DEVELOPMENT OF CAREER ASPIRATIONS IN ADOLESCENTS

by

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(Under the Direction of Jay W. Rojewski)

ABSTRACT

The overarching goal of this dissertation research was to explore the developmental trajectory of occupational aspirations. The first study examined the complex phenomenon of intra-individual and inter-individual differences in and the potential predictors of those differences on career aspirations development over a 12-year period. Results indicated that a curvilinear trend may exist where positive career aspirations tend to decline markedly as adolescents transition from school to postsecondary education, work, and adult life. Socioeconomic status (SES) played an important role in establishing initial career aspirations, while gender and race shaped aspirations in high school and into young adulthood. The second study explored the complex phenomenon of intra-individual and inter-individual differences in career aspirations development, factors influencing the development and applicability of career development theories originating in Western countries with Korean adolescents. Results suggested that the career aspirations of Korean adolescents differed in prestige level at grade 7 when examined by gender and socioeconomic status. In addition, the rate of change and a decreasing trajectory from junior high school to the first year of high school existed. Females held lower aspirations than males. Potentially important *initial differences* in the development of career aspirations based on curriculum track were also detected. Overall, the study lends support to the notion that Western-

based theories of career development are relevant to Korean adolescents but that ages at which certain developmental tasks occur may be different given cultural differences. The third study investigated the impact of a dual curriculum focus on occupational aspirations and their long-term effects. The unweighted latent growth model indicated that individuals show a decreasing trend in occupational aspirations. While the curriculum track was significantly associated with initial level, the rate of change was not significantly associated with the curriculum track. Results from the weighted latent growth model analyses revealed different findings. Initial levels of occupational aspirations in the two comparison groups were not different, nor were the rate of change in career aspirations significantly related to curriculum track, although the trajectories showed the same decreasing pattern. Overall, the study advances our understanding of the developmental nature of career aspirations by demonstrating that career aspirations change over time. The dissertation concludes with a summary of findings and suggestions for future directions.

INDEX WORDS: Career aspirations, Career development, Career and technical education, Korean adolescents, Latent growth modeling, Longitudinal study, Vocational education

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

The Significance of Career Aspirations in Adolescents

Idealized career goals or aspirations, which are work-related goals hoped for under the best possible conditions, have been a long-standing focus for career researchers in the United States. Aspirations play a significant role in predicting later aspirations and, to a lesser degree, attainment (Gottfredson & Becker, 1981; Holland & Gottfredson, 1975; Holland, Gottfredson, & Baker, 1990). Aspirations can be viewed as indicators of self-concept from a developmental perspective (Super, Savickas, & Super, 1996) or as a component of career self-efficacy, outcome expectations, and goals from a social cognitive career theory perspective (Lent, Brown, & Hackett, 1996). Career aspirations are choices about work that reveal information about one's concept of self and anticipated alternatives, as well as personal interests and hopes not bounded by reality (Armstrong & Crombie, 2000; Holland & Gottfredson, 1975; McNulty & Borgen, 1988; Rojewski, 2005). The role of aspirations in career choice and behavior is important because they are involved in stimulating plans, guiding learning, organizing possible life choices, and contributing to groundwork for adult life (Gottfredson, 2005).

Occupational aspirations are relatively stable during adolescence and provide substantial predictive power for later aspirations (Rojewski & Kim, 2003).In general, young adolescents are inclined to express occupational aspirations that reflect their desire to have future occupations associated with high prestige and high social status, whether or not they actually have a realistic chance of attaining those goals (Mau & Bikos, 2000; Rojewski, 2005; Rojewski & Yang, 1997). These aspirations are diminished, i.e., compromised, when adolescents realize their lack of

abilities academically, physically, or financially, perceive significant barriers to attain their goals, or find that their goals are opposed by their families (Armstrong & Crombie, 2000; Davey & Stoppard, 1993; Gottfredson, 1996; McNulty & Borgen, 1988; Rojewski, 2005). Also, the influence of a number of background variables, psychological factors, and sociological aspects on occupational aspirations' prestige has been studied, especially gender, race/ethnicity and socioeconomic status (Dunne, Elliott, & Carlsen, 1981; Fouad & Byars-Winston, 2005; Gottfredson, 1996; Hellenga, Aber, & Rhodes, 2002; Mau & Bikos, 2000; Rojewski & Kim, 2003). However, despite theory and research on occupational aspirations and their long-term effects, relatively little is known about their longitudinal development, influences, and change from childhood through adolescence and into young adulthood.

Developmental Perspectives on Career Aspirations

The development and expression of occupational aspirations can be explained from a number of perspectives including developmental theory (Super, 1990; Super et al., 1996), Gottfredson's (1996) theory of occupational aspirations development, the developmental-contextual approach to career development (Vondracek, Lerner, & Schulenberg, 1986), Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994), and status attainment theory (Hotchkiss & Borow, 1996). Specifically, Super's developmental theory and Gottfredson's theory of circumscription and compromise are the most widely adopted by career development researchers for explaining the developmental perspectives of career. Super (1990; Super et al., 1996) viewed the task of identifying, preparing, establishing, and maintaining a career as a series of predictable developmental stages, including growth, exploration, establishment, maintenance, and disengagement, spanning an individual's life. However, Gottfredson (1996) viewed vocational choice, expressed through aspirations, as a process of eliminating career options and narrowing

possible choice resulting from experiences defined by size and power (3 to 5 years of age), sex roles (6 to 8 years of age), social valuation (9 to 13 years of age), and unique self (14 years of age and older). While presenting different theoretical perspectives on the formation of aspirations, each stage explains aspirations as developmental, reflecting individuals' assessments of personal capabilities and available opportunities, and influenced by personal and societal characteristics including gender, race/ethnicity, curriculum track, and socioeconomic status.

Different Types of Measuring Occupational Aspirations

Although a general consensus does not exist regarding the measure of occupational aspirations, two approaches in general can be adopted when studying occupational aspirations. One method is to report occupational *level*, which reflects a vertical dimension that ranks occupations based on level of prestige or status. Numerical rankings are typically used and usually reflect some combination of wages earned, education required, and perceived value to society. From this perspective, unskilled occupations are assigned lower scores, reflecting lower prestige, than professional occupations. A second approach examines occupational *field* or category. Field is a horizontal dimension based on type of work. Type of work is usually determined by the tasks, duties, and responsibilities of the occupation, and is often measured using Holland's typology (e.g., Arbona & Novy, 1991; McNulty & Borgen, 1988). Knowledge of level and field of aspirations is important in that adolescents are more likely to engage in career compromise and circumscription by shifting aspirations between fields at the same level rather than moving between levels (Gottfredson, 1981). Gottfredson and Becker (1981) posited that changes to the status or prestige of occupational aspirations tend to occur earlier in life than individuals' adjustments to their aspired field of work. The focus of this analysis was on the prestige (status) level of occupational aspirations.

Overview of Three Studies

This dissertation research comprised three studies. The study of the development of occupational aspirations is the overarching theme that ties the three studies together. Specifically, the goal of these three studies was to examine the developmental trajectories of occupational aspirations and the effect of selected covariates on that development.

The first study examined the complex phenomenon of intra-individual and inter-individual differences in and the potential predictors of those differences on career aspirations development over a 12-year period. Using the National Education Longitudinal Study of 1988 data sets, this issue was investigated by integrating prominent factors posited to affect the formation of career aspirations into a latent growth curve model. We hypothesized that individuals would show different growth patterns in occupational aspirations before and after high school graduation. Specifically, we believed that an increase in aspiration level would be evident before high school graduation, whereas a decrease would be evident after high school graduation as this is a critical time point for adolescents to narrow their range of preferred occupations to less compatible but more accessible ones (Gottfredson, 1996). Additionally, we expected that gender, race/ethnicity, and socioeconomic status would significantly predict observed growth trajectories.

The second study explored the complex phenomenon of intra-individual and inter-individual differences in career aspirations development, factors influencing the development, and the applicability of career development theories originating in Western countries with Korean adolescents. To examine the developmental trajectory of career aspirations, the Korean Education Longitudinal Study of 2005 data set was used, administered by the Korea Educational Development Institute. A multiple-group latent growth curve model was used for this analysis. We hypothesized that Korean students would show higher aspiration levels than previously

reported levels for U.S. adolescents. We assumed that Korean adolescents might realize earlier than U.S. adolescents about the significance of the role of academic ability in accomplishing and attaining future career-related outcomes, resulting in relatively early compromise in Korean adolescents. Additionally, we expected that gender, curriculum selection (i.e., vocational/career and technical education or academic curriculum), and socioeconomic status would be significantly associated with observed growth trajectories.

The third study investigated the impact of career and technical education (CTE) on occupational aspirations and its long-term effects. Using the Education Longitudinal Study of 2002 data sets, this issue was investigated by employing propensity score analyses with a latent growth curve model. Propensity score analyses enable researchers to approximate the randomized controlled trials at a given observational data point (Rubin, 1997). I hypothesized that participants would show different growth patterns in occupational aspirations before adjusting for potential confounders associated with the participation in CTE and occupational aspirations. However, I expected that after adjusting for potential confounders associated with the participation in CTE and occupational aspirations, individuals would show similar trajectories of occupational aspirations, meaning that the inclusion of a CTE curriculum does not diminish adolescents' occupational aspirations.

Chapters 2, 3, and 4 detail each of these studies. The dissertation is concluded with a summary of the findings of the three studies in Chapter 5. Chapter 5 also discusses directions for future research.

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CHAPTER 2

DEVELOPMENT OF OCCUPATIONAL ASPIRATION PRESTIGE: A PIECEWISE LATENT GROWTH MODEL OF SELECTED INFLUENCES[1]

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Abstract

Using the National Education Longitudinal Study of 1988 (NELS:88) data sets, the complex phenomenon of intra-individual and inter-individual differences in and the potential predictors of those differences on career aspirations development over a 12-year period was analyzed. Results indicated that 73.1% of the total growth (change) in adolescents' occupational aspiration prestige scores were achieved between grades 8-10, while 26.9% of growth was achieved between grades 10-12. One-third of the total growth in the occupational aspiration scores of these individuals as young adults was observed between high school graduation and 2 years after graduation, while 67.4% of the total growth was obtained during the period between 2-8 years after high school graduation. Individuals with higher initial aspiration scores experienced slower growth in aspirations than those with lower initial aspirations. A negative association between career aspiration prestige scores in grade 12 and 8 years post-graduation existed.

Key words: career aspirations, career development, latent growth modeling, longitudinal study

Introduction

Occupational aspirations, desired work-related goals given ideal circumstances, are preferences about work that reflect information about self concept, perceived opportunities, and interests and hopes (Rojewski, 2005). Aspirations are important to career development and occupational attainment in that they prompt planning, guide learning, help organize life options and choices, and contribute to individuals' preparation for adult life. The development and expression of occupational aspirations can be explained from a number of perspectives including developmental theory (Super, Savickas, & Super, 1996), Gottfredson's (1996) theory of the development of occupational aspirations, and status attainment theory (Hotchkiss & Borow, 1996). While presenting different theoretical perspectives on the formation of aspirations, each of them explains aspirations as developmental, reflecting individuals' assessments of personal capabilities and available opportunities, and influenced by personal and societal characteristics including gender, race/ethnicity, and socioeconomic status.

Gottfredson (1996) viewed vocational choice, expressed through aspirations, as a process of eliminating career options and narrowing possible choice resulting from experiences defined by size and power (3 to 5 years of age), sex roles (6 to 8 years of age), social valuation (9 to 13 years of age), and unique self (14 years of age and older). Throughout the four stage process, occupational aspirations represent the joint product of an individual's assessment of job compatibility and accessibility. These assessments contribute to a zone or range of acceptable occupational alternatives considered to reflect where individuals feel they fit in society. Two processes contribute to an individual's zone of acceptable vocational alternatives. The first, circumscription, involves the progressive elimination of occupations deemed unacceptable. The

second, compromise, occurs as individuals begin to relinquish their most preferred occupations for less compatible but more accessible ones.

Status attainment theory explains occupational aspirations, as well as attainment, as the result of social stratification. Aspirations are formed at an early age by the opportunities or barriers presented to individuals through external factors such as bias, discrimination, cultural expectations, societal attitudes, and stereotypes based on gender, race/ethnicity, and social class. A prominent difference between status attainment theory and psychological career theories is the greater weight assigned to institutional and market forces on constraining career decisions and attainment (Johnson & Mortimer, 2002).

Two approaches can be adopted when studying occupational aspirations. One method is to report occupational *level*, which reflects a vertical dimension that ranks occupations based on level of prestige or status. Numerical rankings are typically used and usually reflect some combination of wages earned, education required, and perceived value to society. From this perspective, unskilled occupations are assigned lower scores, reflecting lower prestige, than professional occupations.

A second approach examines occupational *field* or category. Field is a horizontal dimension based on type of work. Type of work is usually determined by the tasks, duties, and responsibilities of the occupation, and is often measured using Holland's typology (e.g., Arbona & Novy, 1991; McNulty & Borgen, 1988). Knowledge of level and field of aspirations is important in that adolescents are more likely to engage in career compromise and circumscription by shifting aspirations between fields at the same level rather than moving between levels (Gottfredson, 1981). Gottfredson and Becker (1981) posited that changes to the status or prestige of occupational aspirations tend to occur earlier in life than individuals'

adjustments to their aspired field of work. The focus of this analysis was on the prestige (status) level of occupational aspirations.

Occupational aspirations, using prestige level, are relatively stable during adolescence and provide substantial predictive power for later aspirations (Rojewski & Kim, 2003). In general, early adolescents are likely to express high status educational and occupational aspirations, regardless of the reality of attaining those goals. These aspirations are lowered by compromise when individuals do not believe they possess the necessary skills or abilities, believe that the educational or entry-level requirements are beyond their abilities, do not receive support or possess aspirations that are at odds with family and friends, or if they perceive significant community or societal barriers to job entry or success (Armstrong & Crombie, 2000).

The influence of a number of background variables, psychological factors, and sociological aspects on occupational aspirations prestige has been studied, especially, gender, race/ethnicity and socioeconomic status.

Research on gender differences in occupational aspirations has produced mixed results. Even so, a consistent theme in the literature is the pervasive effect of sex-role stereotyping on the occupational and educational attainment of females. As a result, it is generally acknowledged that career development, choice, and attainment is more complex for females (Gottfredson, 1996). Female adolescents report occupational aspirations equal to or greater than their male peers. Male adolescents are more likely to aspire to moderate-prestige aspirations, and female adolescents are more likely to aspire to either high- or low-prestige aspirations (Rojewski & Kim, 2003). In contrast, some studies have indicated that girls are much more likely to restrict their range of potential occupations earlier in life than boys, resulting in lowered occupational and educational aspirations (Dunne, Elliott, & Carlsen, 1981).

Current understanding of the role that race/ethnicity plays on the development of occupational aspirations is limited. This situation is partly explained by the difficulty in disentangling the effects of socioeconomic status and race/ethnicity from one another and from other variables (Mau & Bikos, 2000). The resulting confusion is evident in the literature which presents findings that range from no racial/ethnic differences (Hauser & Anderson, 1991) to lower aspirations for racial/ethnic minorities (Curry & Picou, 1971; Hellenga, Aber, & Rhodes, 2002) to higher aspirations for racial/ethnic minorities (Wilson & Wilson, 1992). Fouad and Byars-Winston (2005) found that race/ethnicity does not greatly influence aspirations yet has a significant influence on individuals' perceptions about occupational opportunities and barriers. The perception of a limited range of occupational options results in minority adolescents being more likely to restrict their career decision-making.

Although the role of socioeconomic status on determining occupational aspirations has received only limited attention, it appears that this factor is highly influential. Individuals from higher socioeconomic status aspire to, expect, and attain higher levels of education and more prestigious occupations than individuals from lower backgrounds (Rojewski & Kim, 2003). Studies guided by status attainment theory have emphasized how socioeconomic status provides a context for the development of occupational aspirations. Higher socioeconomic status brings greater access to the resources needed to finance education, special learning experiences, and role models in high prestige occupations.

Despite theory and research on occupational aspirations and their long-term effects, relatively little is known about their longitudinal development, influences, and change from childhood through adolescence and into young adulthood. We investigated this issue by integrating prominent factors posited to affect the formation of career aspirations into a model (see Figure

1.1). We hypothesize that individuals show different growth patterns in occupational aspirations before and after high school graduation. Specifically, we believed that an increase aspiration level would be evidenced before high school graduation, whereas a decrease would be evident after high school graduation. Additionally, we expected that gender, race/ethnicity, and socioeconomic status would significantly predict observed growth trajectories.

A latent growth curve model (LGM) was employed to reflect the complex phenomenon of intra-individual and inter-individual differences in career aspirations change using latent variables of intercept and slopes within a structural equation modeling framework (Ram & Grimm, 2007). The proposed model coincides with our research purpose, which was to examine the development of career aspirations over a 12-year period and to explore the influence of potential predictors of that change. LGM has an advantage over conventional repeated measures analysis (e.g., repeated MANOVA) in that it can integrate the between-time-points covariance matrix with observed means structures and estimate random variations in measurement errors (Curran, Stice, & Chassin, 1997). Therefore, overall growth parameters and individual variation can be estimated with precision in LGM. LGM further allows us to simultaneously estimate more than two growth models, e.g., multivariate LGM, incorporating both time-varying and time-invariant covariates, and model hierarchically nested longitudinal observations (Duncan, Duncan, & Strycker, 2006).

Method

Data and Sample

This study used the National Education Longitudinal Study of 1988 (NELS:88) data sets, administered by the National Center for Education Statistics. The NELS:88 database was designed to "study the educational, vocational, and personal development of students at various

stages in their educational careers, and the personal, familial, social, institutional, and cultural factors that may affect that development" (Curtin, Ingels, Wu, & Hauer, 2002, p. 2). Data is accessible from several sources at each collection point including school administrators, parents, teachers, and students. Using a two-stage stratified sample with schools as the first-stage unit and a random sample of students within each school as the second-stage unit, a nationally representative probability sample of 26,432 8th graders representing 815 public and 237 private schools across the nation from the 1998 spring term was initially selected.

To ensure that certain policy-relevant subgroups of students (e.g., African American, Hispanic, Asian/Pacific Islander, and limited English proficient youth) would be adequately represented, schools with high minority student enrollment were oversampled. In most participating schools, 23-25 students were randomly selected from all eighth graders (plus, on average, two additional students from oversampled groups). In schools with fewer than 24 eighth graders, all eligible students were selected. Of selected 8th graders, 24,599 students (93.07 %) composed the base-year sample who were administered follow-up questionnaires in 1990 (10th grade), 1992 (12th grade), 1994 (2 years after high school), and 2000 (8 years after high school).

