4-18-2011

Person-Environment Congruence and Academic Achievement of College Students: An Application of Holland's Theory

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PERSON-ENVIRONMENT CONGRUENCE AND ACADEMIC ACHIEVEMENT OF COLLEGE STUDENTS: AN APPLICATION OF HOLLAND'S THEORY

by

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A Dissertation

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

Major: Educational Psychology and Research

The University of Memphis

May, 2011

To the University Council:

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DEDICATION

This dissertation is dedicated to my niece, Kristin, who died during the second semester of my coursework. I promised myself I would complete this degree program in her honor. We love her and miss her.

ACKNOWLEDGMENTS

I would like to express my sincere gratitude to Dr. John Smart for his support and encouragement throughout my doctoral studies and for his guidance and patience during the dissertation stage. Additionally, I thank Dr. Corinna Ethington for her tremendous instruction and support in my doctoral studies and I would like to thank Dr. Ernest Rakow and Dr. Yonghong Xu for their advice, encouragement, and support in my doctoral program and in the completion of this dissertation. I thank all of these committee members without whom I could not have completed my program.

I would also like to thank my wife, Robin, and all of my family including my daughters, mother, and brothers and all of my friends who have shown such great interest in my endeavor to complete this dissertation and earn this degree. Finally, special thanks go to the Brothers of the Christian Schools who have truly supported and influenced me throughout my education.

ABSTRACT

Hargett, John Michael. Ph.D. The University of Memphis. May 2011. Person-Environment Congruence and Academic Achievement of College Students: An Application of Holland's Theory. Major Professor: John C. Smart, Ph.D.

The purpose of the study was to test the hypothesis presented in Holland's theory that academic achievement is a function of the congruence between students' personality types and their academic environments. Holland asserts that higher levels of stability, satisfaction and performance are a function of the fit or congruence between students' personality type and the environment in which they reside.

The subjects in the study were 741 students who graduated from high school between 1998 and 2007 and matriculated to a private, Catholic, comprehensive university in the mid-South during those years. Students were assigned to one of the six Holland personality types based on their highest score on the ACT Interest Inventory which was sent to the university from the American College Testing Program. Students' academic majors were classified into six academic environments proposed by Holland using *The Educational Opportunities Finder*. Congruence levels were calculated for students using Holland's first letter hexagonal distance measure. Students with perfect congruence were identified as congruent. All other students were identified as incongruent.

The means of the grades of students in the two categories of congruence were analyzed using repeated measures analysis of variance. When significance was found, Tukey-Kramer post hoc tests were used for pairwise comparisons to determine significant group differences. Effect sizes were then calculated to ascertain the substantive importance of the findings.

Results for the Artistic personality type demonstrated a statistically significant relationship between person-environment congruence and academic achievement ($p < .05$). Though not statistically significant, results for the Realistic personality type suggest support for the congruence assumption while results for the Conventional and Investigative personality types are contrary to the congruence assumption. Results for Social and Enterprising personality types also suggest support for the congruence assumption, but weak effect sizes for the two, 0.07 and 0.08 respectively, do not offer any substantive importance in the findings.

Results of this study are discussed with reference to the psychological and sociological components of Holland's theory and how each provides explanations for the findings of this study. Suggestions for incorporating both components in the academic advising and counseling of postsecondary students are discussed.

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Chapter 1

Introduction

Background of the Problem

According to statistics compiled by the American College Testing Program, Inc. (ACT Newsroom, 2004), only 50% of college and university students in the United States will persist through graduation and almost one-third will not be retained to the second year. Astin (1975), Kramer (1982), and Noel, Levitz, and Saluri (1985) have shown how losing a freshman student affects university revenue for the three successive years. Plus, the cost of recruiting one new student can be three to four times the cost of retaining a student. Numerous studies from the past 25 years have indicated a significant correlation between quality academic advising and the retention, satisfaction, and academic success of college students (Elliott & Healy, 2001; Heisserrer & Parette, 2002; Metzner, 1989; NSSE, 2005; Peterson, Wagner, & Lamb, 2001; Seidman, 1991; Steele, Kennedy, & Gordon, 1993; Tinto, 2004; Trippi & Cheatham, 1991; Young, Backer, & Roger, 1989). Other studies have found a positive relationship between retention and the frequency, as well as, quality of academic advising (Brigman, Kuh, & Stager, 1982; Pascarella & Terenzini, 1977). Additionally, quality academic advising has been linked to higher grade point average and further development of academic skills (Pascarella & Terenzini, 1991) and career decisions (Feldman & Newcomb, 1969).

Despite the beneficial relationship between academic advising and retention, satisfaction, and academic success, and the fact that academic advising is one of the most widely used student services (Boyer, 1987; Osipow, Carney, & Barak, 1976), advising has largely been a dissatisfying experience for college students (Astin, Korn, & Green,

1987; Boyer, 1987; McLaughlin & Starr, 1982). Astin (1993) found only 40% of surveyed students to be either “satisfied” or “very satisfied” with academic advising which ranked 25th of 27 college services in the study. The American College Testing Program reported similar results (ACT, 2002). A recent ACT survey of college officials even suggests that many colleges and universities poorly execute their academic advising programs (Habley, 2004).

Academic Advising, Career Counseling, and Student Success

Increasing the effectiveness of academic advising can positively affect students’ decisions to stay in school, experience satisfaction, succeed, and eventually graduate (Seidman, 1991; Terenzini, 1993; Tinto, 1987), and improved academic advising has been one of the most frequently recommended and implemented processes for increasing student retention (Beal & Noel, 1980; Forrest, 1982; Lenning, Beal, & Sauer, 1980; Noel, 1985; Stadtman, 1980). Quality advising has also been shown to assist students in identifying educational goals and relating these goals to their curriculum and their future careers. Quality advising has also been linked to academic success when advisors assist students in selecting courses that are compatible with their abilities, interests, and career aspirations (Creamer, 2000; Crocket, 1985; Grites, 1979; Kapraun & Coldren, 1982). Cuseo (2003) stated that a student’s ability to commit to a college major and life goals is the most important factor in student persistence, and Damminger (2001) and Gordon and Habley (2000) emphasize the importance of the selection of a major that matches a student’s abilities and interests.

Providing quality academic advising and career counseling requires the advisor to rely on students’ prior academic performance, standardized test scores, personality test

results, and scores from interest inventories. Understanding students' reasons for attending college along with their rationale for applying themselves to their studies can further augment advisors in their preparation for advising students during the initial stages of their academic careers (Smith, Dai, & Szelest, 2006). Helping students identify, select, and engage in academic majors congruent with their personalities, based upon John Holland's (1985a, 1997) theory, should increase retention and the successful completion of the college degree. Both functions, academic advising and career counseling, involve individual collaboration to assist students in making educational and career decisions reflective of the students' goals, interests, and skills (Reardon & Bullock, 2004).

Person-environment Fit and Student Success

Several person-environment fit theories have been proposed to explain how environments, academic or career, influence behavior and provide frameworks for change as a result of college or vocational effects. Of these models, John Holland's Vocational Personalities and Work Environments "has attracted the most attention and underpins a substantial body of research on college students" (Pascarella & Terenzini, 1991, p. 39). When applied to an academic setting, the theory anticipates that "academic environments exhibit distinctive patterns of values, abilities, and behaviors, that students seek out and enter the environments most congruent with their interests and abilities, and that those initial differences are accentuated over time" (Pascarella & Terenzini, 2005, p. 252).

It is Holland's theory (1985a, 1997) that is the focus of this study that tests the assumption that academic achievement is a function of congruence between students' dominant personality types and their academic environments. Results of the study should

add to current findings that have important educational policy and research implications in the areas of academic advising and career counseling. Reardon and Bullock (2004) contend that "if students can use Holland's theoretical model to recognize, differentiate, and understand these diverse academic environments and the faculty members who dominate them, we believe they are more likely to find a place within the university where their satisfaction, involvement, and persistence will be increased" (p. 111). Utilizing the amassed research findings based upon Holland's theory, academic advisors and counselors may better assist students in selecting educational and employment environments where they are likely to have the greatest probability of persistence, satisfaction, and success.

Holland's Theory

Holland's (1985a, 1997) Theory of Vocational Personalities and Work Environments is comprised of four primary assumptions which represent "the heart of the theory" (1997, p. 2). The first assumption is that people can be categorized by their resemblance to each of six different personality types: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C). These personality types result from a blending of biological, cultural, and social influences which lead to different competencies and interests that help shape how people perceive, think, and behave. The second assumption asserts there are six corresponding work and academic environments which are characterized by a population whose characteristics resemble the six model environments: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. The third assumption is that people seek environments that will allow them to exercise their abilities and skills, express their values and attitudes, and assume roles and engage

in problems befitting their comfort level. In his fourth and key assumption, Holland contends that behavior is determined by the interaction between environment and personality which can be understood and predicted by our knowledge of environments and personality types. For example, educational and career stability, satisfaction, and achievement are positively related to the congruence between the personality types and environments in which people study or work.

