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Holland's Theory and Patterns of College Student Success

Commissioned Report for the National Symposium on Postsecondary Student Success: Spearheading a Dialog on Student Success

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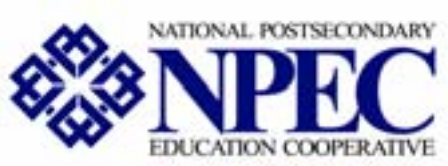

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HOLLAND'S THEORY AND PATTERNS OF COLLEGE STUDENT SUCCESS

Our central purpose in this report is to illustrate the merits of John L. Holland's (1966, 1973, 1985a, 1997) person-environment fit theory as a theory-based approach for advancing our knowledge and understanding of student success in postsecondary education. The first section of the report provides a selective review of current efforts to assess factors associated with student success. We focus primarily on the relative strengths and weaknesses of prevalent theoretical and methodological approaches used to guide this line of inquiry. We are selective in this regard because the scope of our analysis precludes a more exhaustive consideration of specific individual and institutional attributes that have been found to be related to different manifestations of student success, and because an exhaustive review of these factors has been recently completed by Pascarella and Terenzini (2005). We end this first section by analyzing how reliance on Holland's theory would help to alleviate the most salient weaknesses we consider to be inherent in the extant literature.

The next three sections of the report provide a reasonably thorough description of Holland's theory (section 2) while focusing specifically on its utility in advancing knowledge of student success (sections 3 and 4). Our collaborative efforts over the past several years have suggested alternative emphases on different components of the theory and alternative interpretations of findings that inform our understanding of the relative importance of multiple individual and institutional factors associated with student success. The theory was designed initially to help individuals (students) select careers (academic majors) in which they would have the greatest likelihood of subsequent success. This is a substantively different purpose than that of developing an understanding of what postsecondary institutions might collectively do to foster the academic and personal success of their students. The difference has to do with whether the intent is predominantly psychological or sociological in nature, and this distinction has implications for how Holland's theory is used to guide subsequent inquiries. In section 3, we identify and elaborate on modifications to the theory in terms of the centrality of its alternative uses. Then in section 4, we provide illustrative examples of alternative patterns of student success based on the congruence and socializations assumptions of Holland's theory. The fifth and final section of the report describes what we consider to be the primary implications for scholars and campus officials of using Holland's theory to understand and facilitate student success in postsecondary education.

Section 1. Assessing Contemporary Efforts to Understand Student Success

We begin with a brief review of the most common intellectual traditions that have guided research on the topic of how postsecondary institutions affect student success, as manifested in the likelihood of student persistence, satisfaction, and achievement. Such a review is useful because our beliefs regarding the potential benefits of Holland's theory stem from several concerns we have with the most prevalent theories or conceptual models that have been used to study student success. Before we turn to those concerns, it is instructive to locate our approach within the many intellectual traditions manifested in the higher education research literature.

Pascarella and Terenzini (2005) identify two broad categories of theories or models that have guided most research on how college students grow or change as a consequence of their collegiate experiences. They label the first cluster as "developmental" theories or models (e.g., psychological "stage" theories) that focus primarily on *intra*individual change or growth that "typically describe one or more of the dimensions of student development and the stages, phases, or other movement along a given dimension" (p. 18). They label the second family as "college impact" models that focus primarily on interindividual origins of student change "associated with the characteristics of the institutions students

attend (between-college effects) and/or with the experiences students have while enrolled (within-college effects)" (p. 18). Pascarella and Terenzini further note that "the primary difference between the two families of theories lies in the relative degree of attention they give to *what* changes in college students versus *how* these changes come about. Whereas student-centered developmental models concentrate on the nature or content of student change (for example, identity formation, moral or cognitive development), 'college impact' models focus on the sources of change (such as differential institutional characteristics, programs and services, student experiences, and interactions with students and faculty members)" (p. 19).