To examine the effect of select covariates on the trajectory of the career aspirations, we selected the fourth follow-up complete panel who participated across all five NELS:88 data collection points. The resulting initial sample size was 10,827. Out of 10, 827 participants, 5,056 (46.7%) were male and 5771 (53.3%) were female. The ethnic distribution of participants included Asian Pacific Islander (*n*=737), Hispanic (*n*=1,362), African American, not Hispanic (*n*=974), White, not Hispanic (*n*=7,632), Native American and Alaska Native (*n*=121), and missing (*n*=1). The ethnicity variable was recoded into White (*n*=7,632) and non-White (*n*=3195)

groups for analytic purposes. Further information about participants' demographic characteristics appears in Table 1.1.

Measures

Demographic variables. Demographic variables were participants' gender (male=0, female=1) and ethnicity (White=0, nonwhite=1). Also, standardized SES scores (M = 0.00, SD = 1.00) using family income, parents' education levels, and parents' occupations (Owings et al., 1994) were used to measure socioeconomic status of participants. Ethnicity was divided into White (majority) and nonWhite (minority) to acknowledge that "regardless of specific group affiliation, individuals of minority status are more likely to share certain experiences and environmental barriers to educational and career attainment" (Rojewski & Kim, 2003, p. 93).

Career aspirations. Career aspirations were obtained by asking participants to indicate the job they expected to have at age 30 from a listing of 17 (8th grade), 19 (10th grade), 19 (12th grade), 30 (2 years after high school), and 42 (8 years after high school) occupational categories. These categories were coded using socioeconomic index (SEI) codes calculated by Stevens and Cho (1985) assigning these categories a continuous score (Hotchkiss & Borow, 1996). Because measures of career aspirations categories through successive follow-ups were different, we also coded occupations by prestige category (low, medium, and high prestige). For example, occupations such as "homemaker" or "not working" were assigned a SEI value of 15.71 (lowest score) and included in the low prestige category. Occupations reflecting "science, engineering, or professional" professions were assigned SEI values of 68.51 (highest score), and included in the high prestige category. Similar coding decisions and placement into appropriate prestige categories were made for remaining occupations. All SEI scores were transformed by dividing them by 10 to facilitate statistical analysis. The SEI measure has a long history of use in the

sociology literature and the validity and reliability of the SEI has been supported (Hauser, Sewell, & Warren, 1994).

Data Preparation

Table 1.2 presents the means, standard deviations, univariate skewness and kurtosis and correlations for all select covariates and the base year, first follow-up, second follow-up, third follow-up, and fourth follow-up measures of career aspirations.

Missing data. Observational data often contain some degree of missing data, resulting in potential problems with reliability and validity of the research findings (McKnight, McKnight, Sidani, & Figueredo, 2007). Of the available missing value treatment methods, we chose the multiple imputation method using the expectation maximization (EM) algorithm. The EM algorithm was implemented with a weight to deal with missing values and to adjust parameter estimates. Our modified data set contained 10,809 participants.

Normality and outliers. The assumption of univariate normality was deemed tenable. Values of skewness and kurtosis of observed variables are less than absolute values of 2 and 7, respectively (see Table 1.2). The multivariate normality test using PRELIS 2.54 indicated that a relative multivariate kurtosis value was 1.091, meaning that no serious deviations from multivariate normality existed. However, results of Mardia's multivariate normality test were inconsistent with that of univariate normality and relative multivariate kurtosis tests. Multivariate skewness and kurtosis values were 3.450 and 52.351, respectively. According to Bentler and Wu's (2002) recommendation, e.g., multivariate kurtosis should be less than |3|, our dataset appeared to represent a nonnormal distribution. However, Krzanowski (2000) argued that normality is not critical for many multivariate analyses. If the observations are reasonably close to normal distribution when the normality assumption is violated, corrective techniques are

not necessary. A test of outliers using DeCarlo's (1997) normtest resulted in no outliers being detected based on the critical $F(6, 10802)$ value of 34.79 at .05 significance level.

Results

Estimation Method

We used the M*plus* 5.2 version with a MLR (robust maximum likelihood) estimator (allowing parameters to be estimated with standard errors and a mean-adjusted chi-square test statistic robust to non-normality) as the estimation method (Muthén & Muthén, 1998–2007). Applying the [normalized] sampling weights necessary to avoid biased parameter and standard error estimates is important when using large data sets developed by complex sampling design (Asparouhov, 2005). Because the use of normalized weights without accommodating strata (e.g., regions) and clusters (e.g., schools) could result in negatively biased estimates of population parameters (Stapleton, 2006), we analyzed the data using strata and clusters, as well as weights.

Model Selection and Alternative Models

Initial examination of time-specific career aspiration means suggested that a linear latent curve model might not be appropriate as mean values increased until the third time point and then showed a downturn after this point (see Table 1.2). The time span between the third and fourth time points occurred when participants graduated from high school. Considering this nonlinear trend, as well as the explicit transition of time points, a piecewise growth model was established to test our hypothesis. Piecewise trajectory modeling is meant "to approximate the nonlinear function through the use of two or more linear piecewise splines" (Bollen & Curran, 2006, p. 103). Prior to the transition, the slope for the first time point (at 8th grade) was fixed at 0 and the third time point (at 12th grade) at 1. The slope for the second time point (at 10th grade) was freely predicted. Post-transition, the slope for the third time point was fixed at 0 and the fifth

point (8 years after high school graduation) at 1, whereas the slope for the fourth time point (2 years after high school graduation) was estimated. We adopted a freely estimated loadings model because data were collected at inconsistent time periods of a third and fourth follow-up. Bollen and Curran claim that a freely estimated loadings model is flexible in fitting the nonlinear trajectory more parsimoniously given the estimation of fewer parameters compared to a quadratic model. A quadratic growth model can be an alternative model to a piecewise growth model. Empirically, an unconditional quadratic growth model was also tested and compared with the piecewise model. Considering the lowest AIC value [ΔAIC=208.492] (Kline, 2005) and other fit indices (CFI, TLI, RMSEA, and SRMR), the piecewise growth modeling showed a better model over the quadratic model. Therefore, the current study adopted and reports the findings of a piecewise modeling strategy.

Fit Indexes and Cut-off Criteria

We used fit indices to assess the overall latent growth model fit, including SRMR, RMSEA, CFI, and TLI. The rationale of using SRMR rests on its sensitivity to model misspecification, especially when the model is simple. RMSEA and CFI were also used because they are sensitive to model misspecification and insensitive to distribution and sample size (Hu & Bentler, 1995, 1999). TLI, also known as NNFI, was used because it is sensitive regardless of sample size. To assess the model fit, we used recommended cut off criteria by Bollen and Curran, Kline, and Hu and Bentler (1995, 1999; see Table 1.3). The chi-square test of model fit was statistically significant [$\chi^2(4) = 19.772$, $p = .001$]. However, the overall fit indices strongly suggested that the hypothesized model fit the data well [SRMR=.020; RMSEA =.019 (a 90% confidence interval of .011 and .028); CFI=.996; and TLI=.990]. No irregularities in the unconditional model were detected.

The intercept of the unconditional model was 5.073, indicating that, on average, participants reported career aspiration scores of 5.073 units at the first time point (8th grade). Prior to the transition time point (high school graduation), the average rate of change in the slope was .441, meaning that, on average, career aspiration scores increased .441points between each assessment period. After high school graduation, the average rate of change in the slope was -.585, meaning that, on average, career aspiration scores decreased .585 points between each assessment. Both the mean intercept and mean slopes differed significantly from zero ($p < .001$). When setting the total growth in career aspiration prior to high school graduation (between the first and third time points) at 1, 73.1% of the total growth was achieved between the first and second time points or between grades 8-10, while 26.9% of the growth was achieved between the second and third time points or between grades 10-12. Meanwhile, when setting the total growth in career aspiration from the 12th grade to 8 years after graduation at 1, 32.6% of the total negative growth was observed between grade 12 and 2 years after graduation, while 67.4% of the total negative growth was obtained during the period between 2-8 years after graduation.

Statistically significant variance of intercepts (1.866) and two slopes (1.107 for pre-transition and 1.064 for post-transition) suggested significant variability of both intercept and slopes around their mean values. Participants varied in their initial career aspiration scores and their rates of change. The statistically significant negative covariance between the intercept and the slope for the pre-transition period (-.767) implied a negative association between aspiration scores at the initial point and the rate of change in the scores over subsequent time periods. Individuals with higher initial aspiration scores had slower growth in level than those with lower initial aspiration levels. The covariance between intercept and slope for post-transition (-.215) was also statistically significant at the .01 level, implying a negative association between

aspiration scores at the third and fifth time points. A negative covariance between the two linear pieces (-.193), also significant at the .05 level, implied that on average individuals reporting larger slope values prior to transition were likely to report smaller slope values following the transition. The R^2 values within each time point ranged from .419 to .638 [.638, .480, .584, .419, and .524, respectively], indicating that the proportion of the observed variability in career aspiration scores explained by the underlying latent growth factors ranged from 42% to 64%. Parameter estimates and standard errors are reported in Table 1.4.

To test the effect of covariates on latent growth factors, gender, race, and SES were introduced to the initial piecewise growth model. Although the chi-square model fit was statistically significant at the .05 level [$\chi^2(10) = 24.291$, $p = .007$], overall model fit indices improved and suggested that the model fit the data well [SRMR=.013; RMSEA=.011 (a 90% confidence interval of .006 and .017); CFI =.997; and TLI = .993]. The three covariates significantly predicted the intercept factor [.415 for gender, .355 for ethnicity, .654 for SES], indicating that females held higher initial aspirations than males, minorities reported higher initial aspirations than the majority, and individuals with high SES had higher aspirations in grade 8 than counterparts from lower SES backgrounds. However, the prior-slope (i.e., growth prior to high school graduation) was significantly predicted only by gender. That is, compared to males, females had a .118 units higher average growth of career aspiration scores across time points before high school graduation.

Meanwhile, after high school graduation gender and race factors had significant effects on aspiration growth rate. The conditional mean slope after high school graduation was .118 units lower for females than males. Minorities reported .165 units less negative in the average mean growth on career aspiration scores after graduating from high school, compared to majority

students. SES was not a significant predictor of the slopes. After including covariates, the R^2 values within each time point ranged from .420 to .617 [.617, .481, .584, .420, and .521, respectively], indicating that the proportion of the observed variability in career aspirations explained by the underlying latent growth factors ranged from 42% to 62%. Coefficient estimates and standard errors for the effects of covariates on the intercepts and slopes appear in Table 1.5.

Overall Fit of the Model

In the unconditional model, overall fit indices strongly suggested that the hypothesized model fit the data well. All of the path coefficients were significant, the sign of parameters were consistent with the hypotheses, and the R^2 values were reasonable. In the conditional model overall model fit indices improved and suggested that the model fit the data well. The R^2 values are similar to that of unconditional model and standard errors are not large. Although some of the path coefficients were not statistically significant, the paths are critical to our model. The sign of parameter was reasonable. Overall, the conditional model had a reasonable fit.

Discussion

Developmental career theorists (e.g., Gottfredson, 1981, 1996; Super et al., 1996) have posited that career aspirations may change over time and become increasingly stable as adolescents mature. Although not at odds with developmental theories, results of the latent growth model reveal a more sophisticated, curvilinear developmental process. The prestige level of career aspirations increased through high school graduation but then began to decrease into young adulthood. We also noted that whereas the aspirations of individuals with high initial prestige scores remained relatively stable throughout adolescence, a tendency existed for these

aspirations to grow at a slower rate or even to reflect a downturn in value, compared to participants who reported lower initial career aspiration scores.

It is not, perhaps, surprising that career aspirations showed negative growth, movement to less prestigious occupations, following high school graduation. In fact, this trend likely reflects appropriate adjustments to desired occupational goals as young adults crystallize their interests, assess their strengths and abilities, encounter work-related challenges and competition, and recognize educational and career opportunities or barriers. It is clear that career compromise—the process of individuals letting go of preferred occupations for less compatible but more accessible ones (Gottfredson, 1996)—is accentuated around the time of high school graduation.

Our results do not explain the value of or reasons for holding high, albeit inflated, occupational aspirations prior to high school completion. It is possible that the concept of career readiness or motivation can help explain the accelerated downward adjustment of career aspirations that occurred after high school graduation. The concept of career maturity entails both affective and cognitive dimensions and can be used to understand an individual's readiness to address developmental tasks and, ultimately, making appropriate career choices (Phillips & Blustein, 1994). It is possible that the structure and protective nature of high school allows students to delay making these choices. If so, adolescents may not be motivated to obtain information necessary to make informed career choices. Gottfredson (2005) suggested that adolescents limit their occupational information search because it is often time- and place-specific, as well as time-intensive. In any event, once out of school young people feel increasing pressure to determine immediate and long-term future goals related to education, work, and family life.

Career aspirations might also serve as a way for adolescents to insulate themselves from the realities and pressures of limited ability or future expectations. It is also possible that higher aspirations motivate adolescents to achieve more academically and occupationally by establishing idealized goals and intentions or by delaying decision making. In any event, a decrease in occupational aspirations after high school graduation is the result of growing pressure to make career-related choices based on an assessment of job availability and attainability. Research that examines how school environments encourage or delay adolescent career choice might offer interesting insights into this phenomenon.

Previous literature indicates that covariates such as gender, race and SES are significant predictors of career aspirations (Rojewski, 2005). In the present study, each of these covariates predicted significant initial values of career aspirations in the latent growth trajectory model. In general, students who were female, minority status, and high SES reported higher career aspirations than male, majority status, and low SES students when measured in grade 8 (the initial time point). However, gender was the only covariate that related significantly to the growth trajectory of career aspirations from grade 8 to grade 12 (high school graduation). This finding underscores past research showing that female adolescents tend to hold higher career aspirations than their male peers. In fact, male adolescents are more likely to aspire to moderate-prestige occupations, whereas female adolescents are more likely to aspire to either high- or low-prestige occupations (Betz & Fitzgerald, 1987; Rojewski & Yang, 1997). Albeit speculative, it is possible that this trend merely reflects the greater array of moderate-prestige occupations considered gender-appropriate for males rather than females. Conversely, males may perceive a need, ability, or opportunity to initiate the process of career compromise and choice earlier than females.

Our findings lend support to the generally reported finding that female adolescents narrow their educational and occupational expectations downward at an earlier age than males. High school-aged females were more likely than males to report high-prestige aspirations and to adjust their aspirations positively during high school. However, after high school graduation females were more likely to lower their career aspirations than males. Further analysis is needed to determine whether this longitudinal change reflects the restricted range of gender-appropriate occupations perceived by females, the influence of child-bearing decisions, or some other factor.

After high school graduation, race related significantly to the growth trajectory of career aspirations. Specifically, young adults of minority status were less likely to lower their career aspirations than White peers. This finding surprised us in that most literature asserts the likelihood of limited career aspirations for members of minority groups resulting from the actual or perceived racial bias and discrimination experienced after high school graduation (Worthington, Flores, & Navarro, 2005). Additional investigation is warranted to determine the causes and results of this phenomenon.

Perhaps most interesting, given previous research, is our finding that SES did not significantly contribute to the growth models of aspirations either before or after high school graduation. This finding does not mean that SES is an insignificant factor in the development and expression of career aspirations. SES did exert a significant influence on the prestige level of career aspirations at the initial data point, in grade 8. However, once formed, SES was not significantly related to individuals' adjustments to aspirations. This finding does not diminish the substantial relationship SES has on educational and occupational aspirations but does suggest that the impact is more pervasive and is manifest earlier in life than previously thought. Attention

should be focused on determining if/how existing inequities among students based on SES are institutionalized in early school grades and how these affect career aspirations.

One of the main limitations for this study is attributable to the nature of the dataset and its variables. For example, we transformed career aspiration scores from occupational categories into continuous scores using SEI codes that reflect prestige or status. Although the literature supports the reliability and validity of transformed SEI values, the number of categorical levels of the scores varied across measurement points, warranting a cautious interpretation.

Another limitation of this study is the categorization of race/ethnicity. We chose to categorize race into two groups, either majority (White) or minority (nonWhite), for several reasons. First, race/ethnicity has been viewed as a cause of societal reactions such as discrimination or bias, occupational stereotyping, and the restriction of opportunities. Regardless of specific racial/ethnic group affiliation, individuals of minority status are likely to share similar experiences of bias, discrimination, or environmental barriers to educational and career attainment (Hotchkiss & Borow, 1996). This common experience among individuals of minority status suggests that an *etic* perspective (i.e., seeking general principles across groups) is an acceptable alternative in this situation. Second, the use of multiple race/ethnic categories as dummy variables in the growth model was deemed somewhat problematic. Bollen and Curran (2006) noted that "implicit in the dummy variable approach was the assumption that all groups followed the same functional form in their trajectories and that the groups shared the same variances of random intercepts, random slopes, and error as well as the covariance between the random intercepts and random slopes" (p. 184). Since we could not support these assumptions, we did not examine separate racial/ethnic group differences. Multiple-group latent growth modeling is recommended as an alternative to the approach of multiple categories as dummy

variables. While the categorization decision we chose was justified, changes in the way that race/ethnicity is treated may shed additional light on this issue.

In this study, we adopted the multiple imputation method using the EM algorithm. The different techniques of missing value imputation may produce different findings. Thus, other missing value imputation techniques should be considered for future studies.

Career aspirations form in early childhood and remain fairly stable throughout adolescence. We found that SES plays an important role in establishing initial career aspirations, while gender and race shape these aspirations in high school and into young adulthood, respectively. While additional inquiry is needed to understand these findings fully, our results illuminate the need for systematic, long-term career development interventions for children and young adults.

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Table 1.1

Demographic Characteristics of Participants

		SES Quartile							
		Quartile1		Quartile 2		Quartile 3		Quartile 4	
		n	*%*	*n*	*%*	*n*	*%*	*n*	*%*
White	Male	590	(44.2)	855	(45.6)	1026	(47.9)	1142	(50.0)
	Female	745	(55.8)	1018	(54.4)	1116	(52.1)	1140	(50.0)
Non-White	Male	519	(43.1)	337	(44.8)	298	(48.1)	289	(46.6)
	Female	684	(56.9)	415	(55.2)	322	(51.9)	331	(53.4)

Table 1.2

Means, Standard Deviations, Univariate Skewness and Kurtosis and Correlations for All Observed Variables

Variable	1	2	3	4	5	6	7	8
1. Female	1.00							
2. Minority	.02	1.00						
3. SES	-.06	-.28	1.00					
4. CA-BY	0.11	0.01	0.27	1.00				
5. CA-F1	0.13	0.00	0.28	0.46	1.00			
6. CA-F2	0.15	-0.02	0.29	0.43	0.50	1.00		
7. CA-F3	0.14	0.01	0.25	0.32	0.40	0.49	1.00	
8. CA-F4	0.10	0.02	0.26	0.30	0.33	0.37	0.40	1.00
M[a]	50.3	27.7	-0.03	5.07	5.42	5.51	5.32	4.93
SD	—	—	0.80	1.71	1.64	1.58	1.75	1.79
Skewness	—	—	-0.09	-0.50	-0.85	-0.90	-0.74	-0.44
Kurtosis	—	—	-0.45	-1.11	-0.56	-0.44	-0.90	-1.18

Note. N = 10,809 (weighted). CA=Career aspirations. BY=Base-year (grade 8). F1=First follow-up (grade 10). F2=Second follow-up (grade 12). F3=Third follow-up (2 years postsecondary). F4=Fourth follow-up (8 years postsecondary).