The Hexagonal Model

Holland et al. (1969) use a hexagonal model to define the relationships among the six personality types and environments and the congruence between personality types and environments. Personality types and environments appear on the hexagon in a clockwise order beginning with Realistic and followed by Investigative, Artistic, Social, Enterprising, and Conventional. Realistic types in Realistic environments are considered highly congruent. Realistic types in either adjacent environment, Investigative or Conventional, are considered moderately congruent, and Realistic types in twice-removed Artistic or Enterprising environments have a low degree of congruence. Realistic types in Social environments are considered the most incongruent. These four levels of congruence are consistent for each of the respective personality types. Figure 1 illustrates the congruence component of Holland's theory.

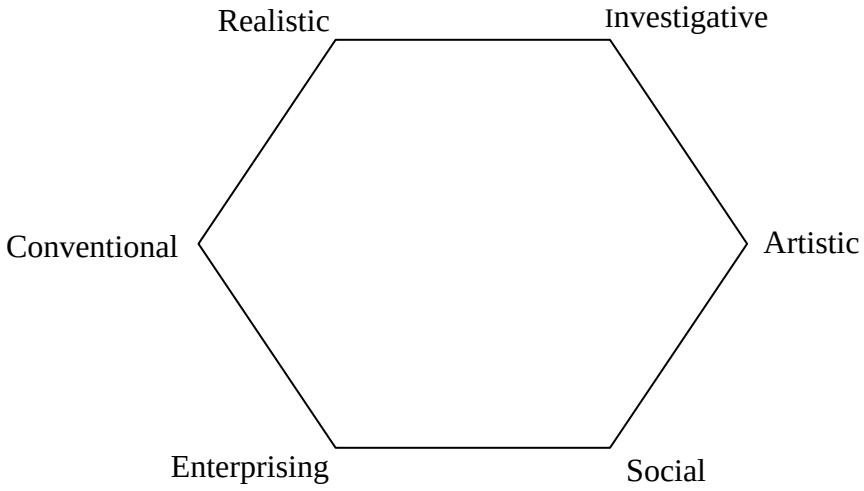

Figure 1. Holland's Hexagonal Model for Defining Personality Types and Academic Environments.

The Congruence Assumption of Holland's Theory

Holland (1973) suggests that positive outcomes such as educational stability, satisfaction, and achievement can be realized by maximizing the congruence between individuals' personality type and their academic environments. He further notes that this hypothesis applies to educational outcomes as well as vocational outcomes, and specifically states that, "the hypotheses about educational behavior derived from the personality types resemble those for vocational behavior. The choice of, stability in, satisfaction with, and achievement in a field of training or study follow rules identical to those outlined for vocational behavior" (Holland, 1997, p. 71). The primary purpose of this dissertation is to test the hypothesis presented in Holland's (1997) theory that educational achievement is a function of the congruence between students' personality types and their academic environments.

A search of the literature reveals a deficiency in the number of studies focusing on the effect of congruence on academic achievement of college students. The preponderance of research has focused on Holland's theory applied to career selection of adults and their subsequent occupational stability and satisfaction (Spokane, 1985; Spokane, Meir, & Catalano, 2000). Additionally, satisfaction has been used as the dependent variable more often than achievement.

Numerous literature reviews focusing on person-environment congruence have revealed consistent, yet weak, evidence suggesting a positive association between congruence and achievement in work and educational settings (see Assouline & Meir, 1987; Holland, 1997; Spokane, 1985; Spokane et al., 2000; Spokane, Luchetta, & Richwine, 2002; Tranberg, Slane, & Ekeburg, 2002; Walsh & Holland, 1992). Smart, Feldman, and Ethington (2000) speculate that this weak relationship may be due to the "conceptual fuzziness and difficulties with measurement associated with assessing educational and occupational success (achievement, performance)" (p. 178). Even though there is less support for the congruence assumption in studies related to students' academic achievement than to their stability in and satisfaction with academic environments, Holland (1985a, 1997) noted that the theory applies to academic achievement in college as well as occupational achievement in a career. Still, fewer studies have been conducted in the academic arena compared to the numbers conducted in adult occupational settings.

Chapter 2

Literature Review

Pascarella and Terenzini (1991, 2005) noted that Holland's work on vocational choice has resulted in substantial research on college students including some studies revealing a positive relationship between academic advising and retention and achievement. Research over the past decade has applied Holland's theory to study the change and stability of college students' abilities, attitudes, and interests, along with their development of alternative educational competencies and values (Feldman, Smart, & Ethington, 2004; Smart et al., 2000) and satisfaction with employment (Wolniak & Pascarella, 2005). Numerous studies have also been devoted to testing the congruence hypothesis of Holland's theory since its inception in 1959. A review of four meta-analyses (Assouline & Meir, 1987; Spokane, 1985; Spokane et al., 2000; and Tranberg et al., 1993) will help summarize the results of these studies and provide a collective representation of the literature surrounding Holland's theory.

The Meta-analyses

Spokane (1985) reviewed 40 correlational and 23 change studies of Holland's theory that were published in six major journals between 1962 and 1983. Only 4 (Bruch & Krieshok, 1981; Frantz & Walsh, 1972; Posthuma & Navran, 1970; and Reutefors, Schneider, & Overton, 1979) of the 40 correlational studies addressed the effect of person-environment congruence on academic achievement in college students. Ten correlational studies focused on academic satisfaction and/or stability; 14 concerned vocational satisfaction and/or stability; and the remainder addressed other outcomes including high school achievement, locus of control, personality, and self-esteem. The 23

change studies looked at the effect of congruence on personality change, predominantly in the vocational arena. Spokane noted that the correlational studies consistently revealed significant positive relationships between congruence and academic performance and persistence, perceived congruence, stability of choice, personality, and job satisfaction. Smart et al. (2000) point out that the findings from the research by Bruch and Krieshok (1981) and Spokane, Malett, and Vance (1978) show a weak positive relationship between congruence and stability (persistence, retention). Conversely, Spokane and colleagues (2000) noted that congruence was not related to academic stability or persistence in studies by Lent, Brown, and Larkin (1987) and Swanson and Hansen (1986). Spokane (1985) emphasizes that even though "large and significant *F* ratios are found in some congruence studies, correlations between congruence and various outcomes rarely exceed .25-.35, and congruence accounts for roughly 5-10% of variance in outcomes" (pp. 328-329).

Assouline and Meir (1987) conducted a formal meta-analysis on 41 congruence studies that yielded 77 correlation coefficients between person-environment congruence and measures of satisfaction, stability, and achievement. The bulk of the 21,638 subjects in the studies were employed adults in various occupations (47%) and university students (37%). An abundance of correlations between congruence and satisfaction represented 69% of the 77 correlations analyzed, followed by correlations between congruence and stability (22%), and correlations between congruence and achievement, a scant 9%. Results from the meta-analysis showed a mean correlation of .15 for congruence-stability and .06 for congruence-achievement with a correlation range from .06 to .24 and .01 to .12, respectively. The mean correlation for congruence-satisfaction was .21 with a range

from -.09 to .51. Assouline and Meir deemed that the mean correlations between congruence-stability and congruence-achievement were reliable estimates of the relationships due to the small ranges of the correlations. The wider range of variance for congruence-satisfaction correlations prompted Assouline and Meir to conclude that this relationship might be misleading. More recently, Smart and colleagues (2000) cited a series of their own studies (Elton & Smart, 1988; Smart, 1987; Smart, Elton, & McLaughlin, 1986) illustrating how satisfaction was positively associated with congruence. Holland and his colleagues (Holland, 1997; Walsh & Holland, 1992) also contend that there is evidence that congruence leads to satisfaction. Others (Chartrand, Camp, & McFadden, 1992) were unable to find positive results supporting the congruence-satisfaction link. Nevertheless, Assouline and Meir note that the relatively high congruence-satisfaction correlations found under certain environmental reference conditions and congruence measuring methods tends to dispute Spokane's (1985) statement that "correlations between congruence and various outcomes rarely exceed .25-.35" (pp. 328-329). They attribute the range of correlations to the different studies of outcome measures, the methods used for identifying Holland environmental types, and the varying congruence measuring methods used. They also speculate that one reason for low congruence-achievement correlations might be a lack of other influential variables like aptitude and suggest that satisfaction, stability, and achievement correlations might be stronger if more reliable methods for measuring variables were available.