Our intellectual interests have decidedly more in common with the "college impact" models, since we are interested in *how* students change but even more so in the extent to which such changes are related to attributes of the institutions students attend and with the experiences students have while enrolled in those institutions. Thus, our concerns with the extant research literature that focuses on student success are derived primarily from that sector of the research literature that is based on "college impact" models as described by Pascarella and Terenzini (2005).

Some Concerns About the Current Research Literature on Student Success

We believe that contemporary efforts to understand student success in American higher education are likely to have only moderate success for three primary reasons. First, current conceptual models tend to be either overly broad or insufficiently developed theoretically. Without sufficient reliance on systematic and full-fledged theory, scholars have been left to an empirical search for predictors of student success, however defined. Second, contemporary efforts to understand the factors that contribute to student success have focused predominantly on the characteristics and behaviors of college students. Pascarella and Terenzini (1991, 2005) have noted this tendency in their discussion of the growing dominance of the psychological research paradigm in the higher education research literature. Third, while the prevailing focus on student characteristics and behaviors is wholly appropriate, the growing dominance of the psychological research paradigm has resulted in a major reduction in attention to the socialization influences of institutions and campus environments. We have witnessed a decline in the past two decades in the research of how, and to what extent, the collective attitudes and behaviors of faculty and administrators and the environments of colleges and universities are seen as contributing to student success. These three characteristics of the contemporary higher education research literature have important implications for the conduct of research on student success.

Theoretical and Concomitant Measurement Limitations. As noted earlier, our own intellectual interests have decidedly more in common with the "college impact" models, since we are interested in not only *how* students change, but especially in the extent to which such changes are related to attributes of the institutions students attend and with the experiences students have while enrolled in them. Pascarella and Terenzini (2005, p. 84) discuss five college impact models, noting that the "models are less specific than theories of individual development in their explication of the particular changes students undergo, less detailed in their overall exposition, and less explicit about their grounding in the work of other theorists." The five "college impact models" they discuss are Astin's I-E-O Model (1970a, 1970b) and his Theory of Involvement (1984), Tinto's (1975, 1993) Theory of Student Departure, Pascarella's (1985) Model of Learning and Cognitive Development, and Weidman's (1989) Model of Undergraduate Socialization. As noted, Pascarella and Terenzini's observations about these five models clearly illustrate that they are highly general in character. They tend to be broad conceptual models that are grounded in and derived from the current traditions and practices of scholars who have studied the personal and institutional factors associated with the persistence, satisfaction, and achievement of college students.

While valuable in terms of bringing some order to and making some sense of the multitude of factors that have been found to be related to various dimensions of student success, these models and others like them do not completely satisfy the fundamental criteria of theories provided by Kerlinger (1986) and others. Moreover, even the two most analytically advanced models, Tinto's Theory of Student Departure and Weidman's Model of Undergraduate Socialization, lack psychometrically validated measures of any constructs in the respective models, nor are there psychometrically validated measures for the constructs imbedded in the three other "college impact" models. In sum, the large bulk of research on student success based upon these models has not been grounded in full-fledged theory, and this less than desirable condition has been compounded by an absence of psychometrically sound measures for the constructs imbedded in them. These theoretical and methodological limitations may be important contributing factors in explaining why literature reviews of empirical studies grounded in such models report weak support for the hypothesized effects of the models' constructs (see, for example, Braxton, Sullivan, & Johnson, 1997).

Dominant Attention on Student Characteristics and Behaviors. The absence of full theoretical grounding and the presence of measurement deficiencies of college impact studies may also have helped encourage an empirical search for factors consistently associated with student success that we noted earlier. The difficulties inherent in this essentially atheoretical mindset have been compounded by the dominance of the psychological research paradigm noted by Pascarella and Terenzini (1991, 2005). One consequence of the confluence of these two forces has been that primary attention is devoted to the characteristics and behaviors of college students. This tendency is manifested in a number of the leading student-centered research traditions that have guided inquiry on the factors contributing to student success. Illustrative of these traditions are Astin's (1984) focus on student involvement, Tinto's (1975, 1993) emphasis on student integration, Pace's (1984, 1990a) attention to the quality of student effort, and the rapidly growing efforts of Kuh (2001) and his colleagues regarding student engagement. While these research traditions may use different terminology to describe their respective concepts of student behaviors, their views are based on the central premise that students learn from what they do in college (Pike, Smart, Kuh, & Hayek, in press). Considerable evidence has emerged in recent years supporting this central premise of the student-centered research traditions (see, for example, Gellin, 2003; Kuh, Hu, & Vesper, 2000; Pike, 1999; Pike & Kuh, 2005; Pike, Kuh, & Gonyea, 2003).