[a]Percentage of variables for female and minority participants.

Table 1.3

Cut off Criteria and Observed Indices for the Model Fit

Indexes	Cut-off criterion	Result		Fit
		Unconditional	*Conditional*	
χ^2	—	19.772 (*df* =4)	24.291 (*df* =10)	No
TLI	0.90 ~ 1.00[a]	.989	.993	Yes
SRMR	< 0.08[b] or < 0.1[c]	.020	.013	Yes
RMSEA	< 0.06[b]	.019	.011	Yes
CFI	≥ 0.95[b]	.996	.997	Yes

[a]Recommended by Bollen and Curran (2006). [b]Recommended by Hu and Bentler (1999). [c]Recommended by Kline (2005).

Table 1.4

Parameter Estimates and Standard Errors

Parameter	Estimate	*SE*	*t*
Factor means			
Intercept (μ_{α})	5.073**	0.029	173.659
Slope1 ($\mu_{\beta 1}$)	0.441**	0.025	17.651
Slope2 ($\mu_{\beta 2}$)	-0.585**	0.030	-19.755
Factor variances			
Intercept ($\psi_{\alpha\alpha}$)	1.866**	0.170	10.964
Slope1 ($\psi_{\beta 1\beta 1}$)	1.107**	0.181	6.101
Slope2 ($\psi_{\beta 2\beta 2}$)	1.064**	0.177	6.000
Factor covariances			
Intercept—Slope1 ($\psi_{\alpha\beta 1}$)	-0.767**	0.175	-4.394
Intercept—Slope2 ($\psi_{\alpha\beta 2}$)	-0.215**	0.054	-3.982
Slope1—Slope2 ($\psi_{\beta 1\beta 2}$)	-0.193*	0.077	-2.506

*$p < .05$, **$p < .01$.

Note. According to Bollen and Curran (2006), the unconditional piecewise latent growth model is composed of two parts: Level 1 and Level 2. The Level 1 model is specified as: $y_{it} = \alpha_{it} + \lambda_{1t}\beta_{1i} + \lambda_{2t}\beta_{2i} + \varepsilon_{it}$, where y_{it} is the trajectory variable y for individual i at time t, α_i is the random intercept, λ_{1t} is one value of time at measurement t, β_{1i} is the first growth rate for individual i, λ_{2t} is second value of time at measurement t, β_{2i} is the second growth rate for individual i, and ε_{it} is the residuals at time t.

In Level 2, the random intercept and two linear slopes can be described as: $\alpha_i = \mu_{\alpha} + \zeta_{\alpha i}$, $\beta_{1i} = \mu_{\beta 1} + \zeta_{\beta 1 i}$, and $\beta_{2i} = \mu_{\beta 2} + \zeta_{\beta 2 i}$, indicating each random coefficient (α_i, β_{1i}, and β_{2i}) has its own intercept (μ_{α}, $\mu_{\beta 1}$, and $\mu_{\beta 2}$, respectively) and error term ($\zeta_{\alpha i}$, $\zeta_{\beta 1 i}$, and $\zeta_{\beta 2 i}$, respectively); where μ_{α} is the mean of the individual intercepts, $\mu_{\beta 1}$ is the mean of the first linear trajectory components, $\mu_{\beta 2}$ is the mean of the second linear trajectory components. For 5 time point data collection, the factor loading matrix $\mathbf{\Lambda}$ for career aspirations would be

$$\mathbf{\Lambda} = \begin{pmatrix} 1 & 0 & 0 \\ 1 & \lambda_{12} & 0 \\ 1 & 1 & 0 \\ 1 & 1 & \lambda_{24} \\ 1 & 1 & 1 \end{pmatrix}$$

where, λ_{12} and λ_{24} are estimated from the data.

Table 1.5

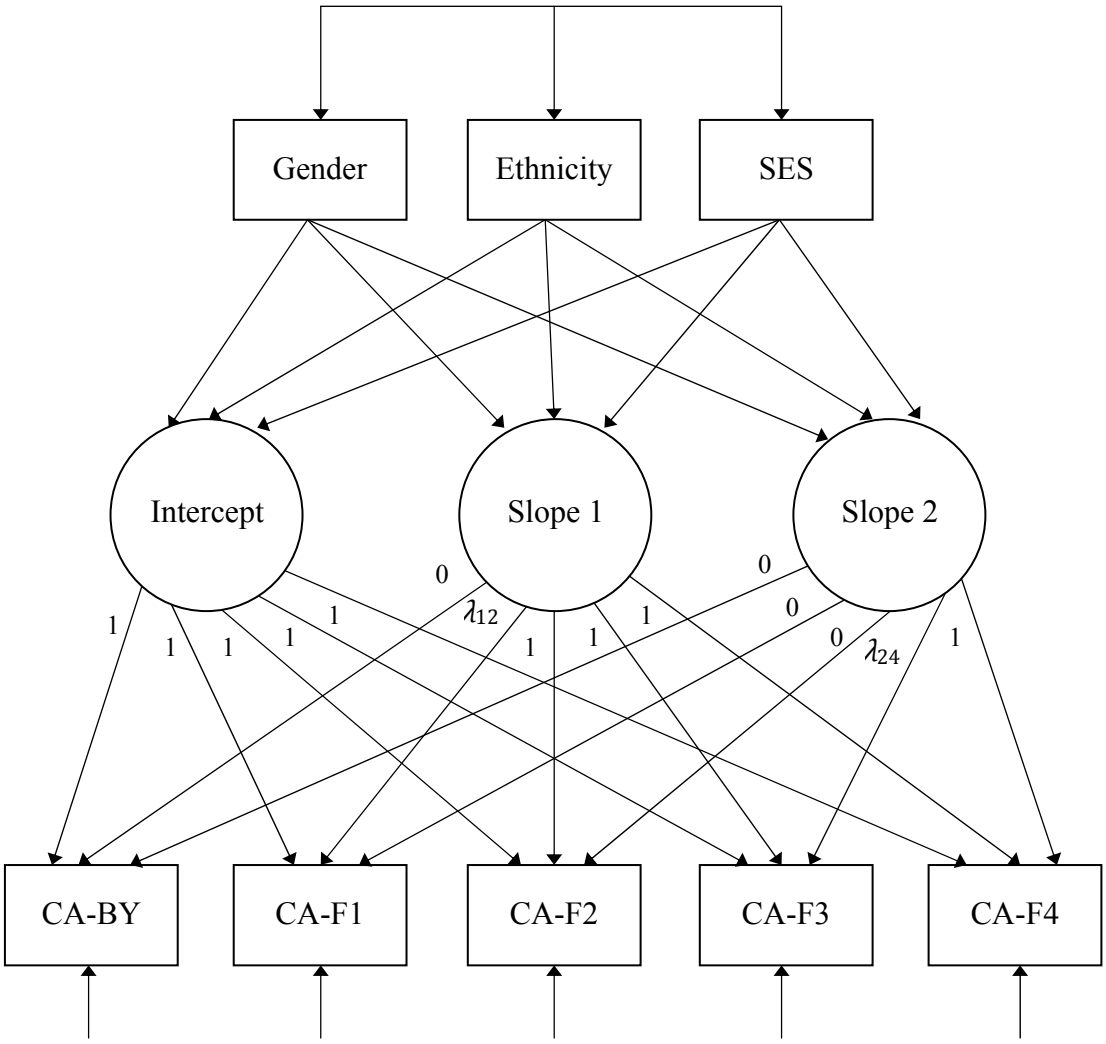
Coefficients Estimates and Standard Errors for Random Intercepts and Slope Regressed on Covariates

Covariate	Intercept			Prior-slope			Post-slope		
	Parameter	*SE*	*t*	Parameter	*SE*	*t*	Parameter	*SE*	*t*
Intercept	4.787	(.038)	125.14**	0.408	(.035)	11.40**	-0.574	(.044)	-13.16**
Gender	0.415	(.049)	8.45**	0.118	(.053)	2.21*	-0.113	(.054)	-2.10*
Ethnicity	0.355	(.058)	6.08**	-0.094	(.064)	-1.49	0.165	(.075)	2.20*
SES	0.654	(.034)	19.31**	-0.024	(.030)	-0.79	0.051	(.038)	1.34

*$p < .05$, **$p < .01$.

Figure Captions

Figure 1.1. Piecewise latent growth model of career aspirations.


Gender
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Slope 1
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λ_{12}
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CHAPTER 3

DEVELOPMENT OF OCCUPATIONAL ASPIRATIONS IN KOREAN ADOLESCENTS: A MULTIPLE-GROUP LATENT CURVE MODEL[2]

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Abstract

The complex phenomenon of intraindividual and interindividual differences in career aspirations development, factors contributing to their development, and the applicability of career development theories originating in Western countries with Korean adolescents were examined in a longitudinal sample of 2979 Korean in 7th through 10th grade. The career aspirations of Korean adolescents differed in prestige level at grade 7 when examined by gender and socioeconomic status. In addition, the rate of change and a decreasing trajectory from junior high school to the first year of high school existed. The rate of decreasing trends for students with higher career aspirations at grade 7 was either slow or stable when compared to adolescents with relatively low initial career aspirations. In addition, adolescents who will be/are in the CTE track held lower prestige aspirations than students in other tracks. Our work lends support to the notion that Western-based theories of career development seem relevant to Korean adolescents and like past studies the ages at which certain developmental tasks may be different given culturally differences but otherwise things appear to be relatively the same. Further research on the development of career aspirations and the impact of covariates on the development should be undertaken to better understand these complex phenomenon.

Key words: career aspirations, career development, career and technical education, Korean adolescents, latent growth modeling, longitudinal study, multiple-group analysis, vocational education

Introduction

Idealized career goals or aspirations, which are work-related goals hoped for under the best possible conditions, have been a long-standing focus for career researchers in the United States. Among other things, investigations have generally confirmed that career aspirations are formulated early in life, perhaps as early as in elementary school (Trice 1991; Trice & King, 1991) and are relatively stable throughout childhood and adolescence (Rojewski, 1999; Rojewski & Kim, 2003; Rojewski & Yang, 1997). Aspirations play a significant role in predicting later aspirations and, to a lesser degree, attainment (Gottfredson & Becker, 1981; Holland & Gottfredson, 1975; Holland, Gottfredson, & Baker, 1990).

In general, early adolescents are inclined to express occupational aspirations that reflect their desire to have future occupations associated with high prestige and high social status, whether or not they actually have a realistic chance of attaining those goals (Mau & Bikos, 2000; Rojewski, 2005; Rojewski & Yang, 1997). These aspirations are diminished, that is, compromised, when adolescents realize their lack of abilities academically, physically, or financially, perceive significant barriers to attain their goals, or find that their goals are opposed by their families (Armstrong & Crombie, 2000; Davey & Stoppard, 1993; Gottfredson, 1996; McNulty & Borgen, 1988; Rojewski, 2005). Recent research has suggested that a curvilinear trend may exist where positive career aspirations tend to decline markedly as adolescents transition from school to postsecondary education, work, and adult life (Lee & Rojewski, 2009).

The exact role of career aspirations in the career development–choice–attainment process is still somewhat unclear and depends to some degree on the theoretical perspective one adopts. For example, aspirations can be viewed as indicators of self-concept from a developmental perspective (Super, Savickas, & Super, 1996) or as a component of career self-efficacy, outcome

expectations, and goals from a social cognitive career theory perspective (Lent, Brown, & Hackett, 1996). Career aspirations are choices about work that reveal information about one's concept of self and anticipated alternatives, as well as personal interests and hopes not bounded by reality (Armstrong & Crombie, 2000; Holland & Gottfredson, 1975; McNulty & Borgen, 1988; Rojewski, 2005). The role of aspirations in career choice and behavior is important because they are involved in stimulating plans, guiding learning, organizing possible life choices, and contributing to groundwork for adult life (Gottfredson, 2005).

Despite the substantial body of work in the United States, there is limited information about career aspirations, or other aspects to career development and behavior, on adolescents and young adults from other parts of the world including South Korea. The small pool of studies that are available appears to show the cross-national validity and applicability of many Western-based career theories, constructs, and findings to Korean adolescents. For example, Hwang, Kim, Ryu, and Heppner (2006) examined the potential applicability of Gottfredson's (1981) career choice circumscription process to a large group of South Korean adolescents. For the most part, similarities existed although differences occurred at the ages when specific developmental tasks were undertaken. The researchers attributed these age differences to possible cultural variables inherent in the South Korean educational system such as underdeveloped school guidance curriculums, lack of work experience, or a high level of academic competition. Similarly, Tak's (2006) work with Korean college students using the Korean version of Career Indecision Inventory confirmed the five-factor solution of career indecision originally found with U.S. students.

Research on the career aspirations of Korean adolescents has revealed mixed results about gender differences, similar to research findings on American adolescents (see e.g., Dunne, Elliott,

& Carlsen, 1981; Lee & Rojewski, 2009; Rojewski & Kim, 2003). Ryu, Kim, and Hwang (2004) found that Korean females had higher initial levels of career aspirations than males. In contrast, Lee and Jyung (2004) found no significant gender differences in career aspirations when measured by prestige level. They also found that students in a vocational curriculum or track reported lower prestige than students enrolled in an academic track and suggested that the vocational students' reported aspirations might be related to future career outcomes.

The development of Korean youths' career aspirations has been reported to be relatively stable, i.e., neither decreasing nor increasing during the transition from junior high school to senior high school (Ryu et al., 2004), although conflicting research has also been reported. For instance, Hwang, Kim, et al. (2006) reported a decreasing trend in career aspirations until high school, followed by an increasing trend after high school completion. In contrast, Hwang, Park, and Yoo (2006) found a consistent, increasing trajectory in career aspirations from childhood through young adulthood.

A number of theoretical perspectives can account for the developmental nature and expression of occupational aspirations, including the life-span, life-space theory, Gottfredson's theory of circumscription and compromise, status attainment theory, and the developmental-contextual approach to career development. Super (1990; Super et al., 1996) viewed the task of identifying, preparing, establishing, and maintaining a career as a series of predictable developmental stages, including growth, exploration, establishment, maintenance, and disengagement, spanning an individual's life. Adolescence (exploration stage) is a critical time in the development and crystallization of occupational aspirations. Successful resolution of the tasks encountered during this stage is characterized by a progressive narrowing of career options, from fantasizing about possible careers, to identifying occupational options, to making job

choices. Super proposed that self-concept is a significant determinant of career aspirations in that it can be viewed as an impression of an adolescent's occupational self-concept. From this perspective, occupational aspirations are viewed as becoming increasingly stable from adolescence to late maturity.

Gottfredson (2005) also explained the formation of occupational aspirations as two processes—compromise and circumscription— from a developmental perspective. Compromise refers to the process of giving up unattainable and inaccessible occupational options for more attainable and realistic occupational alternatives by reflecting on one's occupational self-concept. Circumscription occurs as individuals eliminate unacceptable occupational alternatives by equating self-concept with perceptions of conceivable occupations and ascertaining the level of affinity between the two. Through a process of eliminating career alternatives and narrowing possible options that occur in a series of four stages including size and power (3 to 5 years of age), sex roles (6 to 8 years of age), social valuation (9 to 13 years of age), and unique self (14 years of age and older), individuals narrow their zone of marginally acceptable occupational alternatives. Thus, career aspirations can be represented as a reflection of the continuous interaction between an individual's valuation of occupation congruity and perceived accessibility.

Status attainment theory highlights the significant role of social stratification in forming and developing occupational aspirations and attainment, as well as the significant relationship between educational and occupational aspirations. The central proposition of the theory is that parental occupational status or attainment plays a significant role in affecting the level of education achieved, thereby determining individuals' socioeconomic status and occupational attainment (Hotchkiss & Borow, 1996). That is, the socioeconomic status of the family, race/ethnicity, gender, and other social determinants of individuals significantly affect the level

of occupational aspirations, which in turn, influence educational and occupational attainment (Hellenga, Aber, & Rhodes, 2002). However, unlike psychological career theories that emphasize the role of personal and psychological factors in influencing career decision and attainment, status attainment theory only emphasizes the social aspects such as social stratification that constrains career development and attainment.

Although sociological perspectives on career development such as status attainment theory emphasize the contextual influences on career choice and attainment, Vondracek, Lerner, and Schulenberg (1986) asserted that such perspectives fail to encompass the dynamic interactions between individuals and their constantly changing contexts. Vondracek et al. highlighted that the intra-individuals, intra-contexts, and the interplay between the two are constantly changing over time. That is, the developmental- contextual approach to career development views career development as the result of the continuous dynamic interaction between individuals and multilevel contexts that are related to each other. Furthermore, the developmental-contextual approach views individual life as embedded within hierarchically arranged contexts such as psychological, sociological, political, cultural contexts; thus, change in one context is likely to influence other contexts.

The purpose of the current study was to further understand the complex phenomenon of intraindividual and interindividual differences in career aspirations development and the applicability of career development theories originating in Western countries with Korean adolescents. Thus, we investigated whether developmental trajectories of career aspirations existed and, if they did, which factors contributed to their development. We also investigated whether students' curriculum track selection, for example, vocational/career and technical education or academic curriculum, predicted future career development and attainment.

Method

Data and Sample

To examine the developmental trajectory of career aspirations, we used the Korean Education Longitudinal Study of 2005 (KELS:2005) data set, administered by the Korea Educational Development Institute. The KELS:2005 is designed for longitudinal study of a number of factors. These factors include the educational and developmental aspects of students through various educational stages in their family and school, the educational experience within and outside schools, the transition from middle school to high school to postsecondary education or workforce, the effects of school on students' career paths. KELS:2005 was also developed to investigate school and educational policy impacts on cognitive and affective development and academic achievement of students, and to implement policy-relevant implications and human resource development and management in a long term perspectives (Kim, Kim, Kang, Kim, & Shin, 2007).

KELS:2005 collected data from school principals, teachers, parents, and students every year from 2005 to 2008. A stratified random cluster sampling method was used to select a nationally representative probability sample of 6908 7th graders within 150 schools (122 public, 28 private) representing 703,914 7th graders within 2929 schools (excluding sports academies and branch schools) across the country during the 2005 academic year. In this sampling method, the first stage measured the proportion of schools in cities (16 cities and provinces) based on city size, a random sample of schools within each stratum was the second-stage unit, and a random sample of students within each school was the third-stage unit. In most participating schools, 50 7th graders were randomly selected from each school. In schools with fewer than 50 students, all eligible students were selected. In schools where fewer than 50 students initially agreed to

participate, students with similar characteristics, academic achievement, and background were added (Kim et al., 2007).