Tranberg et al. (1993) conducted a meta-analysis of 27 studies published between 1968 and 1988 and found that satisfaction was not significantly related to congruency and surprisingly found that "the methodologically weakest studies yielded the strongest

satisfaction-congruence relations" (p. 253). The overall mean correlation between congruence and satisfaction for these studies was .17, with a range from -.07 to .42. Satisfaction was then separated into job satisfaction and academic satisfaction. Job satisfaction was a measure of satisfaction with the work environment and academic satisfaction was a measure of satisfaction with the choice of college major. The mean correlation of congruence with job satisfaction was .20, with a range from -.06 to .45, while the mean correlation of congruence with academic satisfaction was .10, with a range from -.11 to .30. The researchers concluded that interest congruence does not solely predict satisfaction due to a lack of significant overall relation between interest congruence and satisfaction. Tranberg et al. suggest that the studies reviewed in their meta-analysis "take an overly simple view of congruence, satisfaction, and the relation between the two" (p. 261) and they suggest that congruence research should be "conceptually more complex than just examining a simple correlation between a convenient measure of satisfaction and a convenient measure of congruence" (p. 262). They also suggest that measures of satisfaction need to include more than one-item assessments that are used in some of the studies, noting that "the measures used to define congruence can be viewed as somewhat crude, often using only a one- or two-letter match" (p. 262). The researchers contend that "it can be argued that Holland's conceptualizations have not really been tested by the simpler congruence measures" (p. 262), and, therefore, support Camp and Chartrand's (1992) recommendation for using "more sophisticated distance measures of congruence" (p. 262) to test Holland's congruence assumption.

Additionally, Holland (1997) notes that Meir (1995) reorganized and reinterpreted the meta-analyses of Assouline and Meir (1987) and Tranberg et al. (1993) and found statistically significant mean correlations for congruence that ranged from .29 to .42. While "one interpretation of these divergent evaluations is that they demonstrate the ambiguities in any meta-analysis," Holland notes that "with one exception, the cited studies in which a correlation was possible are all positive…ranging from primitive to magnificent," and "clearly suggest supportive evidence for congruence" (p. 162). Holland emphasizes that an inherent weakness in these meta-analyses is that the strongest studies reviewed are no more important than the weak ones, and that quality of study design and importance of proper sampling are often neglected in favor of measurement details.

More recently, Spokane et al. (2000) conducted a meta-analysis of 66 studies published between 1985 and 1999. Consistent with previously cited meta-analyses, 41 of the 66 studies tested the relationship of congruence to satisfaction, stability, and/or success in careers. Only 10 of the 66 studies addressed the relationship of congruence to satisfaction, stability, and/or success in college. Of these 10, only 6 addressed the relationship between congruence and academic achievement in college students with 5 (Chartrand et al., 1992; Henry, 1989; Lent et al., 1987; Maryland Longitudinal Study, 1989; and Swanson & Hansen, 1986) of the 6 measuring achievement traditionally using grade point averages. Results of the studies were mixed. Henry (1989) found congruent premedical students had higher science GPAs and higher cumulative GPAs than incongruent students. Alternately, Lent et al. (1987) reported that congruence was not a significant predictor of grades for engineering and science majors taking technical courses. The Maryland Longitudinal Study (1989) found that congruence was associated

with higher GPAs for black students in their sophomore and junior years. There was no association for non-blacks.

In summarizing their meta-analyses, Spokane et al. (2000) state that the "relationship between congruence and satisfaction in traditional correlational studies is presently around .25, or 5% of variance" (p. 179). They suggest this may be significant, particularly "when one considers the multiplicity of external influences upon work … [that] cannot be captured by static research designs" (p. 179). Additionally, they suggest, that, "if appropriate procedures are used, in a number of instances … correlations between congruence and satisfaction or other well-being variables (satisfaction, stability, achievement) substantially exceed the .25 or even .30 plateau and reach correlations of .40" (p. 179). Unfortunately, comparable information for the congruence-achievement relationship is not discussed probably as a result of the sparse number of studies addressing this relationship in their analysis. Holland (1997) suggests that, "if predictions are made about academic achievement, then scholastic aptitude or intelligence controls should be used" (p. 166), and adds that, "other studies should control for type, socioeconomic status, and gender" (p. 166). Assouline and Meir (1987), Chartrand and Walsh (1999), Hoeglund and Hansen (1999), Spokane (1985), Spokane et al. (2000), and Tranberg et al. (1993) offer further methods for improving person-environment congruence-testing including better environmental measures, restriction of range to account for incongruent individuals leaving the respective environment and changes in congruence over time, and consideration of the ever increasing number of congruence-calculating indices. Finally, Holland (1997) notes that, "In general, new work should employ large samples (i.e., $N > 500$) with equal numbers of men and women, represent

all types about equally, and use well-established scales and inventories for assessing theoretical constructs and outcomes" (pp. 166-167). Taking into account these recommendations for improved research design and methodology, future congruence studies may lead to better academic advising, career counseling, and, hopefully, enhanced student satisfaction, stability, and achievement.

The Congruence Assumption and Academic Achievement

As noted in the results of the previous meta-analyses, achievement has been the least studied outcome in congruence research and the findings in this area of research are perhaps the weakest (Assouline & Meir, 1987; Smart et al., 2000; Walsh & Holland, 1992). However, since Holland's (1959) original theory, some studies have attempted to discern a significant relationship between congruence and achievement. Because the primary purpose of this dissertation is to test the hypothesis presented in Holland's (1997) theory that educational achievement is a function of the congruence between personality type and academic environment, a summary of several of those studies follows.

In 1956, students who were finalists for the Merit Scholarship Program completed a vocational interest inventory during their senior year in high school, and were again asked to complete a survey during their senior year of college to determine their self-reported level of achievement in arts, leadership, and science as a result of college. Holland (1963) hypothesized that both male and female S (Scientific) and E (Enterprising) types would report higher levels of achievement in leadership; I (Investigative) and R (Realistic) types would report higher levels of achievement in science; and A (Artistic) types would report higher levels of achievement in the arts.

After controlling for students' pre-college characteristics, resulting correlation coefficients supported the hypothesis except that artistic achievement for males was higher for E types than for A types, and female I and C (Conventional) types had equally correlated achievement in science. Unfortunately, the sample was biased because it contained only academically talented students and Holland was only able to utilize a one letter congruence comparison because more sophisticated indices had not been developed.

Walsh and Hanle (1975) conducted a study of 53 members of the same sorority hoping to link congruence with academic aptitude, academic achievement, and vocational maturity. Researchers compared students' Holland personality type with their current occupational choice. Although not statistically significant, the congruent group was found to have a higher grade point average than incongruent or undecided groups. Students' pre-college traits and the small sample size of only one gender limited the impact of the study.

Reutefors et al. (1979) compared the Holland personality types of 392 male and 424 female college freshmen to their choice of college major and found that congruent students had higher grade point averages than incongruent students. Again, the study was limited because only a first letter congruence measure was used, the researchers did not control for entering student characteristics, and no gender effects were noted.

Three studies from the 1980s focused on specific groups of students and two produced statistically significant results. Bruch and Krieshok (1981) investigated 158 I (Investigative) and R (Realistic) type students enrolled in an engineering program emphasizing mathematical and physical science concepts. Results showed that

Investigative students achieved higher grade point averages than Realistic students in their initial engineering major over a 2-year period. Holland (1997) noted that the researchers' use of three successive classes of students over a four semester period makes this a particularly strong study. However, entering student characteristics were not taken into account, and the use of a one letter comparison for congruence limits the results of this study. Interestingly, Holland (1997) states that, "The most positive studies usually employed simple garden-variety indices of congruence such as single-letter code for both the person and the environment" (p. 166), and he further states, "The sampling and quality of the research design appears to be more important than the indices of congruency" (p. 166).

Martin and Bartol (1986) examined the relationship between personality type congruence and academic major and the successful completion of a Master of Business Administration program. The Vocational Preference Inventory (VPI) (Holland, 1985b) was used to assess the personality type of 168 MBA students with concentrations in accounting, finance, information systems, management, marketing, or operations research. The three letter environmental code was determined for each student using the Dictionary of Holland Occupational Codes (DHOC) (Gottfredson & Holland, 1996) and assigning the code based upon the most common jobs associated with individuals from the six concentrations. Congruence between personalities and environments was calculated using the Iachan (1984) index. To test the hypothesis that congruence predicted program completion, a correlational analysis was conducted and the results proved significant ($r = .156$, $p = .05$). Although the researchers utilized the VPI to assess personality types, determined environmental codes using the *DHOC*, and calculated

congruence with an accepted index, the study was hampered by a small sample size from one institution focusing on one academic area of study. Plus, the researchers did not control for entering student characteristics and, more importantly, they inferred causation from a correlational analysis.