The emphasis on student characteristics and behaviors has been linked to the development of "process indicators" and measures of student behaviors that have been found to be related to desired student outcomes (e.g., learning) following the recommendation of the National Center for Education Statistics (NCES, 1991). Process indicators are frequently referred to as "principles of good practice" or "best practices in undergraduate education" and "are assumed to be equally appropriate, or can be adapted to produce comparable outcomes, for <u>all</u> students across <u>all</u> types of institutional settings" (Kuh, Pace, & Vesper, 1997, p. 436, emphasis added).

The accumulative findings of evidence grounded in the student-centered research traditions, in conjunction with growing interest in the development of process indicators, has led numerous scholars to suggest a uniform set of best practices or "institutional benchmarks" that represent the salient student behaviors and perceptions that have been found to have a consistent, positive association with multiple manifestations of student success (e.g., persistence, satisfaction, learning). Examples of these best practices include the National Benchmarks of Effective Educational Practice developed at the Indiana University Center for Postsecondary Research (IUCPR, 2001). The five national benchmarks are Level of Academic Challenge (e.g., time spent preparing for class, emphasis on higher order thinking in class); Active and Collaborative Learning (e.g., frequency of interaction with other students in and out of class); Student Interaction with Faculty Members (e.g., frequency of interactions with faculty members in and out of class); Enriching Educational Experiences (e.g., frequency of interactions with diverse student groups, use of electronic technology, and participation in internship and study abroad activities); and

Supportive Campus Environment (e.g., students' perceptions of the quality of their relationships with faculty, peers, and administrative personnel).

In an earlier analysis, we raised the possibility that "what scholars find in their inquiries may be influenced by what they looked for" (Smart, Feldman, & Ethington, 2000, p. 238), and we believe that the growing dominance of the psychological research paradigm noted by Pascarella and Terenzini (1991, 2005) and the concomitant emergence of student-centered research traditions manifested in the contributions of Astin, Tinto, Pace, and Kuh have given primary attention to student characteristics and especially their behaviors in the quest to determine the primary factors associated with student success. Indeed, there is a growing body of evidence supporting the importance of student characteristics and behaviors to their ultimate success in postsecondary education. What we find discomforting is the noticeable decline in attention devoted to the influences of campus environments and other manifestations of the collective efforts of faculty and administrative personnel to student success. To be sure, each of the student-centered research traditions manifested in the works of Astin, Tinto, Pace, and Kuh pays homage to both college students and college environments. But even a cursory inspection of the proportion of attention devoted to each of these elements and the respective intellectual and methodological rigor manifested in the respective components leads to the conclusion that the component of the campus environment is of a decidedly distant secondary interest in the conceptual and methodological aspects of these student-centered research traditions and the many studies grounded in them. This lack of attention to environments has most likely resulted in an *overestimation* of the importance of student attributes and behaviors. This circumstance is an example of the classic "third variable" problem, wherein the estimates of the effects of measured variables contain the influence of omitted variables, thus appearing to enhance the importance of those included variables.

Insufficient Attention to Campus Environments. We share with the student-centered research traditions just noted a fundamental belief that basic understanding of student success requires attention to both the predispositions and behaviors of college students *and* the nature of campus environments. We believe, however, that the attention devoted to the college environment component should be at least equivalent to that devoted to the college student component. We are reminded of both the rich intellectual heritage of college environments in the higher education research literature throughout the 1960s, 70s, and 80s and the pervasive effects of college environments on the change and stability of college students documented by Feldman and Newcomb (1969) and Baird (1988).