To examine the effect of covariates on the trajectory of career aspirations, we selected the third follow-up complete panel of students who participated across all four KELS:2005 data collection points. The resulting initial sample size was 5824. We excluded 97 cases which contained missing values in career aspirations prestige scores and SES composite scores at the third follow-up complete data, resulting in a total sample size of 5727 cases. Of this total, 2979 (52.0%) were male and 2748 (48.0%) were female. In Korea, students need to choose either a career and technical education (CTE) track or another track (e.g., general academic, art, foreign language, science and technology) during the transition from 9th to 10th grade. In the KELS:2005 data, 1169 (20.4%) chose the CTE track and 4558 (79.6%) chose other tracks.

Measures

Demographic variables. Participants' gender (male=0, female=1) and curriculum track status (other=0, CTE=1) were selected. Also, standardized SES composite scores (M=0.00, SD= 1.00) using family income, parents' education levels, and parents' occupations in the base year were calculated to assess socioeconomic status of participants. We estimated standardized SES scores by applying the method used in the National Education Longitudinal Study of 1988 and the Education Longitudinal Study of 2002 (see Ingels et al., 2005; Owings et al., 1994). More specifically, family income values were categorized into 23 categories: no income=1, less than ₩500,000=2, less than ₩990,000=3, ₩15,000,000 to ₩16,990,000=21, ₩17,000,000 to ₩20,000,000=22, and ₩20,010,000 to 33,000,000=23, and then we transformed these categorized values score with natural log for the adjustment of highly skewed data. Parents' education levels were categorized into six categories: no high school graduation=1, high school graduation or

equivalent=2, associate's degree or equivalent=3, bachelor's degree=4, master's degree=5 and doctorate=6. Parents' occupations were assigned the International Socioeconomic Index of Occupational Status (ISEI) codes estimated by Ganzeboom and Treiman (1996). Next, each transformed variable was standardized. Finally, using the regression method in principal component analysis, we obtained factor scores based on SES.

Career aspirations. Career aspirations were measured by assigning the ISEI codes estimated by Ganzeboom and Treiman (1996) to participants' reports about the job they aspired to have at age 30 from a listing of 28 occupational categories at each time point. Examples of occupations included housewife, farmer, athlete, teacher, scientist, and lawyer. For occupations that were not identified in the ISEI, we made similar coding decisions by placing nonidentified occupations into appropriate prestige categories. To facilitate statistical analysis, all SEI scores were transformed by dividing them by 10. Maximum and minimum scores were 8.5 and 2.5, respectively. Validation of the ISEI was supported by Ganzeboom and Treiman (1996).

Data Preparation

After selecting the third follow-up complete panel and excluding cases with missing values, our final sample size was 5727. However, since data still contained some missing values, multiple imputation using the expectation maximization (EM) algorithm was performed for missing value treatment. After EM imputation, tests for outliers and normality were conducted resulting in no outliers and no violation of univariate normality being detected (see Table 2.1). However, Mardia's normalized multivariate kurtosis was detected against the assumption of multivariate normality. However, because univariate normality is tenable and no apparent cut-off criteria for multivariate kurtosis have yet been recommended (Finney & DiStefano, 2006), we

assumed that the data was normally distributed and no corrective action was taken (Krzanowski, 2000).

Statistical Analyses

Using the M*plus*5.2 version with a maximum-likelihood estimator, we employed a [multiple-group] latent growth curve model to examine the developmental trajectory of career aspirations over a four-year period and the impact of covariates on the latent growth factors, as well as group differences in the developmental trajectories, the means of the growth factors, variances and covariances, and error variances. To assess whether models demonstrated good fit for each model, the χ–square statistics were used. However, because the χ–square statistic is sensitive to sample size, we also used four different indexes by setting a priori acceptable criteria for model fit, including standardized root mean square residual (SRMR) $\leq .08$, root mean square error of approximation (RMSEA) $\leq .08$, comparative fit index (CFI) $\geq .95$, and Tucker-Lewis index (TLI) $\geq .90$ (Bollen & Curran, 2006; Hu & Bentler, 1998, 1999; Marsh, Hau, & Wen, 2004).

Results

Model Selection and Alternative Models

We initially examined the time-specific career aspiration means, indicating that although mean values decreased over time, the rate of decrease between time points was not equal over time (see Table 2.1). We first fitted a freely estimated loadings model to the data, examined a linear growth model, and then explored a quadratic growth model. The examination of parameter estimates and fit indices for these models supported both linearly and non-linearly decreasing patterns of career aspirations (see Table 2.2). For example, when setting the slope of time 1 and time 4 at 0 and 1, respectively, the freely estimated loadings at time 2 and 3 were .188 and .552, respectively, implying that 18.8% , 36.4% , and 55.2% of the total negative growth were detected

between time points, respectively. Although an unconditional quadratic model showed an empirically better model fit and the underlying latent growth factors better explained the proportion of the observed variability in career aspirations, the current study adopted and reports the findings of a linear growth modeling strategy because this approach was better able to explain the development of career aspirations (Ram & Grimm, 2007) within the limited time points used in this study.

Unconditional Linear Latent Growth Curve Analysis

Although the χ-square test of model fit was statistically significant [$\chi^2(5) = 101.005$, $p < .001$], the other fit indices suggested that a linear growth model had good fit to the data (see Table 2.2). The intercept and slope of the unconditional linear model were 6.121 and -.126, respectively and differed significantly from zero ($p < .001$), reflecting that the average level of career aspirations of Korean 7th graders was 6.121, and career aspirations scores constantly decreased .126 points at each occasion. These results reflected that on average, Korean adolescents' career aspirations scores decrease by 5.743 units by 10th grade. Also, there was statistically significant variance of intercepts (1.362) and slopes (.125) reflecting that interindividual differences in their initial career aspiration scores and their rates of intraindividual changes existed. The statistically significant negative covariance between the intercept and the linear slope (-.229) at the .01 level reflected that adolescents with higher initial aspiration levels had slower decrease in level than those with lower initial aspiration scores. The R^2 values within each time point [.546, .471, .473, and .647, respectively] suggested that the proportion of the observed variability in career aspiration scores captured by the random intercepts and random slopes ranged from 47% to 65%.

Conditional Linear Latent Growth Curve Analysis

To test group differences and the effect of covariates on latent growth factors, the covariates of gender, curriculum track, SES, and the interaction of curriculum track and SES were included in the unconditional linear growth model (see Table 2.3). This conditional model fit the observed data well [$\chi^2(13) = 114.763$, $p < .001$; SRMR = .018; RMSEA = .037 (a 90% confidence interval of .031 and .043); CFI = .984; TLI = .973].While the four covariates significantly related to the initial level of career aspirations [-.117 for female, -.840 for CTE track, .265 for SES, -.187 for interaction of curriculum track and SES], the rate of growth in career aspirations was not related to any covariates. More specifically, adolescents who selected the CTE track and females had lower initial aspirations than their counterparts, while individuals with high SES had higher aspirations in grade 7 than their counterparts from lower SES backgrounds. Also, there was a significant interaction between curriculum track and SES in the association with the initial level of career aspirations, reflecting that the magnitude of the relation between SES and the random intercepts varies as a function of curriculum track. However, there were no significant interaction effects on the random slopes, suggesting that the effects of SES on the random slopes do not vary in CTE and other tracks.

After including covariates, the R^2 values within each time point had not substantially changed compared with the unconditional model, and ranged from .469 to .643 [.546, .469, .475, and .643, respectively], indicating that the proportion of the observed variability in career aspirations explained by the underlying latent growth factors ranged from 47% to 64%. The and values for the random intercepts and slopes were .143 and .010, respectively, reflecting that the covariates accounted for 14% of the variance in initial level of career aspirations and 1% of the variance in the rate of growth in career aspirations.

Test of Curriculum Track Differences

To examine group differences between students who selected the CTE track and those who selected other curriculum tracks, we initially used a dummy variable approach. However, this approach requires the assumption that the growth trajectories of career aspirations for the CTE track versus the other track are not different nor are the variances of the random curve factors, covariances between the random curve factors, and error variances different for the CTE track versus the other track. Failure to acknowledge these underlying assumptions can increase chances for biased parameter estimations and improper model tests (Bollen & Curran, 2006). Therefore, we elected to use a multiple-group analysis to assess whether group differences exist in latent growth factors, the effects of covariates on these factors, and whether other assumptions required for a dummy variable approach were met.

We first estimated the null model simultaneously in both the CTE track and the other track with no restrictions. Next, equality restrictions were introduced to certain parameters for the χ-square difference test between the more constrained model and less constrained model: two factor loadings, λ_2 and λ_3, were restricted to be equal across groups (model 2) and compared with the null model (model 1). The χ-square difference test and CFI difference [$\Delta\chi^2(2) = 5.797$, $p = .055$; $\Delta CFI = 0$] suggested that the freed loadings are similar across the group (see Table 2.4). For the next comparison, the freely estimated factor loadings λ_2 and λ_3 were fixed at 1 and 2, respectively so that constraints were equal across the group (model 3) and compared with model 2. Although the difference in χ^2 was significant [$\Delta\chi^2(2) = 8.844$, $p = .012$], the CFI difference (.002) was less than .01 and RMSEAs for both models 2 and 3 fall within one another's confidence intervals [.071 (a 90% confidence interval of .059 and .084) and .058 (a 90% confidence interval of .049 and .068), respectively], suggesting that the two groups seemed to

share the same linear trajectories. Because both groups shared the same trajectory, we further tested group differences in the means of random intercepts and random slopes, the variances of random intercepts and random slopes, and the covariance between the random intercepts and random slopes, as well as unique variances. The χ-square difference tests and CFI differences, as well as the examination of RMSEAs, revealed that the two groups were significantly different in the means of random intercepts and random slopes, the variances of random intercepts and random slopes, and the covariance between the random intercepts and random slopes, as well as unique variances.

A multiple-group analysis provided evidence of the same linear trajectories and of a difference in the means of intercepts and slopes in the CTE and other track and against the assumptions that the variances of the random curve factors and the covariance between the random intercepts and random slopes were equal as were the error variances at each time point across groups. The significant differences in means of the intercepts were consistent with the dummy variable approach, which indicated that adolescents who selected the CTE track showed significantly lower initial levels of career aspirations (5.392) than that of their counterparts (6.307) (see Table 2.5). However, while the dummy variable approach revealed that there were no differences in the means of random slopes, a multiple-group analysis revealed that the decreasing rate of change for CTE students (-.122) was higher than for other students (-.126) although the differences in the parameters was slight.

Using the conditional multiple-groups analysis, we further examined whether the relationships revealed in the conditional growth model were tenable. The unconditional multiple-groups analysis suggested the base model that has no cross-group constraints on model parameters except for intercept and slope (see Table 2.6). All χ-square difference tests revealed

that significant differences existed in the regression coefficients on the latent components, the latent growth components, and the disturbance variances and covariances, as well as the unique variances across the groups. For example, the decreasing rate of change for CTE students (-.129), after controlling for gender and SES, was significantly smaller than for other students (-.162), compared with the results of the unconditional multiple-group analysis. While statistically significant, the difference was considered trivial. None of the covariates were related to the latent growth factors in the CTE group. However, gender and SES were significantly related to the initial career aspirations [-.134 for female, .264 for SES] and gender had a significant association with growth rate (.080) in other tracks, indicating that these females held lower initial aspirations than their male peers while their rate of change was slower than males (see Table 2.7). Also, individuals with high SES were related to higher aspirations in grade 7 than their counterparts from lower SES backgrounds.

Discussion

The purpose of this study was to examine the complex phenomenon of intraindividual and interindividual differences in career aspirations development, factors influencing to the development, and the applicability of career development theories originating in Western countries with Korean adolescents. Our results suggest that the career aspirations of Korean adolescents differed in prestige level at grade 7 when examined by gender and socioeconomic status. In addition, the rate of change and a decreasing trajectory from junior high school to the first year of high school existed. The rate of decreasing trends for students with higher career aspirations at grade 7 was either slow or stable when compared to adolescents with relatively low initial career aspirations. In addition, adolescents who will be/are in the CTE track held lower prestige aspirations than students in other tracks. Figure 2.1 shows that the initial career

aspirations for adolescents in other curriculum tracks were higher than for students in the CTE curriculum track, but the rates of change over time were similar.

Through this longitudinal approach we were able to identify a negative trajectory for the career aspirations of Korean adolescents over a 4-year period which was steeper than reported for American adolescents. A recent study in the U.S. revealed a positive trend in career aspirations through high school graduation followed by a negative trend which continued into young adulthood (Lee & Rojewski, 2009). This decrease in Korean students' aspirations over time and at earlier ages might be explained as the result of a growing realization that academic ability plays a significant role in accomplishing and attaining future career-related outcomes, such as college entrance. Hwang, Kim, et al. (2006) asserted that because most Korean students are under substantial academic competition to gain prestigious college admission, they narrow their alternative career options well before high school graduation and probably much earlier than U.S. peers.

We also found potentially important *initial differences* in the development of career aspirations based on gender, SES, and curriculum track, but these covariates were not significantly related to the *rate of change* in career aspirations. In general, females held lower aspirations than males. It is interesting that our findings do not support past research which showed that Korean females hold higher initial career aspirations than males (Ryu et al., 2004) or that no gender difference exist (Lee & Jyung, 2004). The multiple-group analysis also revealed that while no gender difference existed in initial career aspirations of students and their rate of change in the CTE group, gender was significantly related to the initial level of career aspirations of students (-.134) and their rate of change (.080) in other tracks. Although the initial level of

career aspiration for females in other tracks is less than males, the decreasing rate of change is not more drastic for females than for males.

The multiple-group analysis showed that gender was significantly related to the growth trajectory of career aspirations only for students in the other track group, but not for students in the CTE track. These differences can be explained, in part, as a result of the greater complexity of career development and attainment experienced by females (Gottfredson, 1996). Differences might also reflect the greater variability present in the other track compared with the CTE track. Further analysis is necessary to determine whether gender differences in career aspirations are tenable.

Adolescents from higher SES backgrounds held higher career aspirations than students from lower SES backgrounds, regardless of educational track. It was also interesting to observe that adolescents who will be/are in the CTE track were more likely to come from low SES families However, multiple-group analysis found no SES effect on the random curve factors for the CTE group. In contrast, SES did play a significant role in forming career aspirations for students in the other track. A possible explanation for this, albeit speculative, might be that adolescents who will be/are in the CTE track are more likely to compromise their career choices and prestige levels of occupation at earlier ages than their counterparts.

Findings from the dummy variable approach and multiple-group analysis did not lead to similar conclusions. While a significant difference in the means of intercepts was found when using the dummy variable approach, gender and SES effects on the latent curve factors were not consistent with the dummy variable approach. This difference might be explained by the violation of assumptions from using the dummy variable approach to group differences which holds that both groups share the same variances of random intercepts and random slopes, and the

same covariance between the latent intercepts and slopes, as well as the same unique variances at each time point across the groups. Thus, cautious interpretation of results obtained from the dummy variable approach is warranted.

This study has several limitations. Perhaps most important is that career aspirations were measured using prestige scores which limited our focus on aspirations to socioeconomic status. That is, our analysis and understanding of aspirations that resulted from this study did not measure other characteristics of career aspirations, such as the zone of alternative jobs. Secondly, we transformed the list of job categories into continuous values with a slightly outdated ISEI, and not all of occupations were found. Because the socioeconomic status for certain jobs is constantly changing due to the evolutionary nature of society and changing values, careful interpretation is needed.

Another limitation is that we should be careful to generalize the results of our analysis. Although a nationally representative sample of Korean 7th graders was used, the study lost substantial numbers of students in the course of analysis. Most importantly, we did not use weighting variables to make the sample representative. Use of weights with data obtained through cluster sampling is critical for adjusting standard errors for unbiased estimators.

The findings from this study support the use of developmental career theories with a Korean group of adolescents. A decreasing trajectory in career aspirations might explain a progressive narrowing of career alternatives to more realistic careers through the constant evaluation of one's self with occupational compatibility and perceived accessibility. Lee and Jyung (2004) noted that most high school Korean students have a zone of acceptable alternatives and career aspirations. Thus, early intervention is needed. Changes in school policy for career development or the

change in social systems may also affect the development of career aspirations and should be examined.

Our work lends support to the notion that Western-based theories of career development seem relevant to Korean adolescents and like past studies the ages at which certain developmental tasks may be different given culturally differences but otherwise things appear to be relatively the same. Further research on the development of career aspirations and the impact of covariates on the development should be undertaken to better understand these complex phenomenon.

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Table 2.1

Means, Standard Deviations, Univariate Skewness and Kurtosis and Correlations for all Observed Variables across Samples of CTE and Other (Academic) Students

Variables	1	2	3	4	5	6	7
			Total (*n*=5727)				
1. Female	—						
2. SES	-.014	—					
3. CA1	-.043	.199	—				
4. CA2	-.014	.192	.493	—			
5. CA3	-.001	.223	.368	.489	—		
6. CA4	.027	.203	.327	.408	.528	—	
7. CTE	.002	-.261	-.233	-.240	-.275	-.272	—
M [a]	48.0	.000	6.11	5.98	5.92	5.73	20.0
SD	—	1.00	1.56	1.50	1.42	1.30	—
Skewness	—	0.18	-0.13	-0.01	0.08	0.22	—
Kurtosis	—	0.00	-0.53	-0.49	-0.44	-0.20	—
			CTE (*n*=1169)				
1. Female	—						
2. SES	.006	—					
3. CA1	-.009	.059	—				
4. CA2	-.028	.022	.383	—			
5. CA3	-.014	.047	.239	.390	—		
6. CA4	-.010	.049	.220	.328	.477	—	
M [a]	48.2	-.516	5.40	5.27	5.15	5.03	
SD	—	0.89	1.51	1.42	1.25	1.13	
Skewness	—	0.17	0.14	0.17	0.12	0.21	
Kurtosis	—	-0.01	-0.29	-0.20	-0.08	0.10	
			Other (*n*=4558)				
1. Female	—						
2. SES	-.019	—					
3. CA1	-.053	.168	—				
4. CA2	-.010	.164	.483	—			
5. CA3	.002	.187	.344	.468	—		
6. CA4	.037	.161	.296	.376	.493	—	
M [a]	47.9	.133	6.30	6.16	6.12	5.91	
SD	—	.98	1.52	1.47	1.40	1.29	
Skewness	—	.17	-.19	-.06	.03	.20	
Kurtosis	—	.02	-.51	-.51	-.50	-.27	

Note. CA1=Career aspirations in grade 7. CA2=Career aspirations in 8th grade. CA3=Career aspirations in 9th grade. CA4=Career aspirations in10th grade. CTE=Career and technical education track. Other=Academic and other tracks [a]Percentage of variables for female participants.