Henry (1989) conducted a study of 157 students enrolled in a medical/dental preparatory program to determine if personality type congruence would predict academic achievement. Students with a dominant I (Investigative) Holland personality type were considered congruent while all others were considered incongruent with their academic major. The Holland environmental code was deemed I (Investigative) for all students since all were enrolled in the same science major. Henry used a one-way ANOVA to determine if there was a significant difference between the congruent and incongruent groups. Statistically significant *F* ratios for average cumulative GPA ($F = 16.96$, $p = .01$) and GPA in science ($F = 14.57$, $p = .01$) for Investigative students show positive, yet inconclusive results. Only the first letter of the Holland code was used for students who typically perform well academically in a major that is also dominated by Investigative types. Entering characteristics such as gender and race were considered, but the researchers did not control for aptitude.

Finally, Feldman and colleagues (1999) conducted a study based on longitudinal data from the Cooperative Institutional Research Program (CIRP) that sought to test Holland's (1997) congruence hypothesis as it relates to academic achievement. The researchers controlled for students' pre-college characteristics and used the students' self-reported major as the environmental measure. Realistic (R) and Conventional (C) were excluded from the study due to the small number of majors in those areas. Students' self-

reported responses to various goals and values associated with the various Holland types were used to classify their Holland personality type. The authors cited that, "Holland (1997) has noted that an individual's personality type may be measured by his or her responses to ability and interest scales. We therefore used the four 1986 ability and interest scales … to determine each student's primary personality type" (Feldman et al., 1999, p. 644). The total sample was comprised of 2,309 students who attended the same four-year institution for all four years. A 2x2x2x2 split-plot analysis of variance was used to test the hypothesis. The 1986 and 1990 ability interest scales were used as dependent variables with the 1986 scales adjusted for regression to the mean (Smart et al., 2000). The researchers' findings were encouraging. Students who entered A (Artistic), E (Enterprising), and I (Investigative) academic environments that were congruent with their dominant personality type exhibited higher levels of academic achievement compared to those students who entered incongruent environments. Even though a one-letter congruence comparison was used to determine congruence, the experimental design featured a large sample from many institutions and controlled for entering student characteristics making this a fairly strong study supporting Holland's (1997) congruence assumption in relation to academic achievement.

Conclusion

While most of the studies reviewed have found mixed or positive results for the relationship between congruence and academic performance, persistence, stability, and job satisfaction, other studies have revealed contradictory results, often with only a weak relationship between congruence and stability or academic achievement. However, in general, the evidence suggests that satisfaction, stability and, to a lesser degree, academic

achievement are positively associated with personality types in congruent environments, thus supporting the main hypotheses in Holland's theory.

Chapter 3

Methodology

Addressing Limitations of Testing the Congruence Assumption

Small sample size and limited variability in samples have been cited as general limitations of congruence studies (Martin & Bartol, 1986). Holland (1985a) stated, "Beware of small N's. Typological studies usually require large N's. Small N's usually restrict the number of analyses you can perform and the number of hypotheses you can cope with" (p. 200). Holland (1997) further suggests that, "In general, new work should employ large samples (i.e., $N > 500$) with equal numbers of men and women, represent all types about equally, and use well-established scales and inventories for assessing theoretical constructs and outcomes" (pp. 166-167). Spokane et al. (2000) further warned that, "unless all six types are sampled … and the finding from a comparison between congruent and incongruent subjects is replicated across more than one type (preferably all six), any finding is more likely the result of the personality characteristics of the congruent type than a true congruence difference" (pp. 173-174). This study addresses the sample selection concern. Sample size and composition adhere to Holland's (1985a, 1997) suggestions that studies should employ sample sizes greater than 500 with reasonably equal numbers of men and women representing all Holland personality types.

Another limitation addressed in this study is the type of grade point average (GPA) used in the analysis. Cumulative GPA is affected by grades in courses not congruent with a student's dominant personality type. Smart et al. (2006) note that efforts to assess student outcomes often ignore variability in student performance measures within their chosen academic environments and they urge institutional officials to "focus

such assessment efforts at the sub-environmental (i.e., academic environment) level, and that the choices of assessment criteria and interpretation of student performance be based on students' academic majors" (p. 38). Therefore, in this study, grade point average from a course congruent with a student's dominant personality type and grade point average from a course incongruent with the student's dominant personality type were used in an effort to match students with courses congruent and incongruent with their interests in order to more accurately test for the effect of congruence and incongruence on students' academic achievement. Future researchers might consider using grades from multiple courses taken in congruent and incongruent environments to increase the reliability of grade point average when used as the dependent variable.

Research Question

The primary purpose of this dissertation was to test the hypothesis in Holland's (1997) theory that educational achievement is a function of the congruence between personality type and academic environment. The research question for this study was:

> Do students attain higher academic achievement, as measured by their final course grade, in courses (environments, majors) that are congruent with their dominant personality type than they attain in courses (environments, majors) that are incongruent with their dominant personality type?

The Sample

The selection of the sample addresses two significant limitations discussed previously: sample size/variability and type of GPA used in the analysis to measure academic achievement. Sample size and composition are consistent with Holland's (1985a, 1997) suggestions of employing large sample sizes of more than 500 with

reasonably equal numbers of mena and women and personality types (see Appendix A). Additionally, using grade point averages (ranging from 0.0 to 4.0) from courses that are congruent and incongruent with students' dominant personality types as the dependent variable addresses the concern expressed by Smart et al. (2006) of appropriately measuring academic achievement.

The subjects in this study were students at a private, Catholic, comprehensive university in the mid-South with a total undergraduate and graduate enrollment of approximately 2,000 students.

The Office of Institutional Research & Effectiveness at the university provided the data and students were not identified in any way. The initial sample consisted of students who graduated from high school between 1998 and 2007 and indicated the university as an institution to which their official American College Testing (ACT) test scores, Interest Inventory (UNIACT) results, and completed student profile section should be sent. The initial sample for this study was 918 students reflecting all Holland personality types. Of these 918 students, 105 had missing data and 72 had tie scores for their dominant personality type on the ACT Interest Inventory. These students were excluded from the study resulting in a sample size of 741, comprised of 380 (51.3%) females and 361 (48.7%) males. The sample consisted of all six Holland types: Realistic (n = 48, 6.5%); Investigative (n = 260, 35.1%); Artistic (n = 132, 17.8%); Social (n = 134, 18.1%); Enterprising (n = 97, 13.1%); and Conventional (n = 70, 9.4%).

Variables

Academic environments (majors). The academic majors included in this study were classified into six academic environments proposed by Holland by using *The*

Educational Opportunities Finder (Rosen, Holmberg, & Holland, 1997). The university's catalog was consulted, when needed, for clarification of disputable classifications of academic major. Table 1 lists the academic majors and corresponding Holland environmental types included in this study.

Table 1

Academic Environments/Majors Represented in Sample

Realistic	*Artistic*	*Enterprising*
Electrical Engineering	English	Business Administration
Mechanical Engineering	Language/Literature	Marketing
	Music	Management
Investigative	Speech	Business Education
Biology	Theater/Drama	Political Science/Pre-Law
Biochemistry	Music/Art Education	Computer Science
Finance		
Civil Engineering	*Social*	*Conventional*
Chemical Engineering	History	Accounting
Astronomy	Philosophy	
Chemistry	Theology/Religion	*Non-Holland Classification*
Mathematics	Elementary Education	Other Business
Natural Science	Political Science	Other Humanities
Physics	Psychology	Other Professional
Statistics	Social Work	Other Social Science
Anthropology	Criminal Justice	Other Technical
Economics		Other Fields
Ethnic Studies		
Sociology		

Personality types. The ACT Interest Inventory, called the UNIACT, is included with students' request for submission of ACT test scores to specific colleges and universities. The 90 Inventory items measure six categories of occupational interests

representing the six Holland personality types. Holland (1997) states that, “if vocational interests are an expression of personality, then it follows that interest inventories are personality inventories” (p. 8), and the main focus of the Interest Inventory is to help students identify majors congruent with their interests. The *UNIACT Technical Manual* contains several chapters concerning the psychometric properties of the Inventory and describes more than 20 years of research supporting the reliability and validity of *UNIACT* (ACT, 2008).

