concept (U-SC).

Figure 5. Three-class solution for joint development in underachievement and task importance (U-TI).

Figure 6. Three-class solution for joint development in underachievement and psychological cost value for reading (U-PCV).

Figure 7. Two-class solution for joint development in underachievement and global self-worth (U-SW).

Appendix A

Reading Self-Concept of Ability

1. How good at reading are you? (1=not very good, 7=very good)
2. If you were to list all the students from best to worst in reading, where are you? (1=one of the worst, 7=the best)
3. Compared to other subjects, how good are you at reading? (1=not as good as other activities, 7=better than other activities)
4. How well do you expect to do in reading this year? (1=not at all well, 7=very well)
5. How good would you be at learning something new in reading? (1=not very good, 7=very good)

Reading Task Importance

Note. Items comprising the Task Importance scale in Wave 2 are italicized

1. *How useful is what you learn in reading? (1=not at all useful, 7=very useful)*
2. Compared to other subjects, how useful is reading? (1=not as useful as what I learn in other activities, 7=a lot more useful than what I learn in other activities)
3. *For me, being good in reading is: (1=not at all important, 7=very important)*
4. Compared to other activities, how important is it to be good in reading? (1=not as important as being good in other activities, 7=a lot more important than being good in other activities)

Psychological Cost Value for Reading (Reading Worries)

1. How much do you worry about doing badly in reading/English? (1=a little, 7=a lot)

Global Self-Worth

(Each item was followed by "which is more like you?")

Note. Reverse-coded items are marked with an asterisk. Items used in Wave 2 are italicized.

(1=really true for me, 2=sort of true for me; 3=sort of true for me, 4=really true for me)

1. *Some kids feel they would like to change a lot of things about themselves, but others would like to stay the same.*
2. *Some kids are happy being the way they are but other kids wish they were different.**
3. *Some kids aren't very happy with the way they do things, but others think the way they do things is fine.*
4. *Some kids are sure of themselves, but others are not very sure of themselves.**
5. *Some kids feel good about the way they act, but other kids wish they acted differently.**

6. Some kids are sure that what they do is right, but other kids aren't so sure whether or not they do the right thing.*
7. Some kids think they are not a very good person, but others are pretty sure they are a good person.

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Biography

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