Table 2.2

Parameter Estimates, Standard Errors, Fit Indices, and R^2 Values for Unconditional Models

	Free-loading[a]		Linear[b]		Quadratic[c]	
Parameter	Estimate	*SE*	Estimate	*SE*	Estimate	*SE*
Factor means						
Intercept (μ_α)	6.089**	.021	6.121**	.019	6.106**	.021
Linear ($\mu_{\beta 1}$)	-.357**	.022	-.126**	.007	-.075**	.023
Quadratic ($\mu_{\beta 2}$)	—	—	—	—	-.016*	.007
Factor variances						
Intercept ($\psi_{\alpha\alpha}$)	1.245**	.047	1.362**	.048	1.680**	.096
Linear ($\psi_{\beta 1\beta 1}$)	.039**	.017	.125**	.009	.912**	.115
Quadratic ($\psi_{\beta 2\beta 2}$)	—	—	—	—	.067**	.008
Factor covariances						
Intercept—Linear ($\psi_{\alpha\beta 1}$)	-.105**	.029	-.229**	.015	-.618**	.101
Intercept—Quadratic ($\psi_{\alpha\beta 2}$)	—	—	—	—	.093**	.024
Linear—Quadratic ($\psi_{\beta 1\beta 2}$)	—	—	—	—	-.223**	.029
Unique variances						
VAR (ϵ_1)	1.275	.017	1.134	.037	.758	.092
VAR (ϵ_2)	1.098	.012	1.156	.027	1.093	.033
VAR (ϵ_3)	1.070	.008	1.055	.025	.931	.030
VAR (ϵ_4)	.489	.034	.608	.028	..491	.076
Fit indices						
χ^2	88.478		101.005		15.018	
df	3		5		1	
TLI	.969		.979		.985	
SRMR	.042		.031		.009	
RMSEA (90% CI)	.071 (.058–.084)		.058 (.048–.068)		.049 (.029–.073)	
CFI	.984		.982		.997	
R^2 *values*						
R_1^2	.494		.546		.689	
R_2^2	.494		.471		.516	
R_3^2	.473		.473		.541	
R_4^2	.714		.647		.711	

Note. CI=Confidence interval. [a]Intercept loadings for the all time points were fixed at 1 and slope loadings for the first wave was fixed at 0 and the fourth wave at 1. [b]Intercept loadings for the all time points were fixed at 1 and slope loadings for each time point were fixed at 0, 1, 2, and 3, respectively. [c]Intercept loadings for all time points were fixed at 1, linear slope loadings for each time point were fixed at 0, 1, 2, and 3, respectively, and quadratic slope loadings for each time point were fixed at 0, 1, 4, and 9, respectively.

Table 2.3

Coefficients Estimates and Standard Errors for Random Intercepts and Slopes Regressed on Covariates

Covariate	Intercept			Linear		
	Parameter	*SE*	*t*	Parameter	*SE*	*t*
	6.329	.027	231.69**	-.156	.011	-14.58**
Female	-.117	.037	-3.18**	.065	.014	4.53
CTE	-.840	.051	-16.32**	-.001	.020	-.06
SES	.265	.021	12.65**	.014	.008	-1.77
CTE × SES	-.187	.050	-3.71**	.007	.020	.35

** $p < .01$.

Table 2.4

Goodness-of-Fit Statistics for Tests of Multiple-Groups Analysis of Career Aspirations for CTE and Other Track Students for Unconditional Latent Growth Curve Model

Model description	Comparative model	χ^2	*df*	$\Delta\chi^2$	Δdf	*p*-value
1.No cross-group constraints on model parameter except for λ_1=0 and λ_4=1	—	92.53	6	—	—	—
2. Model 1 with λ_2 and λ_3 constrained equally	Model 1	98.327	8	5.797	2	.055
3. No cross-group constraints on model parameter except for intercept and slope (fixed at 0, 1, 2, and 3, respectively)	Model 2	107.171	10	8.844	2	.012
4. Model 3 with μ_α constrained equally	Model 3	479.832	11	372.661	1	<.001
5. Model 4 with μ_β constrained equally	Model 4	807.754	12	327.922	1	<.001
6. Model 5 with $\psi_{\alpha\alpha}$, $\psi_{\beta\beta}$, and $\psi_{\alpha\beta}$ constrained equally	Model 5	833.613	15	25.859	3	<.001
7. Model 6 except for removal of constraints on μ	Model 3	132.060	13	24.889	3	<.001
8. Model 7 with VAR (ϵ_1), VAR (ϵ_2), VAR (ϵ_3), and VAR (ϵ_4) constrained equally	Model 7	172.576	17	40.516	4	<.001

Table 2.5

Parameter Estimates, Standard Errors, and R^2 Values for an Unconditional Multiple-Groups Analysis

	Other		CTE	
Parameter	Estimate	*SE*	Estimate	*SE*
Factor means				
Intercept (μ_α)	6.307**	.021	5.392**	.040
Linear (μ_β)	-.126**	.008	-.122**	.016
Factor variances				
Intercept ($\psi_{\alpha\alpha}$)	1.286**	.047	.973**	.085
Linear ($\psi_{\beta\beta}$)	.126**	.008	.117**	.015
Factor covariances				
Intercept—Linear ($\psi_{\alpha\beta}$)	-.233**	.016	-.201**	.031
Unique variances				
VAR (ϵ_1)	1.081	.017	1.346	.037
VAR (ϵ_2)	1.139	.012	1.248	.027
VAR (ϵ_3)	1.080	.008	.925	.025
VAR (ϵ_4)	.656	.034	.453	.028
R^2 *values*				
R_1^2	.543		.420	
R_2^2	.454		.355	
R_3^2	.443		.408	
R_4^2	.609		.644	

** $p < .01$.

Table 2.6

Chi-Square Difference Tests of Multiple-Groups Analysis of Career Aspirations for CTE and Other Track Students for Conditional Latent Growth Curve Model

Model description	Comparative model	χ^2	*df*	$\Delta\chi^2$	Δdf	*p*-value
1. No cross-group constraints on model parameter except for intercept and linear	—	516.16	20	—	—	—
2. Model 1 with gender and SES effects on the random intercepts and random linear components constrained equally	Model 1	551.702	24	35.542	4	<.001
3. Model 2 with μ_α and μ_β constrained equally	Model 2	1041.815	26	490.113	2	<.001
4. Model 3 with $\psi_{\alpha\alpha}$, $\psi_{\beta\beta}$, and $\psi_{\alpha\beta}$ constrained equally	Model 3	1083.650	29	41.835	3	<.001
5. Model 4 withVAR (ϵ_1), VAR (ϵ_2), VAR (ϵ_3), and VAR (ϵ_4) constrained equally	Model 4	1115.364	33	31.714	4	<.001
6. Model 2 except for removal of constraints on μ	Model 2	581.636	27	29.934	3	<.001
7. Model 6 withVAR (ϵ_1), VAR (ϵ_2), VAR (ϵ_3), and VAR (ϵ_4) constrained equally	Model 7	621.293	31	39.657	4	<.001

Table 2.7

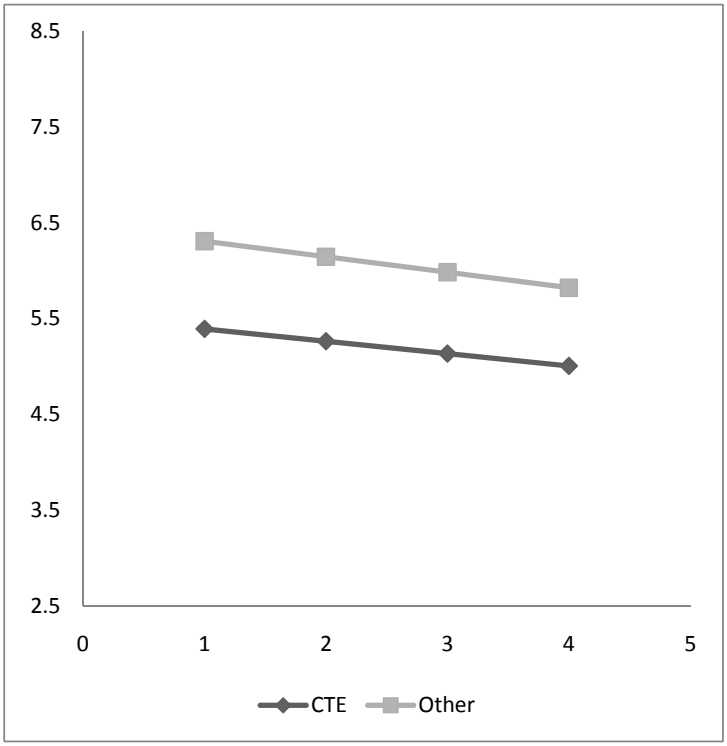
Parameter Estimates, Standard Errors, and R^2 values for a Conditional Multiple-Groups Analysis

	Other		CTE	
Parameter	Estimate	*SE*	Estimate	*SE*
Factor means				
Intercept (μ_α)	6.336**	.029	5.457**	.060
Linear (μ_β)	-.162**	.011	-.129**	.023
Factor variances				
Intercept ($\psi_{\alpha\alpha}$)	1.286**	.047	.973**	.085
Linear ($\psi_{\beta\beta}$)	.126**	.008	.117**	.015
Conditional Covariances				
Intercept—Linear ($\psi_{\alpha\beta}$)	-.226**	.016	-.200**	.031
Covariates				
Female ($\gamma_{\alpha D}$)	-.134**	.042	-.053	.079
SES ($\gamma_{\alpha x}$)	.264**	.021	.076	.045
Female ($\gamma_{\beta D}$)	.080**	.016	.009	.031
SES ($\gamma_{\beta x}$)	-.014	.008	-.006	.018
Unique variances				
VAR (ϵ_1)	1.080	.042	1.343	.091
VAR (ϵ_2)	1.142	.030	1.249	.064
VAR (ϵ_3)	1.076	.028	.925	.047
VAR (ϵ_4)	.660	.032	.453	.052
R^2 *values*				
R_1^2	.544		.420	
R_2^2	.453		.356	
R_3^2	.444		.408	
R_4^2	.608		.644	
R_α^2	.057		.007	
R_β^2	.014		.001	

** $p < .01$.

Figure Captions

Figure 2.1. Model-predicted means for career aspirations from 7th grade through 10th grade for both CTE and other tracks.



Note. CTE=Career and technical education track. Other=Academic and other tracks.

CHAPTER 4

EFFICACY OF DUAL CONCENTRATION CURRICULUM ON THE DEVELOPMENT OF OCCUPATIONAL ASPIRATIONS[3]

[3] Lee, I. H. To be submitted to the *Journal of Vocational Behavior*.

Abstract

Using the Education Longitudinal Study of 2002 (ELS:2002) data sets, the impact of participation in secondary career and technical education on occupational aspirations and their long-term effects was examined. This study employed propensity score analyses with a latent growth curve model (LGM). The unweighted LGM revealed a negative trajectory for occupational aspirations. While curriculum track was significantly associated with the initial prestige level of occupational aspirations, the rate of change was not associated with curriculum track. Results from the weighted LMG analyses revealed different findings from the unweighted model in that the initial prestige levels of occupational aspirations in the two comparison groups, dual and academic concentrators, were not different, nor was the rate of change in career aspirations significantly related to curriculum track, although the trajectories showed the same decreasing pattern. Overall, the study advances our understanding of the developmental nature of career aspiration by demonstrating how they change over time.

Key words: career aspirations, career development, career and technical education, latent growth modeling, longitudinal study, multiple-group analysis, propensity score analysis

Introduction

Career and technical education (CTE), previously known as vocational/technical education, has traditionally played a significant role as an alternative educational route for providing entry-level workforce education below the bachelor's degree level to meet workforce needs (Levesque et al., 1995). However, in an increasingly globalizing economy in which learning and competition are vital components for sustainable economic prosperity, the recasting of educational systems to demand an academically more rigorous education for a highly skilled and knowledgeable workforce has become a key to success around the world. Reflecting this phenomenon, CTE is evolving to encompass academic rigor in the curriculum (e.g., math-enhanced CTE lessons) and to seamlessly connect secondary to postsecondary education (e.g., dual enrollment, career pathways) to prepare a well educated and highly skilled future workforce (Scott & Sarkees-Wircenski, 2008). To respond to the call, educators have altered and improved the definition of vocational and technical education that was provided in the Carl D. Perkins Vocational and Technical Education Act of 1998, expanding the possibility of CTE to prepare students for careers requiring further education by excluding the restriction of preparing individuals for careers requiring less than a baccalaureate degree (Stern & Stearns, 2006) and lessening the negative stigma associated with vocational education (Castellano, Stringfield, & Stone, 2003).

Until recently much of the research on the effectiveness of CTE on secondary and postsecondary outcomes has focused on high school graduation, academic achievement, and economic returns, often revealing contradictory results (see Ainsworth & Roscigno, 2005; Arum, 1998; Arum & Shavit, 1995; Bishop & Mane, 2004; Carbonaro, 2005; Castellano, Stone, Stringfield, Farley, & Wayman, 2004; Kang & Bishop, 1989; Kemple & Scott-Clayton, 2004;

Kober & Rentner, 2000; Lewis, Hern, & Zilbert, 1993; Mane, 1999; Meer, 2007; Plank, 2001; Plank, DeLuca, & Estacion, 2008). For example, Ainsworth and Roscigno attempted to determine whether participation in vocational education was likely to reproduce race, class, and gender inequalities and affect students' educational and occupational trajectories in their late adolescence. They found that significant inequalities in gender, race, and class existed, even holding educational expectations and prior academic achievement constant. Whereas participation in CTE programs tend to reduce unemployment later on, students experienced in CTE are more likely to drop out of high school and less likely to attend college. However, some research has revealed significantly positive effects of CTE experience. For example, using the program for international student assessments (PISA) in 2000 and 2001 to examine the effectiveness of CTE availability on reducing high school dropout rates, Bishop and Mane found that while students were maintaining test scores at age 15 or college attendance rates after the age of 20, the availability of the CTE option tended to reduce upper-secondary dropout rates and to improve labor market outcomes without the need for participants to enter and complete a postsecondary education.

In contrast to previous effectiveness studies of CTE, the recent study of Kelly and Price (2009) examined the effectiveness of CTE on students' psychological adjustment to school, including effort, extracurricular participation, sense of belonging, lack of interest in school, attitudes toward school and teachers, educational expectations, career aspirations, locus of control, and self-concept. They found that prospective CTE students were not significantly different in terms of social psychological engagement constructs such as attitudes towards school, sense of belonging, and level of effort when compared to their counterparts. Although they found that involvement in the CTE curriculum tended to decrease students' educational and

occupational expectations or aspirations, they argued that it was not necessarily a negative outcome in that most students tended to show high expectations and aspirations in their early adolescence. Kelly and Price (2009) concluded that "the instructional environment in high school vocational courses is not as different from traditional coursework (p. 822)."

The National Center for Education Statistics (NCES) classifies high school students into four types: academic, CTE, dual (both academic and CTE), and general concentration (Levesque et al., 2008). Dual concentrators are identified as students who complete both a CTE concentration (3 or more CTE units in at least one field) and a college preparatory concentration. However, recently CTE concentrators were redefined as students who earned 2 or more CTE units in a CTE concentration (Hudson & Laird, 2009). Since relatively little research has focused on dual concentrators and the efficacy of the inclusion of CTE courses on the development of psychological constructs, I set out in this study to explore the developmental trajectory of occupational aspirations and the effect of the inclusion of CTE courses with academic courses on growth in occupational aspirations; i.e., I wanted to determine whether the developmental trajectory of occupational aspirations in dual concentrators was different from that in academic concentrators.

Although career aspirations are formulated early in life, they remain relatively stable throughout childhood and adolescence (Rojewski, 1999; Rojewski & Kim, 2003; Rojewski & Yang, 1997; Trice & King, 1991). Generally, early adolescents are inclined to express occupational aspirations that reflect their desire to have future occupations associated with high prestige and high social status, whether or not they actually have a realistic chance of attaining those goals (Mau & Bikos, 2000; Rojewski, 2005; Rojewski & Yang). These aspirations are diminished, i.e., compromised, when adolescents realize their lack of abilities academically,

physically, or financially; perceive significant barriers to attain their goals; or find that their goals are opposed by their families (Armstrong & Crombie, 2000; Davey & Stoppard, 1993; Gottfredson, 1996; Lee & Rojewski, 2009; McNulty & Borgen, 1988; Rojewski, 2005).

Aspirations play a significant role in prompting planning, guiding learning, helping organize life options and choices, and contributing to individuals' preparation for adult life (Gottfredson, 2005). However, the exact role of career aspirations in the career development–choice–attainment process is still somewhat unclear and depends to some degree on the theoretical perspective one adopts. From a developmental and social cognitive perspective, aspirations can be viewed as indicators of self-concept or as a component of career self-efficacy, outcome expectations, and goals (Lent, Brown & Hackett, 1996; Super, Savickas, & Super, 1996).

The developmental characteristics of career aspirations are supported by a number of theoretical perspectives, including Super's (1990) life-span, life-space theory, Gottfredson's (1981, 2005) theory of circumscription and compromise, and Vondracek, Lerner, and Schulenberg's (1986) developmental-contextual approach to career development. Whereas most other developmental theories of career development focus on the initial stage of the career choice process that usually take place in early or later adolescence (Osipow & Fitzgerald, 1996), Super's life-span, life-space theory covers career development over the life course. Super's (Super et al.) theory argues that individuals experience their career-related life stage over the life span and that career choices and one's ability to adjust to an occupation depend on an individual's developmental stage. More specifically, Super viewed the following tasks as a series of predictable developmental stages, including, growth, exploration, establishment, maintenance, and disengagement, spanning an individual's life: developing curiosity, fantasies, and early interests; being aware of and concerned about one's future career; crystallizing, specifying, and

implementing a career; stabilizing, consolidating, and advancing a career; holding, updating, and innovating a career; and planning for and anticipating a retirement . The exploration stage that usually takes place in adolescence is an important period in developing and crystallizing career aspirations. This stage involves the tasks of crystallizing, specifying, and implementing a career. Adolescents who are successful are resolute in fulfilling these tasks as they determine their areas of interest and level of work, select their occupation, and plan to attain their desired career.

Self-concept can be defined as views or beliefs about oneself. An adolescent's occupational self-concept is the significant determinant of successful resolution of the three tasks during this stage. Individuals who have a good understanding of themselves at any given point in their lives can select careers that enable them to exercise their self-concept, resulting in the development of a self-concept that influences their career aspirations and choices over time (Gelso & Fretz, 1992). In regard to self-concept, it stands to reason that career choices may change as additional life roles develop and change.

The formation of career aspirations from a developmental perspective is well supported by Gottfredson's (1981, 2005) theory of circumscription and compromise. The process of eliminating career options and narrowing possible options takes place in a series of four stages, including size and power (e.g., individuals begin classifying the world into adults and children and begin realizing that adults are assigned occupational roles, 3 to 5 years of age), sex roles (e.g., individuals become cognizant of the distinction between male and female occupations, develop a tolerable sex-type boundary, and often state a preference for same sex-type occupations, 6 to 8 years of age), social valuation (e.g., individuals become aware of the occupational hierarchy, begin to associate occupational prestige with income, education, and overall lifestyle, and express preferences for occupations whose prestige is consistent with the

standards set by their social reference group, 9 to 13 years of age), and unique self (e.g., individuals evaluate the occupational choices they have retained as acceptable in terms of gender and prestige, by using personal criteria, including interests, values, personality, aptitudes, experiences, and family needs, and seek career choices that are compatible with their self-perception, 14 years of age and older).