Holland’s personality types are paired with the six UNIACT scales with Realistic matched with Technical, Investigative with Science and Technology, Artistic with Arts, Social with Social Service, Enterprising with Administration and Sales, and Conventional with Business Operations. Students in this study were assigned to one of the six personality types based on their highest scale score on the Inventory. Scores for each scale range from a minimum of 20 to a maximum of 80. For example, a student with a high score of 80 on Science and Technology and a low score of 32 on Social Service was designated as a dominant Investigative personality type. Conversely, a student with a high score of 66 on Administration and Sales and a low score of 41 in Science and Technology was designated as a dominant Enterprising personality type. Table 2 lists the frequencies and percentages of the six Holland personality types for the 741 students in this sample.

Table 2

Frequencies and Percentages of Holland Personality Types (N = 741)

Personality Type	*f*	%
Realistic	48	6.5
Investigative	260	35.1
Artistic	132	17.8
Social	134	18.1
Enterprising	97	13.1
Conventional	70	9.4

Congruence. "A person's relationship to the environment can be assessed according to the degree of congruence or compatibility as defined by the hexagonal model" (Holland, 1997, p. 55). Two categories of congruence were used in this study, congruent and incongruent. Congruence results when a dominant personality type is in a matching environment (e.g., a dominant Conventional personality type in a Conventional environment or a dominant Realistic personality type in a Realistic environment). Conversely, a dominant Conventional personality type is incongruent with courses taken in any of the five environments other than the Conventional environment, just as a dominant Realistic personality type is incongruent with courses taken in any of the five environments other than the Realistic environment.

This study focused on courses within academic environments (majors) that were congruent or incongruent with students' dominant personality types. Once personality

type and environment are identified, congruence indices can measure the magnitude of congruence between the two (Brown & Gore, 1994). Holland's (1997) first letter hexagonal distance measure, a revision of his original dichotomous first-letter agreement index (1963), was used to determine congruence. For example, a student with a dominant Conventional personality type taking a course in a Conventional environment represented clear or perfect congruence and was assigned a value of 4. Incongruence occurred when students took courses that did not match their dominant personality type. For example, a dominant Realistic personality type in an adjacent Investigative or Conventional environment on the hexagon was considered modestly incongruent as was a dominant Artistic personality type in an adjacent Investigative or Social environment. These students were assigned a value of 3. An even greater degree of incongruence occurred when a dominant personality type was paired with an environment that was twice removed on the hexagon. For example, a dominant Enterprising personality type was moderately incongruent in a Realistic or Artistic environment while a dominant Conventional personality type was moderately incongruent in an Investigative or Social environment. These students were assigned a value of 2. Students whose dominant personality type was opposite (highly incongruent) an environment on the hexagon were assigned a value of 1.

A plethora of congruence indices with varying degrees of complexity have evolved since Holland's (1963) original index (Assouline & Meir, 1987). However, Holland (1997) is skeptical that outcomes due to congruence or lack of congruence can be significantly affected by the researcher's choice of a particular congruence index. Instead, he notes that, "earlier studies appeared to benefit from desirable sampling,

standardized or well-established outcomes measures, concrete or well-defined environmental measures, and standardized inventories" (p. 166), and that, "the sampling and quality of the research design appears to be more important that the indices of congruency" (p. 166). Therefore, this study utilized Holland's first-letter hexagonal distance measure when assigning congruence, while attempting to mitigate the concerns of improper sampling, weak outcomes measures, and the absence of standardized inventories.

Appendix A lists each of the six Holland personality types and course types, with congruence and varying levels of congruence, completed by the students in this study. The first column lists the number of students who took a course congruent with each of the six dominant personality types. The second column shows the number of students and percentages in each of the categories in the first column who took a course that was highly incongruent with their dominant personality type (opposite on the hexagon). All Enterprising, Conventional, and Realistic personality types took only highly incongruent courses. Not all of the Investigative, Artistic, or Social personality types took only a highly incongruent course, so the number of courses they took that were either moderately incongruent (twice removed on the hexagon) or that were modestly incongruent (adjacent on the hexagon) is listed. For example, of the 260 students with a dominant Investigative personality type who took a congruent course, 90 (34.6%) took a highly incongruent course, 136 (52.3%) took a course that was moderately incongruent, and 34 (13.1%) took a modestly incongruent course. Students who took a course that was highly incongruent (opposite on the hexagon) ranged from a high of 100% to a low of 10.5%.

Academic achievement. There were two measures of academic achievement. The first measure was the grade, represented by grade point average, in the first congruent course completed by students with a specific dominant personality type. The second measure of academic achievement was the grade, represented by grade point average, in the first course completed that was most incongruent with each student's specific dominant personality type. A grade of A was assigned a value of 4.0, a grade of B was assigned a value of 3.0, a C was assigned a value of 2.0, a D was assigned a value of 1.0, and an F was assigned a value of 0.0. For example, students with a dominant Realistic personality type who received a grade of F in a perfectly congruent freshman electrical engineering (Realistic) course were assigned a value of 0.0. Students with a dominant Realistic personality type who took a highly incongruent history (Social) course in their freshman year and received a grade of C were assigned a value of 2.0. In another example, students with a dominant Investigative personality type who received a grade of B in a perfectly congruent freshman biology (Investigative) course were assigned a value of 3.0. Students with a dominant Investigative personality type who took a moderately incongruent psychology (Social) course and received a grade of A were assigned a value of 4.0. Academic achievement, represented by the numerical grade point average, was the dependent variable in a repeated measures analysis of variance.

Analyses

Because students self-select into majors, this study was designed to use students as their own controls in order to more accurately assess the influence these environments have on their achievement. A repeated measures design was used to longitudinally measure how each personality type in the sample was affected by coursework in the

environment that was congruent with their dominant personality type, and coursework in the environment that was incongruent with their dominant personality type. Higher levels of achievement were represented by respective grades in the first congruent and the first incongruent courses taken, with an A = 4.0 points, B = 3.0 points, C = 2.0 points, D = 1.0 points, and F = 0.0 points. Comparison of grade point averages among the personality types for coursework taken within congruent environments and within incongruent environments was examined to assess the assumption that students attained greater achievement within congruent academic environments than within incongruent academic environments.

Repeated measures analysis of variance was used to test this assumption. The between subjects factor in this 6 X 2 design was the six personality types and the within subjects factor was students' grades in the two courses that were congruent and incongruent with their dominant personality type. The expectation of the hypothesis was that students earn higher grades in courses congruent with their dominant personality type than grades they earn in courses incongruent with their dominant personality type. A significant interaction in the 6 X 2 design would indicate that the hypothesized result was not true for all personality types and the interactive effects would be plotted for each of the groups (i.e., personality types).

Chapter 4

Results

The means of the grades of students in the two categories of congruence, as determined by Holland's (1997) first letter hexagonal distance measure, were analyzed using repeated measures analysis of variance procedures. When significance was found, Tukey-Kramer post hoc tests were used for pairwise comparisons to determine significant group differences. Effect sizes were then calculated to ascertain the substantive importance of the findings.

Preliminary test. Box's Test for Homogeneity of Variance was significant F (15, 487,803) = 3.866, p = .000. However, this did not present a problem because the total number of subjects was equal for students with grades in congruent courses and students with grades in incongruent courses.

Table 3 presents the means and standard deviations for grades, represented by GPA, in the first course taken that was congruent and the first course taken that was incongruent with the dominant personality type of students for each of the six Holland personality types.

Post hoc tests. The repeated measures ANOVA produced a significant interaction, F (5, 735) = 3.602, p = .003, between type of grade earned in congruent or incongruent courses and dominant Holland personality type indicating that any differences in the grades received in congruent and incongruent courses were dependent upon which dominant Holland personality type was examined. In Figure 2, one immediately notices that the estimated marginal means of grades in courses that are congruent with dominant Realistic, Artistic, Social, and Enterprising personality types are higher than the estimated

Table 3

Means and Standard Deviations of Grades in Congruent and Incongruent Courses *(N = 741)**

Holland Type	Congruent Grade	Incongruent Grade	Average Grade
Realistic, *n* = 48	2.771 (1.477)	2.417 (1.235)	2.594
Investigative, *n* = 260	2.577 (1.175)	2.727 (1.168)	2.652
Artistic, *n* = 132	3.000 (1.034)	2.576 (1.099)	2.788
Social, *n* = 134	2.769 (1.244)	2.694 (1.276)	2.731
Enterprising, *n* = 97	2.742 (1.063)	2.650 (1.259)	2.696
Conventional, *n* = 70	2.986 (1.042)	3.314 (0.843)	3.150
Total, *n* = 741	2.760 (1.168)	2.719 (1.182)	

* Standard Deviations shown in parentheses

marginal means of grades in courses that are incongruent for each of those respective dominant personality types. Conversely, estimated marginal means of grades for dominant Investigative and dominant Conventional personality types are higher in courses that are incongruent with those personality types than they are in courses that are congruent with those dominant personality types.

Results for students with dominant Realistic and Artistic personality types provide support for the congruence assumption of Holland's theory. However, results for students with dominant Investigative and Conventional personality types suggest a contradiction to the congruence assumption, while results for students with dominant Social and Enterprising personality types in Figure 2 are too analogous to indicate support or lack of support for the congruence assumption.

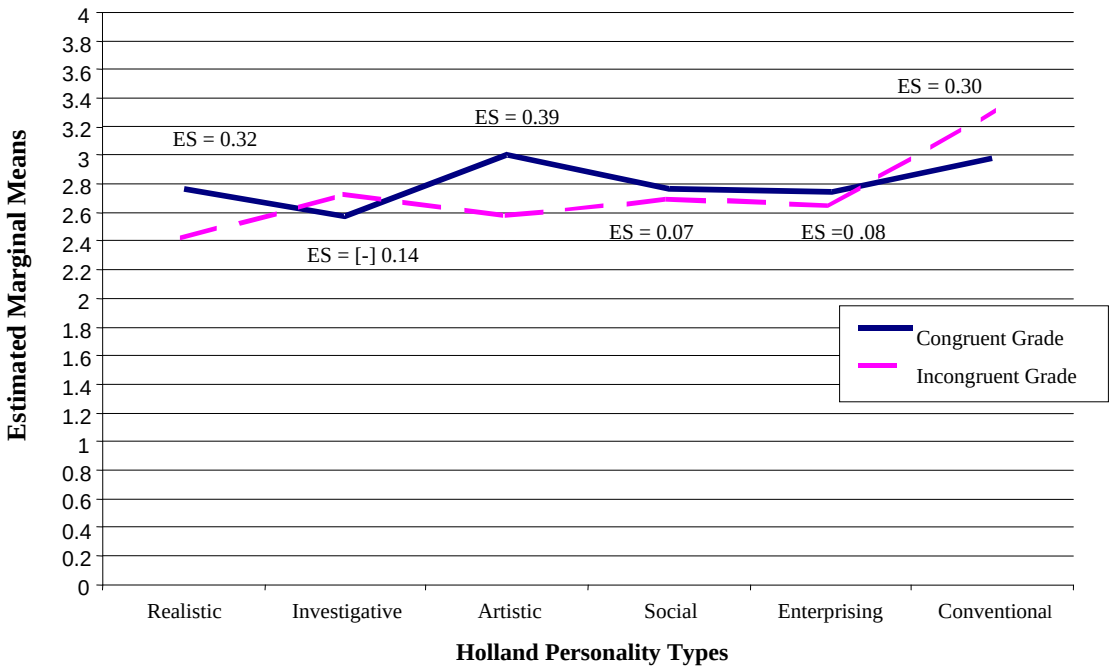

Figure 2. Estimated Marginal Means of Grades

In order to determine any statistically significant differences between congruence and incongruence for each of the six Holland personality types, Tukey-Kramer post-hoc procedures were used. The only statistically significant pair-wise comparison revealed in the post hoc tests was found for Artistic personality types ($p < .05$), $Q = 4.43$, $Q_{cv} = Q_{.05, 2, 735} = 3.84$. These results are given in Table 4.

Tests for substantive importance. Statistical significance indicates when a treatment effect or difference can be confidently inferred. An effect size (ES) is used as a supplement to statistical significance to indicate the strength of the effect. Statistical significance can be augmented with this exploration of practical significance. Therefore, effect sizes were calculated using the error mean square from the within-subjects analyses to further explore any substantive importance in the results.

Though not statistically significant, effect sizes for students with dominant Realistic (ES = 0.32) and Conventional (ES = 0.30) personality types are comparable to the effect size found in the statistically significant dominant Artistic (ES = 0.39) personality type. However, these effect sizes may be a function of the sample sizes for the Realistic ($n = 48$) and Conventional ($n = 70$) personality types and one must be cautious when inferring substantive significance from effect sizes associated with small samples. Still, results for the dominant Realistic personality type suggest support for the congruence assumption while results for the dominant Conventional personality type are contrary to the congruence assumption. The estimated marginal means of grades in congruent and incongruent courses for students with dominant Investigative, Social, and Enterprising personality types depicted in Figure 2 suggest a contradiction to the congruence assumption for Investigative types and support for the congruence

assumption for Social and Enterprising types. However, the very small effect sizes for Investigative (ES = [-] 0.14), Social (ES = 0.07), and Enterprising (ES = 0.08)

Table 4

Results of Tukey-Kramer Post Hoc Tests

	Q	Q_{cv}	Effect Size
Realistic, n = 48			
Congruent vs. Incongruent	2.23	3.84	0.32
Investigative, n = 260			
Congruent vs. Incongruent	-2.20	3.84	[-] 0.14
Artistic, n = 132			
Congruent vs. Incongruent	4.43*	3.84	0.39
Social, n = 134			
Congruent vs. Incongruent	0.79	3.84	0.07
Enterprising, n = 97			
Congruent vs. Incongruent	0.83	3.84	0.08
Conventional, n = 70			
Congruent vs. Incongruent	2.50	3.84	0.30

*$p < .05$

personality types do not suggest any substantive importance in the results for these three personality types.

Chapter 5

Discussion

The validity of the basic tenets of John Holland's (1966, 1973, 1985a, 1997) theory is supported by the findings of hundreds of studies focusing on a variety of student outcomes including selection of and satisfaction with major, persistence, and academic achievement (Assouline & Meir, 1987; Spokane, 1985; Spokane et al., 2000; Tsabari, Tziner, & Meir, 2005), and there is "… consistent evidence based on Holland's theory that academic environments are a primary influence on what students do and do not learn…" (Feldman et al., 2008, p. 338). The purpose of this study was to test the hypothesis in Holland's (1997) theory that academic achievement is a function of the congruence between students' personality types and their academic environments.

The Essential Components of Holland's Theory

Three essential components comprise Holland's (1966, 1973, 1985a, 1997) theory. The individual or *psychological component* assumes that most people can be classified as one of six personality types (Realistic, Investigative, Artistic, Social, Enterprising, Conventional) and Holland has developed thorough definitions of the notable attitudes, interests, and competencies of these six personality types over the past forty years. The environmental or *sociological component* asserts that logically there is a related environment that encourages the development of the characteristics of people who dominate these environments. For example, Social environments are dominated by Social personality types and cultivate the development of the distinctive attitudes, interests, values, and competencies of Social personality types. The interactions between people and their environments constitute the *congruence component* of the theory.

Congruence occurs when dominant personality types inhabit like environments. For example, a dominant Conventional personality type in a Conventional environment represents a perfect "fit" or congruence between personality type and environment. Students with a dominant personality type in an environment not matching their dominant personality type are considered incongruent with that environment.

The Basic Assumptions of Holland's Theory

The three basic assumptions that are associated with the three components of Holland's (1966, 1973, 1985a, 1997) theory are individuals, environment, and congruence. The *self-selection assumption* is a psychological component of the theory in which individuals seek work or educational environments that are reflective of their personality types because these environments offer them opportunities, activities, tasks, and roles that reward their values, self-perceptions, and personality traits. The *congruence assumption* suggests that educational stability, satisfaction, and achievement are a function of the "fit" or congruence between students' personality type and their academic environments, or, majors. The *socialization assumption* suggests students' educational stability, satisfaction, and achievement are determined by the extent to which students learn and display the attitudes, values, interests, and competencies that are consistent with and reinforced and rewarded by their chosen academic environments, regardless of the congruence with the academic environment, or, major.

The majority of research utilizing Holland's theory has focused on the psychological component, or individual, self-selection assumption, and on the results of individuals' choices of congruent or incongruent environments. Holland (1997) noted the lack of studies dedicated to the socialization assumption, stating that "the environmental

models are only occasionally studied" (p. 160). The following addresses both the psychological and sociological components of the theory as they relate to the findings of this study, and also introduces innovative examples of *two alternative patterns of student success* (Feldman et al., 2008; Smart et al., 2006) that are the result of a growing focus on the sociological assumption of Holland's theory.

The Congruence Assumption

As noted previously, the congruence assumption of Holland's (1966, 1973, 1985a, 1997) theory posits that person-environment congruence or "fit" is related, among other things, to stability, satisfaction, and success or achievement in both vocational as well as educational settings. However, the relationship between congruence and success or achievement has received less attention from scholars than has the relationship between congruence and satisfaction. The prior research that has focused on the congruence-achievement relationship has received mixed support (Assouline & Meir, 1987; Camp & Chartrand, 1992; Henry, 1989; Spokane, 1985; Spokane et al., 2000; and Tranberg et al., 1993) and the results of this study only modestly support the theoretical model.