Gottfredson (1996) viewed the elimination of possible alternatives in the early stages as an unconscious process that becomes a conscious process in the final stage of unique self. An important component of this stage is the development of idealistic and realistic career aspirations that refer to compromise as the process of giving up unattainable and inaccessible occupational options for more attainable and realistic occupational alternatives. Through a developmental process, the gradual elimination of unacceptable occupational alternatives, referred to as circumscription, takes place resulting in perceptions of acceptable careers within a zone of acceptable alternatives. In this process, cognitive maturation, which includes the development of a self-concept, plays a significant role in career development. Gottfredson (1981) noted that career preferences are tightly bound to self-concept because one's career is an overt social expression of one's self-concept.

Expanding on Bandura's (1977, 1986) social cognitive theory, Social Cognitive Career Theory (SCCT; Lent, Brown, & Hackett, 1994) provides a framework for understanding the interplay between the individual, contextual, and learning factors and their contribution to the career development process. This theory addresses why students aspire to, decide on, or persist in particular types of careers and academic domains, as well as experience success or failure that affects particular academic or career behaviors. The central construct of SCCT encompasses self-efficacy, outcome expectations, goals, and contextual support or barriers. Self-efficacy, which

refers to an individual's beliefs about his or her ability to perform a specific behavior, is a core element that enables individuals to organize themselves and take actions to obtain an outcome. Outcome expectations refer to the consequences of succeeding or failing at a given task. Goals are viewed as the determination to be involved in particular activities or produce a future outcome. Contextual supports or barriers refer to identified supports or barriers that come with one's attempts at achieving any goal.

Despite research on the impact of CTE on occupational aspirations and its long-term effects, relatively little is known about the impact of curriculum differences on the longitudinal development of career aspirations. I investigated this issue by employing propensity score analyses with a latent growth curve model (LGM). Propensity score analyses enable researchers to approximate the randomized controlled trials at a given observational data point. That is, propensity score analyses can be used to evaluate the causal effect of treatments when a randomized controlled trial is not feasible (Rosenbaum, 2002). Propensity scores represent the predicted probability of being involved in a treatment (Rosenbaum & Rubin, 1983). Using estimated propensity scores, researchers can approximate a randomized controlled experiment that sets up control and treatment cases equivalently on selected covariates (Rosenbaum & Rubin, 1985). I hypothesized that participants would show different growth patterns in occupational aspirations before the approximation of randomized controlled trials. However, I expected that after adjusting for potential confounders associated with participation in CTE and occupational aspirations, individuals would show similar trajectories of occupational aspirations.

Method

Data and Sample

The data for this study were drawn from the restricted base-year through second follow-up surveys of the Education Longitudinal Study of 2002 (ELS:2002), administered by the National Center for Education Statistics (NCES). The purpose of the ELS:2002 was to examine and better understand various education-related issues raised by the transition from high school to postsecondary education, the workforce, or adulthood. Implementing a two-stage stratified probability sampling design, (i.e., schools as the first-stage unit and a random sample of students within each school as the second-stage unit), ELS:2002 initially selected a nationally representative probability sample of 15,362 U.S. high school sophomores in 752 public, Catholic, and other private schools in the spring term of 2002 (Ingels et al., 2007).

To examine the effect of a dual curriculum on the trajectory of career aspirations, I selected the second complete follow-up panel, in which students were classified as either academic or dual concentrators across three data collection points. The resulting initial sample size was 3,460. Out of 3,460 participants, 2,890 (83.6%) were academic concentrators and 570 (16.4%) were dual concentrators. The group of academic concentrators was 48% male and 52% female, while dual concentrator group was 50% male and 50% female. The ethnic distribution of academic concentrators included White, non-Hispanic (67%), American Indian/Alaska Native, non-Hispanic (1%), Asian, non-Hispanic (13%), Black or African-American, non-Hispanic (7%), Hispanic, no race specified (3%), Hispanic, race specified (5%), more than one race, non-Hispanic (4%), and Native Hawaii/Pacific Islander, non-Hispanic (0%). The ethnic distribution of dual concentrators included White, non-Hispanic (63%), American Indian/Alaska Native, non-Hispanic (0%), Asian, non-Hispanic (12%), Black or African-American, non-Hispanic

(12%), Hispanic, no race specified (3%), Hispanic, race specified (7%), more than one race, non-Hispanic (3%), and Native Hawaii/Pacific Islander, non-Hispanic (0%). Also, the average socioeconomic status (SES) of academic concentrators was 0.46, while that of dual concentrators was 0.20. Further information about participants' demographic characteristics appears in Table 3.1.

Measures

Curriculum track. Participants' curriculum track status (academic=0, dual=1) was classified using students' transcript data, including the Classification of Secondary School Courses (CSSC) code, a comprehensive course coding system that classifies courses into broad subject areas (Bozick et al., 2006), assigned to each course and the Standardized Credits in Carnegie units (SCCU), a standardization of course credits based on the amount of time spent on a subject during the high school years (Shedd, 2003), for each course. First, I multiplied the CSSC by the SCCU to standardize the number of units across participants. Next, based on 12 occupational concentration areas (incl., agriculture and natural resources, communications and design, computer and information sciences, health sciences, marketing, business, engineering technologies, construction and architecture, manufacturing, repair and transportation, consumer and culinary services, and public services), I created an indicator variable of the number of units in each occupational area in which participants earned credits in order to define occupational concentrators who earned at least 2.0 credits within an occupational area (Hudson & Laird, 2009). After defining occupational concentrators using the curriculum concentration variable indicated by transcripts, I classified participants as either academic or dual concentrators (academic=0, dual=1).

Career aspirations. Career aspirations were obtained by asking participants at three time points to indicate the job they expected to have at age 30 from a list of 17 occupational categories. These categories were coded using the socioeconomic index (SEI) codes calculated by Stevens and Cho (1985). The categories were assigned a continuous score (Hotchkiss & Borow, 1996). The SEI measure has a long history of use in the sociology literature, and the validity and reliability of the SEI have been supported (Hauser, Sewell, & Warren, 1994). Because measures of career aspirations categories through successive follow-ups were different, I also coded occupations by prestige category (low, medium, and high prestige). For example, occupations such as *homemaker* were assigned an SEI value of 15.71 (lowest score) and included in the low prestige category. Occupations reflecting professions were assigned SEI values of 68.51 (highest score) and included in the high prestige category. Similar coding decisions and placement into appropriate prestige categories were made for the remaining occupations. All SEI scores were transformed by dividing them by 10 to facilitate statistical analysis.

Covariates for propensity score estimation.

Based on the Social Cognitive Career Theory (SCCT), I selected covariates to include in the propensity score model. SCCT posits that self-efficacy is predicted by personal input, contextual affordances (e.g., socioeconomic status, gender), previous learning experience and failure (e.g. learning, academic achievement), and contextual influences (e.g., school type, availability of a vocational program, opportunity of planning career development), that it influences outcome expectations and interests, and that eventually these constructs predict goals (e.g., educational and occupational aspirations). These interrelationships between central constructs explained by direct or indirect paths provide a framework for understanding SCCT. Although the construct of career aspiration was not proposed in SCCT, it seems to reflect goals. Thus, an individual's self-

efficacy, outcome expectations, and interests partly cause the construct of career aspirations; they can be viewed as "important mediators of motivation and development" (Rojewski, 2005, p. 137). Thus, I posited that a combination of these important constructs affect involvement in the CTE program and relate to the development of career aspirations. These factors were used to form the analysis model (see Table 3.1). Fifty-six variables from the ELS:2002 data set were selected for the propensity score model. Specifically, seven variables for person inputs (e.g., sex, ethnicity, native language, school suspension/probation), four variables for background contextual affordances (e.g., SES, mother's and father's educational expectations, parent involvement) , three variables for self-efficacy expectations (base-year and first-follow-up math self-efficacy, base-year reading self-efficacy), 13 variables for learning experiences (e.g., retention, academic honor, experience of work-based learning, academic achievement, GPA), four variables for outcome expectations (importance of good grades, student's educational expectation, postsecondary education plan), six variables for interests (participation in science/math fair, voc/tech skills competition, and school academic clubs) , eight variables for contextual influences (e.g., school control, geographic region of school, opportunity of career development, availability of voc/tech program) and one variable for goals (e.g., base-year career aspirations).

Data Preparation

Observational data often contain some degree of missing data, resulting in potential problems with reliability and validity of research findings (McKnight, McKnight, Sidani, & Figueredo, 2007). Of the available missing value treatment methods, I selected the multiple imputation method using the Amelia II program with the expectation maximization (EM) algorithm to create 10 multiply imputed data sets (Honaker, King, & Blackwell, 2010). To assess whether the distribution of multiply imputed data sets was similar to that of the observed data sets, I

compared density distributions of imputed values and the distribution of the observed values, but no irregular distributions were found. Table 3.2 presents the pooled means and correlations for curriculum track, the base year, first follow-up, and second follow-up measures of career aspirations.

Propensity Score Estimation and Matching Algorithm

To estimate the causal effect of the dual curriculum on the development of career aspirations, I used the boosted logistic regression model to estimate propensity scores that reflect the probability of a participant choosing the dual curriculum, conditional on observed covariates. The advantage of boosted regression is its flexibility in capturing nonlinear effects and interaction terms and in handling a large number of covariates, resulting in a better estimation than binary logistic and probit regression models (McCaffrey, Ridgeway & Morral, 2004)

Using the estimated propensity scores, I created two propensity score weights to estimate an asymptotically unbiased estimate of the causal parameter of curriculum choice, including a standardized mortality/morbidity ratio (SMR) estimator (i.e., assigning weight that is calculated by dividing propensity score into one minus propensity score to control cases) to estimate the treatment effect on the treated and the inverse probability of treatment weight (IPTW) estimator (e.g., assigning weight of inverse of propensity score to treatment cases and assigning weight of inverse of one minus propensity score to control cases) to estimate the average treatment effect (Robins, Hernan, & Brumback, 2000; Sato & Matsuyama, 2003). I also employed a full matching strategy to data to control for confounding associated with measured covariates under the assumption of no unmeasured confounders. The full matching method is the "optimal form of stratification" (p. 161) in which all available samples are stratified into matched sets either containing one treated case and one or more control cases or containing one or more treated

cases and one control case. The full matching method is "optimal in terms of minimizing a weighted average of the estimated distance measure between each treated subject and each control subject within each subclass" (Ho, Imai, King, & Stuart, 2009, p. 11).

Statistical Analyses

A latent growth curve model was employed to examine the curriculum effect on the development of career aspirations over a 6-year period. As the estimation method for the model, I used a robust maximum likelihood (MLR) estimator provided by M*plus* 6.0 that allows parameters to be estimated with standard errors and a mean-adjusted chi-square test statistic robust to non-normality (Muthén & Muthén, 1998–2007). Although it is critical to accommodate appropriate sampling weights, strata, and clusters to avoid biased parameter and standard error estimates in analyzing large data sets developed by complex sampling design (Asparouhov, 2005), this study does not consider the design effects to examine the causal influence of dual curriculum on the development of career aspirations. Instead, propensity score weights are accommodated for the analyses to approximate a randomized controlled trial.

Results

Assessment of Matching Quality

To assess the extent to which propensity score matching was successful, meaning that differences in covariates between treatment and control groups were minimized, I compared covariates by treatment and control groups before and after matching. I employed regression analysis for continuous covariates, binary logistic regression for binary covariates, ordinal logit model for ordered categorical covariates, and multinomial logit model for multiple categorical covariates to check for significant differences between treatment and control groups. Table 3.1 shows matching differences on covariates between treatment and control groups. However, after

matching, the differences were minimized and most covariates, except for Native Hawaii/Pacific Islander, participated in school vocational clubs, and other private in school control, were not statistically different between treatment and control groups, concluding that well balanced samples were matched.

Model Selection and Fit Indexes

Because ELS:2002 data only provide a second follow-up study, meaning that the longitudinal variable for career aspirations only has three-time points, the current study reports the findings of a linear latent curve model. In the model, I fixed intercept loadings for all the time points at 1. Because the initial status for the current study is the second time point (at 10th grade), slope loadings for each time point were fixed at -2, 0, and 2, respectively.

To assess whether models demonstrated good fit for each model, I used χ–square statistics and four different indexes by setting a priori acceptable criteria for model fit, including standardized root mean square residual (SRMR) $\leq$0.08, root mean square error of approximation (RMSEA) $\leq$0.08, comparative fit index (CFI) $\geq$ 0.95, and Tucker-Lewis index (TLI) $\geq$ 0.90 (Bollen & Curran, 2006; Hu & Bentler, 1998, 1999; Marsh, Hau, & Wen, 2004). However, as current software does not provide fit indexes that consider multiply imputed data sets, I reported mean fit indexes with standard deviations.

In the unweighted model, the chi-square test of model fit was not statistically significant [$\chi^2(2) = 3.38$, SD=1.89]. Also, the overall fit indexes strongly suggested that the hypothesized model fit the data well [SRMR=0.01 (SD=0.00); RMSEA =0.01 (SD=0.01); CFI=1.00 (SD=0.00); and TLI=0.99 (SD=0.01)]. In the propensity score weighted models, overall fit indexes strongly suggested that the hypothesized models fit the data well (see Table 3.3).

Unweighted Latent Growth Model Analysis

To test the effect of curriculum track on latent growth factors, a dummy variable of curriculum track was introduced to the linear latent growth model. The intercept of the unweighted model was 6.13, indicating that, on average, academic track participants reported career aspiration scores of 6.13 units, reflecting high prestige, at the second time point (10th grade). The average rate of change in the slope was -0.08, meaning that, on average, career aspiration scores for students on the academic track decreased 0.08 points per year. That is, career aspiration scores for academic track 8th graders are 0.16 points higher than those of 10th graders on the same track. After high school graduation, on average, career aspiration scores for academic track participants decreased 0.16 points between each assessment. Both the mean intercept and mean slopes differed significantly from zero ($p < 0.01$). The R^2 values within each time point ranged from 0.23 to 0.36 [0.27, 0.23, and 0.36, respectively], indicating that the proportion of the observed variability in career aspiration scores explained by the underlying latent growth factors ranged from 23% to 36%.

The curriculum track was significantly associated with the intercept factor (-0.15), indicating that dual concentrators held lower initial aspirations in grade 10 than academic concentrators. However, the slope was not significantly associated with curriculum track. That is, compared to academic concentrators, dual concentrators had a 0.02-unit lower average growth in career aspiration scores across years. Coefficient estimates and standard errors for the effects of curriculum track on the intercept and slope appear in Table 3.4.

Weighted Latent Growth Model Analysis

To approximate the randomized controlled trial to test the effect of curriculum track on the development of career aspirations, I employed the same linear latent growth model as the

previously tested model, except for accommodating with three different weights, including SMR weights, inverse probability treatment weights, and weights generated by a full matching. The intercept of the SMR-weighted model was 6.03, indicating that, on average, academic track participants reported career aspiration scores of 6.03 units, reflecting high prestige, at the second time point (10th grade). The average rate of change in the slope was -0.09, meaning that, on average, career aspiration scores for students on the academic track decreased 0.09 points per year. That is, career aspiration scores for 8th graders on the academic track were 0.18 points higher than those of 10th graders on the academic track. After high school graduation, on average, career aspiration scores for academic track participants decreased 0.09 points across years. Both the mean intercept and mean slopes differed significantly from zero ($p < 0.01$). The R^2 values within each time point ranged from 0.22 to 0.37 [0.22, 0.24, and 0.37, respectively], indicating that the proportion of the observed variability in career aspiration scores explained by the underlying latent growth factors ranged from 22% to 37%.

The curriculum track was not significantly associated with the intercept factor (-0.05), indicating that although the initial level of career aspiration for dual concentrators was lower than that of academic concentrators, this difference was not statistically significant. Also, the slope was not significantly associated with curriculum track. That is, although dual concentrators had a 0.01 units faster average decreasing trend compared to academic concentrators across year, the difference is trivial. The findings of two different weighted models also supported that of the odds-weighted model.

The IPTW estimator and full matching models also provided results similar to those of the odds-weighted model. Further coefficient estimates and standard errors of the IPTW estimator

and full matching for the effects of curriculum track on the intercept and slope appear in Table 3.4.

Discussion

The current study supports developmental perspectives of occupational aspirations that may change over time and become gradually more stable as adolescents mature (Gottfredson, 1996; Super et al., 1996). Specifically, examination of the developmental trajectories of occupational aspirations using the unweighted latent growth model supports the hypothesis that occupational aspirations show different growth patterns between two curriculum tracks although the two show patterns of decreasing aspirations. However, after the approximation of a randomized controlled experiment using propensity score weighting, the comparative groups do not reveal different trajectories of occupational aspirations.

Both unweighted and weighted latent growth model estimates reveal an interesting picture. In the unweighted model, occupational aspirations showed negative growth movement to less prestigious occupations over time. This finding is surprising given the previous literature demonstrating that occupational aspirations tend to increase before high school graduation and decrease afterwards. According to Lee and Rojewski (2009), this trend accounts for "appropriate adjustments to desired occupational goals as young adults crystallize their interest, assess their strengths and abilities, encounter work-related challenges and competition, and recognize educational and career opportunities or barriers" (p. 88). The current findings do not support previous studies indicating that occupational aspirations show a decreasing pattern before high school graduation. This seems to suggest that career compromise is accentuated for both academic and dual concentrators during their high school years rather than around the time of high school graduation. The inconsistent results between the present study and Lee and

Rojewski's study might be explained by the current study's use of a recently collected high school sample, meaning that the pressure to make career-related choices based on an assessment of job availability and attainability has changed and increased among young adolescents as compared with adolescents at the same age in 1990. Research that investigates how this phenomenon takes place in young adolescents today compared with adolescents in the past might offer interesting insights.

Results from the weighted latent growth model analyses reveal different findings from those of the unweighted model in that the initial levels of occupational aspirations in the two comparison groups were not different, nor was the rate of change in career aspirations significantly related to curriculum track, although the trajectories show the same decreasing pattern. Although academic concentrators held higher aspirations than dual concentrators, after adjusting for confounding variables related to the selection of curriculum and outcome variables, the initial level and the rate of change in occupational aspirations were not different between dual and academic concentrators. That is, if academic concentrators who had a high chance of being involved in a dual concentration program actually participated in a dual program, their aspirations were not significantly different from what they would have been had they been involved in an academic program. This does not mean that the academic curriculum was not successful in leveraging students' occupational aspirations nor was the dual curriculum better than the academic curriculum for the development of occupational aspirations. The finding suggests that the dual curriculum might be more promising for implementing diverse career development intervention programs, ensuring the development and maintenance of occupational aspirations. Further analysis is needed to determine whether curriculum differences in

occupational aspirations are tenable and which intervention programs would be effective and efficient with the dual curriculum.