Only the Artistic personality type of Holland's six personality types exhibited a statistically significant relationship between person-environment congruence and academic achievement ($p < .05$), $Q = 4.43$, $Q_{cv} = Q_{.05,\ 2,\ 735} = 3.84$) in this study. Other studies have also resulted in significant findings for Artistic personality types and the congruence assumption of Holland's theory. Feldman et al. (1999) found that Artistic personality types provided the strongest support for the congruence assumption among the four personality types they studied. Students with dominant Artistic personality types

increased their self-reported, arts-related abilities and interests by 0.649 standard deviations, equivalent to approximately 24 percentile points. Artistic students in incongruent environments experienced decreases in their artistic abilities in those incongruent environments by 0.243 standard deviations, nearly 10 percentile points (see also Smart, 1997; Smart et al., 2000, 2006). Feldman (1999) and colleagues also found considerable support for student change in Investigative and Enterprising interests and abilities but not for change in the interests and abilities of students with dominant Social personality types. They also found that students with dominant Investigative or Enterprising personalities who entered a major field congruent with their dominant personality type gained on those respective abilities and interests, while those students with these same dominant personality types who did not enter a congruent major either showed no gains or actually declined in these abilities. Citing the collective findings of prior research that supports a definition of student success based on the longitudinal change and stability in the initially prominent characteristics of students, Smart et al. (2000) concluded that there is "strong evidence in support of the congruence assumption … [in that students who] enter academic environments congruent with their primary personality types increase their dominant skills and interests over the four-year period of college, while those entering incongruent environments either increase less or actually decrease their commensurate abilities and interests" (p. 203).

The Socialization Assumption

Feldman et al. (2001) acknowledged that data constraints did not allow them to compare the relationship between person-environment congruence and socialization influences of the environment when analyzing their effects on student change and

stability in their 1999 study (Feldman et al., 1999). More recently, they have paid closer attention to the socialization assumption of Holland's (1966, 1973, 1985a, 1997) theory when studying its relationship to the educational abilities and interests of students in postsecondary education (Feldman et al., 2008; Smart et al., 2006). Collective evidence from their longitudinal studies of over 2,300 students from more than 300 colleges and universities supports all three of these assumptions. While the findings support the congruence assumption of students increasing their initially prominent characteristics based upon the students choosing an academic environment congruent with their dominant personality type, more intriguing results support the socialization assumption of Holland's theory. Regardless of their dominant personality types as freshmen, the researchers found that academic environments were just as successful in socializing students to their distinctive set of preferred interests and abilities for both congruent and incongruent dominant personality types (Feldman et al., 1999, 2001, 2004; Smart et al., 2000). For example, Feldman et al. (2001) explored the change and stability of students whose dominant personality types were incongruent with their respective environment. They found the largest gain in self-reported abilities and interests for students whose dominant personality type was *incongruent* [emphasis added] with an academic environment was made by students in the Artistic environment (ES = 0.747), followed by students in Investigative environments (ES = 0.430). Essentially, students who entered an environment that was incongruent with their dominant personality type "… actually increased in the interests and abilities of the environment they did enter" (p. 688). With the addition of data not presented in their earlier works, Feldman et al. (2008) provide further evidence supporting the *socialization assumption* "… in that there is a consistent

pattern of student growth in the distinctive ability and interest scale that is assumed to be required, reinforced, and rewarded by each of the four academic environments irrespective of the students' primary personality types" (p. 353). They found that students with dominant Investigative personality types displayed substantial growth in Investigative abilities and interests when they entered Investigative environments (ES = 0.32). Similarly, students with dominant Investigative types who entered Artistic environments exhibited growth in Artistic abilities Interests (ES = 0.48), and Investigative type students who entered Enterprising environments exhibited growth in Enterprising abilities and interests (ES = 0.56). The same results were found for dominant Investigative types who entered Social environments, but these results were not statistically significant (ES = 0.11).

Feldman and colleagues (2001, 2004) maintain that these findings do not contradict the results of their 1999 study. Rather, they explain that students who enter academic environments that reward the abilities and interests of those environments will exhibit enhanced abilities and interests in those environments. In the 2001 study, findings led the researchers to conclude that " … the impacts of academic environments appear to be comparable for students whose personality types are congruent or incongruent with the respective environments (although the initial gap between the two groups of students does not lessen)" (p. 689). Terefore, the findings of the two studies do not conflict because they address two distinct, yet related questions. The first question focuses on the pattern of change and stability for students whose dominant personality is congruent with their academic environment. The second question addresses the socialization effects that disciplines have on the abilities and interests of students whether or not the student's

dominant personality type is congruent with the environment. The findings of this study are consistent with the results of these two prior studies in which students with dominant Artistic and Realistic personality types exhibited gains in academic achievement in courses congruent with their personality types (see Figure 2), thus supporting the congruence assumption in Holland's theory. Conversely, students with dominant Investigative and Conventional personality types in this study actually exhibited greater gains in academic achievement in courses that were incongruent with their dominant personality type than in courses that were congruent. While these results contradict the fundamental premise of the congruence assumption, they do lend additional support to the socialization assumption of the theory. Environments that were not congruent with their dominant personality types were just as successful, and in this case more successful, in socializing students to the distinctive set of preferred interests and abilities of those environments.

Two Alternative Patterns of Student Success

Abundant evidence generally supports the fundamental assumptions of Holland's theory albeit with varying amounts and strengths for personality types and environments across the assumptions (see Assouline & Meir, 1987; Spokane, 1985; Spokane et al., 2000; Tsabari et al., 2005). This evidence supports a definition of student success based on students' initial attitudes, interests, and abilities changing over time as a result of their congruence, or lack of, with corresponding academic environments. Notably, however, the socialization assumption of Holland's theory has received less attention than this congruence assumption by researchers who rely on Holland's theory.

More recently, scholars have identified two alternative patterns of student success based upon both the congruence and socialization assumptions of Holland's theory. First, Feldman and colleagues (2008) and Smart and colleagues (2006) present a *more peaked and highly differentiated profile* [italics in original] of student learning based on the congruence assumption. This pattern of student success results in students enhancing the initial attitudes, interests, and abilities associated with their dominant personality type while remaining constant or declining in initially prominent characteristics that are associated with other personality types and environments. For example, using the means of ability and interest scale scores of four Holland personality types from the responses of 2,309 students completing the 1986 and 1990 Cooperative Institutional Research Program (CIRP) survey during four years of college enrollment, Feldman et al. (2008) found a more peaked and highly differentiated pattern of success for students with a dominant Investigative personality type whose academic majors were in a congruent Investigative environment. Investigative interest and ability scale scores for these students increased from 56.94 in 1986 to 58.62 in 1990 with a corresponding effect size of 0.32. These same students' scores on the other three ability and interest scales declined. Effect sizes reflecting the declines in those interest scale scores were [-] 0.27 for Artistic, [-] 0.20 for Social, and [-] 0.20 for Enterprising. The researchers found the same basic pattern for Artistic, Social, and Enterprising personality types. "Put otherwise, students become better at what they were best at the time they enter college, and remain stable or decline in other abilities and interests" (p. 355). Second, the researchers present a *more balanced or less peaked profile* [italics in original] of student learning based on the socialization assumption of Holland's theory. This pattern of

student success finds students growing in their attitudes, interests, and abilities of their chosen academic environment regardless of their congruence with that environment, while remaining constant or only slightly declining in their initially prominent characteristics. Their distinctive patterns of abilities and interests are reinforced and rewarded by whatever academic environment they select and their resulting profile is more balanced and less peaked because they end up with two strong areas of attitudes, abilities, and interests. These students grow in whatever academic area they choose no matter what dominant personality type they exhibit, and the initially prominent characteristics of their dominant personality type remain strong or only slightly decrease. For example, for students with dominant Investigative personality types, Feldman and colleagues (2008) found that only those Investigative personality types who entered Investigative environments grew in Investigative interests and abilities (ES = 0.32); only those Investigative types who entered Artistic environments grew in Artistic interests and abilities (ES = 0.48); only those Investigative types who entered Social environments grew in Social interests and abilities (ES = 0.11, non-significant); and only those Investigative types who entered Enterprising environments grew in Enterprising interests and abilities (ES = 0.56). Just as important were the findings for dominant Investigative personality types who entered incongruent Artistic, Social, or Enterprising environments. Those students with Investigative personality types remained stable or slightly declined in their initial prominent Investigative characteristics with respective effect sizes of [-] 0.84, [-] 0.17, and 0.09 for those entering Artistic, Social, or Enterprising environments. "That is to say, the magnitude of their 'losses' in terms of their initially prominent characteristics tends to be offset by or compensated by the magnitude of their 'gains' in

the abilities and interests promoted by their chosen (but incongruent) academic environment" (pp. 356-7). This second alternative pattern of student success results in a more balanced, less peaked or differentiated profile of student learning.

Student Success: The Importance of Congruence and Socialization

The results of this study lend partial support to both the congruence and socialization assumptions of Holland's theory. Students with dominant Artistic personality types exhibited greater gains in academic abilities in courses within congruent Artistic environments, or courses, (ES = 0.39) than they did in courses within incongruent environments. These results are consistent with earlier findings as Smart et al. (2000) noted, " … the likelihood of students with a dominant Artistic personality type further developing their Artistic abilities and interests is contingent upon their entry into an Artistic academic environment: those who enter a congruent, Artistic environment show decidedly greater growth in these attributes than those who enter an incongruent, non-Artistic environment (whose Artistic abilities and interests actually decline)" (p. 214). Likewise, dominant Realistic personality types, those majoring in electrical or mechanical engineering in this study, exhibited greater gains within congruent Realistic environments, or courses, than within incongruent environments. However, results for Realistic personality types were not statistically significant although the effect size of 0.32 is highly similar to the effect size for Artistic personality types. Again, the congruence assumption is supported by the results for Realistic personality types. Another explanation for the poorer performance in incongruent courses for Realistic personality types may be due to one academic environment being less effective than other academic environments in reinforcing and rewarding its distinctive set of

competencies and interests. All of the 48 students with dominant Realistic personality types in this study took highly incongruent Social courses (see Table 5) and they may have experienced lesser gains in those Social courses because as Smart et al. (2000) found, “Social academic environments in general seem to be less successful than others in reinforcing and rewarding their distinctive set of competencies and interests” (p. 203). This, too, may explain why results for dominant Social personality types in this study do not statistically (effect size = 0.07) support the congruence assumption. Smart and colleagues found that “ … Social academic environments, more than others, do not have a focused set of consistent and explicit goals for undergraduate education,” resulting in “ … apparently weaker ‘success’ of Social environments in the further development of students’ Social abilities and interests and for the unexpected lack of support for the congruence assumption pertaining to students with a dominant Social personality type” (p. 204).

Why, then, do results for dominant Enterprising personality types in this study not substantively support the congruence assumption of Holland’s theory and why do results for dominant Conventional and Investigative types contradict the congruence assumption? Again, although not statistically significant (ES = 0.08), dominant Enterprising personality types exhibited greater gains in environments (courses) congruent with their personality type than they did in environments (courses) incongruent with their personality type. These results are in accord with the more psychologically oriented congruence component of Holland’s theory resulting in a more peaked alternative profile of student success in which students with dominant Enterprising personality types performed better in courses congruent with their initially

prominent sets of interests and abilities than they did in courses incongruent with their prominent sets of interests and abilities. Conversely, results in this study for dominant

Table 5

Holland Personality Type With First Congruent and Incongruent Course Taken by Discipline and Greatest Frequency (N = 741)

Dominant Personality Type/ Congruent Courses	Course Incongruence Levels		
	Highly Incongruent	Moderately Incongruent	Modestly Incongruent
Investigative (*N* = 260)			
biology, chemistry, or math (*n* = 194)	business (*n* = 90)	religion (*n*=100) political sci (*n*=36)	English (*n* = 28)
Artistic (*N* = 132)			
English (*n* = 113)	accounting (*n* = 25)	engineering (*n* = 17) business (*n* = 12)	biology, chemistry, or math (*n* = 35)
Social (*N* = 134)			
religion (*n* = 80)	electrical or mechanical engineering (*n* = 12)	biology, chemistry, or math (*n* = 73)	English (*n* = 2)
Enterprising (*N* = 97)			
business (*n* = 92)	biology, chemistry, or math (*n* = 44)	none	political sci (*n* = 52)
Conventional (*N* = 70)			
accounting (*n* = 65)	English (*n* = 48) speech (*n* = 22)	none	none
Realistic (*N* = 48)			
electrical or mechanical engineering (*n* = 41)	religion (*n* = 35) history (*n* = 13)	none	none

Investigative and Conventional personality types more closely approximate the sociologically oriented socialization component of Holland's theory. Students with these two dominant personality types exhibited considerably higher achievement in environments (courses) that were incongruent with their initially prominent characteristics than they did in courses congruent with their prominent sets of interests and abilities, resulting in a more balanced alternative profile of student success. The congruence assumption of Holland's theory played a significant role in the achievement results for several personality types in this study. Just as significant, however, was the capacity of academic environments in students' acquisition of interests and abilities, represented by achievement in coursework, no matter what dominant personality type they exhibited.

Holland's Theory: A Blended Application

The results of this study suggest advancing a blended application of Holland's theory for use by academic advisors who assist students in making educational and occupational decisions that are congruent with students' distinctive goals, values, interests, and abilities. Research supports both the congruence assumption of Holland's theory (see Assouline & Meir, 1987; Spokane, 1985; Spokane et al., 2000; Tsabari et al., 2005) as well as the socialization assumption of the theory (see Feldman et al., 2001, 2004; Feldman et al., 2008; Smart et al., 2006). That is, students who enter academic environments congruent with their primary personality types increase their skills and interests, while those entering incongruent environments either remain stable or actually decrease their commensurate skills and interests. Plus, academic environments are just as successful in socializing students to their distinctive set of preferred interests and abilities

for both congruent and incongruent dominant personality types. In either case, academic environments are central to understanding student success in postsecondary education.

If students' interests lie in further developing their initially prominent characteristics, the students should be advised to select an academic environment, or major, that is congruent with their dominant personality type. Those students should also be encouraged early in their academic careers to take courses in environments that are congruent with their dominant personality type. These environments will reinforce and reward the students' initially prominent interests and abilities which, theoretically, will lead to a more highly peaked profile of student success that is identified by a particular set of interests and abilities. Other students might be interested in developing a more balanced profile of student success. Those students should actually be advised to take courses in academic environments that will assist them in developing interests and abilities that are not part of their initially prominent characteristics.

Conclusion

Whether students desire to enhance their initially prominent interests and abilities or to broaden their range of other competencies, it is paramount that academic advisors and counselors provide their students with consistent and accurate information when selecting appropriate academic environments. The congruence and socialization assumptions of Holland's (1966, 1973, 1985a, 1997) theory and the alternative patterns of student success identified by Smart et al. (2006) provide clear evidence that student personality type and academic environments are fundamental components in assisting students in their selection of academic majors which will have a significant impact on the

development of their attitudes, interests, abilities, and achievement during their postsecondary experience.

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Appendix A

Holland Personality Type With Frequency of Course Type Incongruence Levels (N = 741)

Dominant Personality Type	Course Incongruence Levels: Highly Incongruent[a]	Moderately Incongruent[b]	Modestly Incongruent[c]
Investigative (n=260)	Enterprising (n=90); 34.6%	Conventional or Social (n=136); 52.3%	Realistic or Artistic (n=34); 13.1%
Artistic (n=132)	Conventional (n=36); 27.3%	Realistic or Enterprising (n=42); 31.8%	Investigative or Social (n=54); 40.9%
Social (n=134)	Realistic (n=14); 10.5%	Investigative or Conventional (n=118); 88.1%	Artistic or Enterprising (n=2); 1.5%
Enterprising (n=97)	Investigative (n=97); 100%		
Conventional (n=70)	Artistic (n=70); 100%		
Realistic (n=48)	Social (n=48); 100%		

[a]opposite on the hexagon
[b]twice removed on the hexagon
[c]adjacent on the hexagon

THE UNIVERSITY OF MEMPHIS

Institutional Review Board

To: John Hargett
Counseling, Educational Psychology & Research

From: Chair, Institutional Review Board
for the Protection of Human Subjects
Administration 315

Subject: Person-environment congruence and academic achievement of college students: An application of Holland's theory (E10-83)

Approval Date: October 30, 2009

This is to notify you that the Institutional Review Board has designated the above referenced protocol as exempt from the full federal regulations. This project was reviewed in accordance with all applicable statutes and regulations as well as ethical principles.

When the project is finished or terminated, please complete the attached Notice of Completion and send to the Board in Administration 315.

Approval for this protocol does not expire. However, any change to the protocol must be reviewed and approved by the board prior to implementing the change.

Chair, Institutional Review Board
The University of Memphis

Dr. J. Smart