Another important finding was that there was no difference in the rate of change in career aspirations between academic and dual concentrators when adjusting for confounding variables. This finding means that although academic concentrators held higher aspirations than dual concentrators, the impact of the program on aspirations was not visible. In other words, dual programs have a great possibility of enhancing and implementing various career development interventions. For example, Castellano et al. (2003) provided a thorough review of secondary CTE reform efforts in conjunction with comprehensive school reforms, found a lack of research on the intersection of CTE with comprehensive school reform, and made a recommendation regarding the need for a seamless bridge from CTE into the academic curriculum, "thereby making the academic curriculum more relevant and engaging and making the vocational curriculum more appealing, and lessening the status distinction between career-bound and college-bound students" (p. 261). Gray (2004) also argued that CTE experience helps students to make more effective career plans as "a prerequite to making their postsecondary plans" and to verify in a real-world context their tentative preference for careers (p. 134). However, further attention should be given to determining if the impact of a dual program on career aspirations is viable.

Results of this study have important implications for policy makers, counselors, and teachers. Above all, career aspirations will continue to play a vital role in affecting students' academic and vocational behaviors and outcomes. Those students who show low career aspirations could be targeted for intervention to improve their aspirations and consequently enhance the possibility of planning, building, and attaining desired careers. Also, it is interesting that less is known about

the students who are stable in their career aspirations and which factors are related to this phenomenon. Future research efforts to explain these factors may provide counselors and administrators with valuable information to assist in guiding students' career development efforts.

Several limitations of the present study should be noted. First is the nature of the data set and its variables. To estimate career aspirations, I used SEI codes that reflect the prestige level of the occupation to transform categorical variables into continuous variables. More reliable and valid measures of occupational aspirations should be employed or developed. For example, using a occupational aspirations variable that reveals an individual's self-reported aspirations, a researcher can measure aspirations more accurately by directly assigning SEI scores to a student's response. In addition, because I used the multiple imputation method, which has many of the limitations involved in using conventional statistical analyses, I cannot actually estimate exact fit-indexes that do not allow me to employ a multiple group analysis that enables the comparison of the difference of intercept, slope, variances, etc. Furthermore, although ELS:2002 is a longitudinal study, I cannot consider accommodating several longitudinal variables that might produce biased estimations for repeated measures while conducting the multiple imputation and propensity score estimation. More analytical strategies using multiple imputation longitudinal data sets with propensity score analysis should be developed for future studies.

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Table 3.1

Pretreatment Characteristics and Group Differences between Academic and Dual Concentrators on All Covariates Before and After Propensity Score Weighting

	Unweighted					SMR weighted					IPTW					Full matching				
	Academic		Dual			Academic		Dual			Academic		Dual			Academic		Dual		
covariate	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*
Person inputs																				
Sex - composite (recoded)					-1.02					-0.75					-0.55					-0.12
Male	0.48	0.01	0.50	0.02		0.48	0.02	0.50	0.02		0.48	0.01	0.49	0.03		0.49	0.04	0.50	0.02	
Female	0.52	0.01	0.50	0.02		0.52	0.02	0.50	0.02		0.52	0.01	0.51	0.03		0.51	0.04	0.50	0.02	
F1 student's race/ethnicity-composite (restricted & recoded)																				
White, non-Hispanic	0.67	0.01	0.63	0.02		0.64	0.02	0.63	0.02		0.67	0.01	0.67	0.02		0.62	0.04	0.63	0.02	
American Indian/Alaska Native, non-Hispanic	0.01	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.77
Asian, non-Hispanic	0.13	0.01	0.12	0.01	-0.15	0.11	0.01	0.12	0.01	0.58	0.13	0.01	0.14	0.02	0.40	0.09	0.01	0.12	0.01	1.51
Black or African-American, non-Hispanic	0.07	0.01	0.12	0.01	4.83	0.12	0.01	0.12	0.01	0.56	0.08	0.01	0.09	0.01	0.63	0.14	0.03	0.12	0.01	-0.46
Hispanic, no race specified	0.03	0.00	0.03	0.01	-0.81	0.03	0.01	0.03	0.01	-0.38	0.03	0.00	0.02	0.01	-1.33	0.03	0.01	0.03	0.01	-0.33
Hispanic, race specified	0.05	0.00	0.07	0.01	1.73	0.06	0.01	0.07	0.01	0.36	0.05	0.00	0.05	0.01	-0.40	0.09	0.03	0.07	0.01	-0.81
More than one race, non-Hispanic	0.04	0.00	0.03	0.01	-0.18	0.03	0.01	0.03	0.01	0.05	0.04	0.00	0.04	0.01	0.21	0.03	0.01	0.03	0.01	0.30
Native Hawaii/Pacific Islander, non-Hispanic	0.00	0.00	0.00	0.00	-89.96	0.00	0.00	0.00	0.00	-12.51	0.00	0.00	0.00	0.00	-22.98	0.00	0.00	0.00	0.00	-6.46
F1 family composition (recoded)					2.71					-0.39					0.30					-0.88
Mother and Father	0.75	0.01	0.70	0.02		0.69	0.02	0.70	0.02		0.74	0.01	0.73	0.02		0.66	0.04	0.69	0.02	
Others	0.25	0.01	0.31	0.02		0.31	0.02	0.31	0.02		0.26	0.01	0.27	0.02		0.34	0.04	0.31	0.02	
F1 whether English is student^s native language-composite					0.93					-0.27					1.94					-1.31
No	0.15	0.01	0.14	0.01		0.13	0.01	0.14	0.01		0.15	0.01	0.12	0.01		0.11	0.02	0.14	0.01	
Yes	0.85	0.01	0.86	0.01		0.87	0.0	0.86	0.01		0.85	0.01	0.89	0.01		0.89	0.02	0.86	0.01	
					2.72					0.30					0.29					-0.49

	Unweighted					SMR weighted					IPTW					Full matching				
	Academic		Dual			Academic		Dual			Academic		Dual			Academic		Dual		
covariate	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*
How many times put on in-school suspension (recoded)																				
Never	0.97	0.00	0.95	0.01		0.95	0.01	0.95	0.01		0.97	0.00	0.97	0.01		0.94	0.02	0.95	0.01	
1-2 times	0.03	0.00	0.04	0.01		0.04	0.01	0.04	0.01		0.03	0.00	0.03	0.01		0.05	0.02	0.04	0.01	
3 or more times	0.00	0.00	0.01	0.00		0.01	0.00	0.01	0.00		0.00	0.00	0.01	0.01		0.01	0.01	0.01	0.00	
How many times suspended/put on probation (recoded)					1.59					0.47					-0.19					-0.22
Never	0.98	0.00	0.97	0.00		0.98	0.01	0.97	0.00		0.98	0.00	0.98	0.01		0.97	0.02	0.97	0.01	
1-2 times	0.02	0.00	0.03	0.01		0.02	0.01	0.03	0.01		0.02	0.00	0.02	0.01		0.03	0.02	0.03	0.01	
3 or more times	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.01	0.00	0.00	
How many times transferred for disciplinary reasons (recoded)					-0.00					-0.00					-0.01					-0.00
Never	0.99	0.00	0.99	0.00		0.99	0.00	0.99	0.00		0.99	0.00	0.99	0.00		0.99	0.00	0.99	0.00	
Yes	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.01	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
Background contextual affordances																				
F1 socio-economic status composite, v.2 (restricted)	0.46	0.13	0.20	0.03	-8.57	0.24	0.02	0.20	0.03	-1.06	0.43	0.01	0.42	0.03	-0.28	0.15	0.05	0.20	0.03	0.91
How far in school mother wants respondent to go (recorded)																				
More than graduate from college	0.87	0.01	0.84	0.01		0.84	0.01	0.84	0.01		0.87	0.01	0.87	0.02		0.82	0.00	0.84	0.01	
Less than 4-year college graduation	0.09	0.01	0.13	0.01	3.17	0.12	0.01	0.13	0.01	0.35	0.09	0.01	0.10	0.01	0.37	0.15	0.03	0.13	0.01	-0.54
Don't know	0.04	0.00	0.03	0.01		0.04	0.01	0.03	0.01		0.04	0.00	0.03	0.01		0.03	0.01	0.03	0.01	
How far in school father wants respondent to go (recorded)																				
More than graduate from college	0.86	0.01	0.81	0.02	3.74	0.81	0.01	0.81	0.02	0.44	0.85	0.01	0.84	0.02	0.78	0.79	0.04	0.81	0.02	-0.44
Less than 4-year college graduation	0.08	0.01	0.13	0.01	-0.36	0.12	0.01	0.13	0.01	-0.90	0.09	0.01	0.10	0.01	-0.56	0.15	0.04	0.13	0.01	-0.81
Don't know	0.06	0.01	0.06	0.01		0.07	0.01	0.06	0.01		0.06	0.01	0.06	0.01		0.07	0.02	0.06	0.01	
Parent Involvement	18.19	0.06	18.20	0.13	0.12	18.10	0.11	18.20	0.13	0.60	18.17	0.06	18.24	0.15	0.44	18.01	0.31	18.21	0.13	0.57
Self-efficacy expectations																				
BY Math self-efficacy	14.04	0.08	14.15	0.17	0.58	14.15	0.14	14.15	0.17	0.02	14.06	0.08	14.15	0.21	0.39	14.24	0.38	14.15	0.17	-0.22
BY Reading self-efficacy	14.57	0.08	14.40	0.16	-0.95	14.49	0.13	14.40	0.16	-0.51	14.56	0.08	14.63	0.18	0.40	14.40	0.31	14.40	0.15	0.01
F1 Math self-efficacy	14.07	0.07	14.05	0.15	-0.14	14.02	0.11	14.05	0.15	0.15	14.06	0.07	14.04	0.19	-0.07	14.10	0.30	14.05	0.15	-0.17

	Unweighted					SMR weighted					IPTW					Full matching				
	Academic		Dual			Academic		Dual			Academic		Dual			Academic		Dual		
covariate	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*
Learning experiences																				
10th grader ever held back a grade					1.90					0.78					0.64					0.21
No	0.95	0.00	0.94	0.01		0.95	0.01	0.94	0.01		0.95	0.01	0.95	0.01		0.94	0.02	0.94	0.01	
Yes	0.05	0.00	0.07	0.01		0.05	0.01	0.07	0.01		0.05	0.01	0.06	0.01		0.06	0.02	0.06	0.01	
Won an academic honor					-0.24					0.11					1.26					0.33
No	0.44	0.01	0.45	0.02		0.45	0.02	0.45	0.02		0.44	0.01	0.41	0.03		0.46	0.04	0.45	0.02	
Yes	0.56	0.01	0.55	0.02		0.55	0.02	0.55	0.02		0.56	0.01	0.59	0.03		0.54	0.04	0.55	0.02	
Ever in Advanced Placement program					-0.82					-0.67					0.04					-0.50
No	0.72	0.01	0.74	0.02		0.72	0.02	0.74	0.02		0.72	0.01	0.72	0.02		0.72	0.04	0.73	0.02	
Yes	0.28	0.01	0.27	0.02		0.28	0.02	0.27	0.02		0.28	0.01	0.28	0.02		0.28	0.04	0.27	0.02	
Ever in part-time program at regional vocational school					1.55					0.37					0.55					-0.19
No	0.95	0.00	0.94	0.01		0.94	0.01	0.94	0.01		0.95	0.01	0.94	0.01		0.93	0.03	0.94	0.01	
Yes	0.05	0.00	0.06	0.01		0.06	0.01	0.06	0.01		0.05	0.01	0.06	0.01		0.07	0.03	0.06	0.01	
Ever in career academy					2.35					0.32					0.12					-0.00
No	0.95	0.01	0.93	0.01		0.93	0.01	0.93	0.01		0.95	0.01	0.95	0.01		0.93	0.03	0.93	0.01	
Yes	0.05	0.01	0.07	0.01		0.07	0.01	0.07	0.01		0.05	0.00	0.05	0.01		0.07	0.03	0.07	0.01	
Ever in program to help prepare for college					-0.24					-0.67					-0.54					-0.54
No	0.76	0.01	0.76	0.02		0.75	0.01	0.76	0.02		0.75	0.01	0.77	0.02		0.74	0.04	0.76	0.02	
Yes	0.14	0.01	0.24	0.02		0.25	0.01	0.24	0.02		0.25	0.01	0.23	0.02		0.26	0.04	0.24	0.02	
Did not participate in these work-based learning experiences					0.93					-1.14					-0.59					-0.43
Participated	0.48	0.01	0.48	0.02		0.45	0.02	0.48	0.02		0.47	0.01	0.49	0.03		0.46	0.05	0.48	0.02	
Did not participate	0.52	0.01	0.52	0.02		0.55	0.02	0.52	0.02		0.53	0.01	0.51	0.03		0.54	0.05	0.52	0.02	
BY Reading test standardized score	57.27	0.15	55.11	0.30	-6.51	55.48	0.23	55.11	0.30	-1.00	56.97	0.15	56.84	0.39	-0.31	54.68	0.52	55.11	0.30	0.70
BY Math test standardized score	57.86	0.14	56.25	0.29	-5.04	56.48	0.23	56.25	0.29	-0.63	57.62	0.15	57.71	0.37	0.21	55.76	0.55	56.25	0.29	0.78
F1 Math test standardized score	58.14	0.14	56.03	0.29	-6.46	56.35	0.24	56.03	0.29	-0.84	57.83	0.15	57.67	0.35	-0.41	55.39	0.54	56.03	0.29	1.04
GPA for all academic courses, honors weighted	3.338	0.01	3.21	0.24	-4.84	3.24	0.02	3.21	0.24	-0.91	3.32	0.01	3.313	0.03	-0.27	3.18	0.05	3.21	0.02	0.53

	Unweighted					SMR weighted					IPTW					Full matching				
	Academic		Dual			Academic		Dual			Academic		Dual			Academic		Dual		
covariate	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*
Math course taking pipeline					-4.60					-0.63					-0.14					1.03
Advanced I	0.27	0.01	0.33	0.02		0.32	0.02	0.33	0.02		0.27	0.01	0.27	0.02		0.36	0.04	0.33	0.02	
Advanced II/Pre-calculus	0.37	0.01	0.39	0.02		0.38	0.01	0.39	0.02		0.37	0.01	0.38	0.02		0.39	0.04	0.39	0.02	
Advanced III/Calculus	0.36	0.01	0.28	0.02		0.30	0.01	0.28	0.02		0.36	0.01	0.35	0.03		0.25	0.03	0.28	0.02	
Science course taking pipeline					-5.74					-0.11					-0.97					2.04
Chemistry1 or Physics1	0.32	0.01	0.41	0.02		0.42	0.02	0.41	0.02		0.33	0.01	0.36	0.02		0.50	0.04	0.41	0.02	
Chemistry1 & Physics 1	0.31	0.01	0.31	0.02		0.29	0.01	0.31	0.02		0.31	0.01	0.30	0.02		0.27	0.03	0.31	0.02	
Chemistry2 or Physics2 or advanced Biology	0.14	0.01	0.12	0.01		0.13	0.01	0.12	0.01		0.14	0.01	0.13	0.02		0.11	0.02	0.12	0.01	
Chemistry & Physics & level 7	0.23	0.01	0.16	0.01		0.16	0.01	0.16	0.01		0.22	0.01	0.21	0.02		0.12	0.02	0.16	0.01	
Outcome expectations																				
Importance of good grades to student					1.93					0.39					0.99					0.14
Not important	0.01	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.01	0.00	0.00	0.00		0.01	0.01	0.00	0.00	
Somewhat important	0.04	0.00	0.04	0.01		0.04	0.01	0.04	0.01		0.04	0.00	0.04	0.01		0.05	0.02	0.04	0.01	
Important	0.28	0.01	0.25	0.02		0.25	0.01	0.25	0.02		0.27	0.01	0.27	0.02		0.24	0.03	0.25	0.02	
Very important	0.67	0.01	0.71	0.02		0.70	0.01	0.71	0.02		0.68	0.01	0.70	0.02		0.71	0.04	0.71	0.02	
How far in school student thinks will get-composite (recoded)										1.25					0.05					0.73
More than graduate from college	0.92	0.01	0.90	0.01		0.91	0.01	0.90	0.01		0.92	0.01	0.92	0.01		0.91	0.02	0.90	0.01	
Less than 4-year college graduation	0.02	0.00	0.04	0.01	2.56	0.03	0.01	0.04	0.01	1.07	0.03	0.00	0.03	0.01	0.56	0.03	0.01	0.04	0.01	0.81
Don't know	0.05	0.00	0.06	0.01	1.18	0.05	0.01	0.06	0.01	0.82	0.05	0.00	0.05	0.01	-0.29	0.05	0.02	0.06	0.01	0.50
F1 how far in school student thinks will get-composite (recoded)																				
More than graduate from college	0.94	0.00	0.90	0.01		0.90	0.01	0.90	0.01		0.93	0.01	0.93	0.01		0.87	0.03	0.89	0.01	
Less than 4-year college graduation	0.01	0.00	0.08	0.01	4.80	0.07	0.01	0.08	0.01	0.53	0.04	0.00	0.04	0.01	-0.02	0.10	0.03	0.08	0.01	-0.89
Don't know	0.03	0.00	0.03	0.01	0.88	0.03	0.01	0.03	0.01	0.17	0.03	0.00	0.03	0.01	0.13	0.03	0.02	0.03	0.01	-0.18
F1 postsecondary plans right after high school (recoded)																				
Four-year college/Early high school graduate attending postsecondary	0.93	0.01	0.85	0.01		0.86	0.01	0.85	0.01		0.91	0.01	0.91	0.01		0.80	0.85	0.85	0.01	

	Unweighted					SMR weighted					IPTW					Full matching				
	Academic		Dual			Academic		Dual			Academic		Dual			Academic		Dual		
covariate	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*
school																				
Vocational, technical, or trade/community college	0.06	0.00	0.13	0.01	5.87	0.12	0.01	0.13	0.01	0.36	0.07	0.00	0.08	0.01	0.49	0.18	0.04	0.13	0.01	-1.22
Don't know/Planning but unspecified/Don't plan to continue	0.01	0.00	0.02	0.01	2.62	0.02	0.00	0.02	0.01	0.63	0.01	0.00	0.01	0.00	-0.01	0.02	0.01	0.02	0.01	0.35
Interests																				
Participated in science/math fair					-1.56					-0.92					-0.73					-0.14
No	0.82	0.01	0.84	0.01		0.83	0.01	0.84	0.01		0.82	0.01	0.83	0.02		0.84	0.03	0.84	0.01	
Yes	0.18	0.01	0.16	0.01		0.17	0.01	0.16	0.01		0.18	0.01	0.17	0.02		0.16	0.03	0.16	0.01	
Participated in voc/tech skills competition					6.01					0.14					0.83					-1.44
No	0.96	0.00	0.908	0.01		0.90	0.02	0.908	0.01		0.95	0.00	0.94	0.01		0.84	0.04	0.90	0.01	
Yes	0.04	0.00	0.10	0.01		0.10	0.02	0.10	0.01		0.05	0.00	0.06	0.01		0.16	0.04	0.10	0.01	
Participated in academic honor society (recoded)																				
Did not participate	0.55	0.01	0.61	0.02		0.58	0.02	0.61	0.02		0.56	0.01	0.57	0.03		0.59	0.04	0.60	0.02	
Participated	0.38	0.01	0.33	0.02	-2.48	0.35	0.02	0.33	0.02	-1.11	0.37	0.01	0.36	0.02	-0.62	0.34	0.04	0.33	0.02	-0.29
Participated as officer/leader/captain	0.07	0.01	0.07	0.01	-0.79	0.07	0.01	0.07	0.01	-0.47	0.07	0.00	0.07	0.01	0.16	0.07	0.03	0.07	0.01	-0.29
Participated in school academic clubs (recoded)																				
Did not participate	0.64	0.01	0.70	0.02		0.68	0.01	0.70	0.02		0.64	0.01	0.65	0.03		0.68	0.04	0.70	0.02	
Participated	0.28	0.01	0.24	0.02	-2.61	0.25	0.01	0.24	0.02	-0.77	0.28	0.01	0.27	0.02	-0.26	0.24	0.03	0.24	0.02	-0.11
Participated as officer/leader/captain	0.08	0.01	0.06	0.01	-2.72	0.07	0.01	0.06	0.01	-1.46	0.08	0.00	0.08	0.02	-0.15	0.08	0.03	0.06	0.01	-0.87
Participated in school vocational clubs (recoded)																				
Did not participate	0.93	0.01	0.75	0.02		0.76	0.02	0.75	0.02		0.90	0.01	0.89	0.01		0.61	0.04	0.75	0.02	
Participated	0.06	0.00	0.18	0.02	10.57	0.17	0.01	0.18	0.02	0.60	0.08	0.01	0.09	0.01	1.16	0.25	0.04	0.18	0.02	-2.34
Participated as officer/leader/captain	0.01	0.00	0.07	0.01	8.44	0.07	0.01	0.07	0.01	0.30	0.02	0.00	0.03	0.00	0.82	0.14	0.04	0.07	0.01	-2.20
College entrance information (composite score of F1S48A-M)	5.74	0.05	5.52	0.10	-1.98	5.55	0.09	5.52	0.10	-0.22	5.71	0.05	5.67	0.12	-0.34	5.50	0.29	5.52	0.10	0.06
Contextual influences																				
School control																				
Public	0.59	0.01	0.86	0.01		0.85	0.01	0.86	0.01		0.64	0.01	0.69	0.03		0.85	0.02	0.86	0.01	
Catholic	0.27	0.01	0.11	0.01	-9.93	0.11	0.01	0.11	0.01	-0.19	0.24	0.01	0.23	0.03	-0.91	0.09	0.01	0.11	0.01	1.09
Other private	0.14	0.01	0.03	0.01	-8.35	0.05	0.00	0.03	0.01	-1.78	0.12	0.01	0.08	0.02	-2.16	0.06	0.01	0.03	0.01	-2.32

	Unweighted					SMR weighted					IPTW					Full matching				
	Academic		Dual			Academic		Dual			Academic		Dual			Academic		Dual		
covariate	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*
School urbanicity																				
Urban	0.38	0.01	0.33	0.02	-1.13	0.30	0.01	0.33	0.02	0.95	0.37	0.01	0.36	0.03	-0.06	0.30	0.04	0.33	0.02	0.09
Suburban	0.50	0.01	0.48	0.02		0.48	0.02	0.48	0.02		0.49	0.01	0.49	0.03		0.45	0.04	0.48	0.02	
Rural	0.12	0.01	0.20	0.02	4.37	0.22	0.02	0.20	0.02	-0.51	0.14	0.01	0.15	0.01	0.59	0.25	0.04	0.20	0.02	-1.36
Geographic region of school																				
Northeast	0.22	0.01	0.22	0.02	-2.51	0.21	0.01	0.22	0.02	0.20	0.22	0.01	0.24	0.02	0.37	0.18	0.02	0.22	0.02	1.93
Midwest	0.25	0.01	0.18	0.02	-5.36	0.20	0.01	0.18	0.02	-0.75	0.24	0.01	0.21	0.02	-1.19	0.16	0.03	0.18	0.02	1.10
South	0.38	0.01	0.51	0.02		0.50	0.02	0.51	0.02		0.40	0.01	0.42	0.02		0.60	0.04	0.51	0.02	
West	0.15	0.01	0.09	0.01	-5.63	0.09	0.01	0.09	0.01	-0.72	0.14	0.01	0.14	0.02	-0.41	0.06	0.01	0.09	0.01	2.15
High school program reported by student-composite																				
General	0.24	0.01	0.13	0.02	-5.41	0.13	0.01	0.13	0.02	-0.17	0.22	0.01	0.18	0.03	-1.61	0.12	0.02	0.13	0.02	0.38
College preparatory-academic	0.31	0.01	0.31	0.02	-1.86	0.31	0.02	0.31	0.02	-0.07	0.31	0.01	0.30	0.03	-1.04	0.30	0.04	0.31	0.02	0.49
Vocational-including technical/business	0.45	0.01	0.56	0.02		0.56	0.02	0.56	0.02		0.47	0.01	0.52	0.03		0.58	0.04	0.56	0.02	
Students develop career plan					6.16					0.44					1.67					-0.81
No, students do not do this	0.28	0.01	0.17	0.02		0.17	0.01	0.17	0.02		0.26	0.01	0.22	0.03		0.14	0.02	0.17	0.02	
Yes, some students do this	0.37	0.01	0.37	0.02		0.38	0.02	0.37	0.02		0.37	0.01	0.37	0.03		0.37	0.04	0.37	0.02	
Yes, all students do this	0.35	0.01	0.46	0.02		0.45	0.02	0.46	0.02		0.37	0.01	0.41	0.03		0.49	0.04	0.46	0.02	
Students select career major/pathway					2.78					0.10					0.82					-0.10
No, students do not do this	0.36	0.01	0.26	0.02		0.26	0.02	0.26	0.02		0.34	0.01	0.30	0.03		0.24	0.04	0.25	0.02	
Yes, some students do this	0.44	0.01	0.57	0.03		0.55	0.02	0.57	0.03		0.46	0.01	0.51	0.03		0.60	0.05	0.58	0.03	
Yes, all students do this	0.20	0.01	0.18	0.02		0.18	0.0	0.18	0.02		0.20	0.01	0.19	0.03		0.17	0.03	0.18	0.02	
Availability of a vocational/technical program																				
At this school only	0.18	0.01	0.36	0.02	12.79	0.34	0.0	0.36	0.02	-0.46	0.21	0.01	0.23	0.02	0.87	0.41	0.04	0.36	0.02	1.59
At an area/regional voc/tech school only	0.29	0.01	0.30	0.02	8.25	0.30	0.01	0.30	0.02	-0.39	0.29	0.01	0.33	0.02	0.93	0.26	0.03	0.30	0.02	0.30
At this school and area/regional school	0.14	0.01	0.22	0.02	10.50	0.22	0.01	0.22	0.02	-1.23	0.15	0.01	0.16	0.02	0.20	0.23	0.04	0.22	0.02	1.56
Not available	0.38	0.01	0.13	0.01		0.14	0.01	0.13	0.01		0.34	0.01	0.28	0.03		0.10	0.02	0.13	0.01	
Counselors/teachers encourage students to enroll					-4.85					-0.24					-0.96					0.44

	Unweighted					SMR weighted					IPTW					Full matching				
	Academic		Dual			Academic		Dual			Academic		Dual			Academic		Dual		
covariate	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*	*M*	*SE*	*M*	*SE*	*t*
in academic classes																				
Not at all accurate	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
Not at all accurate-somewhat accurate	0.01	0.00	0.01	0.01		0.01	0.01	0.01	0.01		0.01	0.00	0.01	0.00		0.01	0.01	0.01	0.01	
Somewhat accurate	0.07	0.01	0.07	0.01		0.08	0.01	0.07	0.01		0.07	0.01	0.07	0.01		0.09	0.03	0.07	0.01	
Somewhat accurate-very accurate	0.29	0.01	0.39	0.02		0.38	0.02	0.39	0.02		0.31	0.01	0.34	0.02		0.39	0.05	0.39	0.02	
Very accurate	0.63	0.00	0.52	0.02		0.53	0.02	0.52	0.02		0.61	0.01	0.59	0.03		0.51	0.04	0.52	0.02	
Goals																				
BY Career aspirations	0.08	0.00	0.08	0.00	-1.92	0.08	0.00	0.08	0.00	-0.46	0.09	0.00	0.09	0.00	0.16	0.08	0.00	0.08	0.00	0.49

Table 3.2

Pooled Variance-Covariances and Means for All Observed Variables

Variables	1	2	3	4	1	2	3	4
	Unweighted				SMR weighted			
1. BYSEI	1.47				1.63			
2. F1SEI	0.35	1.89			0.35	2.02		
3. F2SEI	0.30	0.54	2.14		0.34	0.60	2.33	
4. Dual Track	-0.02	-0.02	-0.03	0.16	-0.01	-0.01	-0.01	0.25
M	6.27	6.12	5.93	0.19	6.19	6.04	5.79	0.53
	IPTW				Full matching			
1. BYSEI	1.43				1.70			
2. F1SEI	0.31	1.84			0.32	2.19		
3. F2SEI	0.30	0.53	2.09		0.34	0.59	2.42	
4. Dual Track	0.00	-0.00	-0.00	0.25	0.01	0.00	0.00	0.16
M	6.29	6.12	5.94	0.45	6.14	5.99	5.76	0.19

Note. BYSEI =Career aspirations in grade 10. F1SEI =Career aspirations in 12th grade. F2SEI =Career aspirations 2 years after high school graduation

Table 3.3

Cut off Criteria and Observed Indices for the Model Fit

Indexes	Cut-off criterion	Result			
		Unweighted (*SD*)	*SMR weighted* (*SD*)	*IPTW* (*SD*)	*Full Matching* (*SD*)
χ^2 (*df* =2)	—	1.22 (0.54)	1.92 (1.08)	0.63 (0.53)	2.19 (1.96)
TLI	0.90 ~ 1.00[a]	1.00 (0.00)	1.00 (0.02)	1.02 (0.01)	1.00 (0.11)
SRMR	< 0.08[b] or < 0.1[c]	0.00 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01 (0.01)
RMSEA	< 0.06[b]	0.00 (0.00)	0.01 (0.01)	0.00 (0.00)	0.01 (0.01)
CFI	≥ 0.95[b]	1.00 (0.00)	0.99 (0.00)	1.00 (0.00)	0.98 (0.03)

[a]Recommended by Bollen and Curran (2006). [b]Recommended by Hu and Bentler (1999).
[c]Recommended by Kline (2005).

Table 3.4

Pooled Coefficients Estimates and Standard Errors for Random Intercepts and Slopes Regressed on Track

	Intercept			Linear		
Covariate	Parameter	*SE*	*t*	Parameter	*SE*	*t*
			Unweighted			
	6.13	(0.03)	330.65**	-0.08	(0.01)	-9.18**
Track	-0.15	(0.05)	-3.24**	-0.02	(0.02)	-0.83
			SMR weighted			
	6.03	(0.26)	183.71**	-0.09	(0.02)	-5.79**
Track	-0.05	(0.05)	-0.90	-0.01	(0.02)	-0.29
			IPTW			
	6.12	(0.02)	313.50**	-0.09	(0.01)	-8.97**
Track	-0.00	(0.05)	-0.04	-0.01	(0.02)	-0.27
			Full matching			
	5.96	(0.08)	79.66**	-0.09	(0.04)	-2.56**
Track	0.03	(0.08)	0.33	-0.01	(0.04)	-0.18

**$p < .01$.

CHAPTER 5

DISSERTATION CONCLUSION

Summary of Findings

The overarching goal of the three studies in this dissertation was to examine the developmental trajectories of career aspirations. To examine the effect of select covariates on the trajectory of the career aspirations, three different data sets were used: NELS:88 (Study 1), KELS:2005 (Study 2), and ELS:2002 (Study 3). The NELS:88 data sets was developed using a nationally representative probability sample of 26,432 8th graders representing 815 public and 237 private schools across the United States from the 1998 spring term (Curtin, Ingels, Wu, & Hauer, 2002). For Study 1, we selected the fourth follow-up complete panel who participated across all five NELS:88 data collection points. The resulting sample size was 10,809. The KELS:2005 initially selected a nationally representative probability sample of 6908 7th graders from 150 schools (122 public, 28 private) representing 703,914 7th graders within 2929 schools (excluding sports academies and branch schools) across South Korea during the 2005 academic year (Kim, Kim, Kim, Kim, & Shin, 2007). For Study 2, we selected the third follow-up complete panel of students who participated across all four KELS:2005 data collection points. This decision resulted in a total number of 2979 Korean adolescents. The ELS:2002 initially selected a nationally representative probability sample of 15,362 U.S. high school sophomores in 752 public, Catholic, and other private schools in the spring term of 2002 (Ingels, Pratt, Rogers, Siegel, & Stutts, 2007). For Study 3, I selected the second follow-up complete panel who were classified as either academic or dual concentrators and participated across three ELS:2002 data collection points. A total of 3,455 individuals composed the data sample.

The first study examined the complex phenomenon of intra-individual and inter-individual differences in and the potential predictors of those differences on career aspirations development over a 12-year period. Results indicated that a curvilinear trend may exist where positive career aspirations tend to decline markedly as adolescents transition from school to postsecondary education, work, and adult life. Also, individuals with higher initial aspiration scores experienced slower growth in aspirations than those with lower initial aspirations. Whereas previous literature indicates that covariates such as gender, race and SES are significant predictors of career aspirations (Rojewski, 2005), the present study showed that each of these covariates predicted significant initial values of career aspirations in the latent growth trajectory model. In general, students who were female, minority status, and high SES reported higher career aspirations than male, majority status, and low SES students when measured in grade 8 (the initial time point). However, gender was the only covariate that related significantly to the growth trajectory of career aspirations from grade 8 to grade 12 (high school graduation). In sum, career aspirations form in early childhood and remain fairly stable throughout adolescence. We found that SES plays an important role in establishing initial career aspirations, while gender and race shape these aspirations in high school and into young adulthood, respectively.

The second study explored the complex phenomenon of intra-individual and inter-individual differences in career aspirations development, factors influencing the development, and the applicability of career development theories originating in Western countries with Korean adolescents. Our results suggest that the career aspirations of Korean adolescents differed in prestige level at grade 7 when examined by gender and socioeconomic status. In addition, the rate of change and a decreasing trajectory from junior high school to the first year of high school existed. The rate of decreasing trends for students with higher career aspirations at grade 7 was

either slow or stable when compared to adolescents with relatively low initial career aspirations. In general, females held lower aspirations than males. We also found potentially important *initial differences* in the development of career aspirations based on curriculum track, but this covariate was not significantly related to the *rate of change* in career aspirations. Overall, the study lends support to the notion that Western-based theories of career development seem relevant to Korean adolescents and, like past studies have shown, the ages at which certain developmental tasks are accomplished may be different given cultural differences, but otherwise things appear to be relatively the same.

The third study investigated the impact of CTE inclusion on occupational aspirations and their long-term effects. The unweighted latent growth model indicated that individuals show a negative trajectory of occupational aspirations. While the curriculum track was significantly associated with the initial level, the rate of change was not significantly associated with the curriculum track. However, results from the weighted latent growth model analyses revealed different findings from those of the unweighted model in that the initial levels of occupational aspirations in the two comparison groups were not different, nor was the rate of change in career aspirations significantly related to curriculum track, although the trajectories show the same decreasing pattern. Overall, the study was believed to advance our understanding of the developmental nature of career aspiration by demonstrating that career aspirations change over time.

Future Directions

Career aspirations might also serve as a way for adolescents to insulate themselves from the realities and pressures of limited ability or future expectations. It is also possible that higher aspirations motivate adolescents to achieve more academically and occupationally by

establishing idealized goals and intentions or by delaying decision making. In any event, a decrease in occupational aspirations is the result of growing pressure to make career-related choices based on an assessment of job availability and attainability. Research that examines how school environments encourage or delay adolescent career choice might offer interesting insights into this phenomenon.

This study has several limitations. Perhaps most important is that career aspirations were measured using prestige scores which limited our focus on aspirations to socioeconomic status. That is, our analysis and understanding of aspirations that resulted from this study did not measure other characteristics of career aspirations, such as the zone of alternative jobs. Secondly, we transformed the list of job categories into continuous values with a slightly outdated SEI and ISEI, and not all of the occupations were found. Although the literature supports the reliability and validity of transformed SEI and ISEI values, careful interpretation is needed. This is because the socioeconomic status for certain jobs is constantly changing due to the evolutionary nature of society and changing values. Also, more reliable and valid measures of occupational aspirations should be developed. For example, using a restricted occupational aspirations variable that reveals an individual's self-reported occupation choices, a researcher can measure aspirations more accurately.

Through these longitudinal approaches we were in general able to identify a negative trajectory for the career aspirations of both Korean and American adolescents over time. Although Study 1 revealed a positive trend in career aspirations of American youths through high school graduation followed by a negative trend which continued into young adulthood, Study 3 reported a negative trend in career aspirations before high school graduation. This decrease in students' aspirations over time and at earlier ages might be explained as the result of

a growing realization that academic ability plays a significant role in accomplishing and attaining future career-related outcomes, such as college entrance. Additionally, this seems to suggest that career compromise is accentuated during youth's high school years rather than around the time of high school graduation. Also, the inconsistent results in the two studies might be explained by Study 3's use of a recently collected high school sample, meaning that the pressure to make career-related choices based on an assessment of job availability and attainability has changed and increased among early adolescents as compared with adolescents at the same age in 1990. Research that investigates how this phenomenon takes place in young adolescents today compared with adolescents in the past might offer interesting insights.

Our work lends support to the notion that Western-based theories of career development seem relevant to Korean adolescents and like past studies have shown, the ages at which certain developmental tasks are accomplished may be different given cultural differences, but otherwise things appear to be relatively the same. Using culturally different samples, further research on the development of career aspirations and the impact of the covariates should be undertaken to better understand these complex phenomena.

The findings of Study 3 revealed that there were no differences in the rate of change in career aspirations between academic and dual concentrators when adjusting for confounding variables. This finding means that although in general academic concentrators held higher aspirations than dual concentrators, the impact of the program on aspirations was not visible. In other words, dual programs might have a great possibility of enhancing and implementing various career development interventions. However, further attention and analysis should be given to determining if the impact of a dual program on career aspirations is viable and culturally tenable using culturally different samples.

The results of this dissertation have important implications for policy makers, counselors, and teachers in both America and Korea. Above all, career aspirations will continue to play a vital role in affecting students' academic and vocational behaviors and outcomes. Those students who show low career aspirations could be targeted for intervention to improve their aspirations and consequently enhance the possibility of planning, building, and in turn attaining their desired career. Also, it is interesting that less is known about the students who are stable in their career aspirations and which factors are related to this phenomenon. Future research efforts to explain these factors (or discern factors that contribute to career aspirations) may provide counselors and administrators with valuable information to assist in guiding students' career development efforts.

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