Focused attention on the study of college environments and their relationship to the change and stability of college students was a primary concern of higher education scholars beginning with the pioneering work of Pace and Stern (1958). Intellectual and conceptual interest in college environments was complemented by the development of intellectually sophisticated and methodologically sound measurement instruments to aid scholars in their quest to learn how college environments contributed to students' adjustment to and success in their collegiate endeavors. Instruments such as the College Characteristics Index (CCI) (Stern, 1970), College and University Environment Scales (CUES) (Pace, 1969), Institutional Functioning Inventory (IFI) (Peterson, Centra, Hartnett, & Linn, 1970), and Institutional Goal Inventory (IGI) (Peterson & Uhl, 1977) measured multiple components of campus environments and were central to fostering the study of college environments.

There appears to be a general consensus that the nature of campus environments and sub-environments is related to patterns of student growth and development, though the consistency and magnitude of the relationships varies across studies (Feldman & Newcomb, 1969; Baird, 1988). For example, in their review of the research on the impact of college on students, Feldman and Newcomb (1969) primarily framed their analysis in terms of the overall institutional environment (e.g., types of colleges) as well as the more specific subenvironments within colleges (e.g., major fields and residential groupings). In addition to reviewing many specific studies showing the distinctive impacts of various

specific college environments and subenvironments, the authors made a case for a more general environmental impact in terms of the accentuation of initial group differences. At the institutional (college) level, they write: "What we discovered to be most usual, in the studies we have surveyed, is that diversities among entering student bodies [across different college and universities] are, if anything, amplified during the college years . . ." (p. 141). As an example at the subenvironmental level, Feldman and Newcomb reported the following as a generalization that could be made across studies of major-field effects:

> The evidence is clear . . . that differential experiences in the several major fields do have impacts beyond those attributable to initial selection into those fields. Perhaps the most convincing evidence of this is the prevalence of the accentuation of initial major-field differences. It has been shown that preexisting differences in characteristics typical of students initially choosing different curricular tend to become more pronounced following experience in terms of those major fields (p. 193).

Accentuation of initial group differences, as one kind of environmental impact, has received conceptual refinement and additional empirical support since Feldman and Newcomb originally called attention to the phenomenon (see, for example, Feldman & Weiler, 1976; Smart & Feldman, 1998). For instance, Feldman and Weiler (1976) explored whether preexisting differences in characteristics of University of Michigan students initially selecting different college majors tended to become more pronounced (or accentuated) following their experiences in those major fields. The researchers found accentuation of initial group differences for female students on the Complexity and Religious Liberalism scales of the Omnibus Personality Inventory. Estheticism scores for female students and Theoretical Orientation scores for male students also showed accentuation of initial group differences (although the findings were a little less clear in these two cases).

Much of the richness of this earlier genre of scholarship on college environments has been lost in the past two or three decades with the emerging dominance of the psychological research paradigm noted by Pascarella and Terenzini (1991, 2005) and the concomitant development of student-centered research traditions manifested in the seminal contributions of Astin (1970a, 1970b, 1984), Tinto (1975, 1993), Pace (1984, 1990a), and Kuh (2001). We regard this as a problematic development if, as all seem to agree, knowledge of the likelihood of student persistence, satisfaction, and success (e.g., learning) requires knowledge of both students' predispositions and behaviors and of campus environments. There are, however, some studies devoted to the study of college and university environments. The work of Berger and Milem (2000), Hurtado, Dey, Gurin, and Gurin (2003), and Baird (2005) are illustrative of the limited number of contemporary efforts that demonstrate the importance of analyzing college and university environments to understand student success.

Potential Benefits From Reliance on Holland's Theory

We seek in our present efforts to offer a theory-based approach to the study of student success in postsecondary education that devotes equal attention to both the predispositions and behaviors of college students and the campus environments they encounter in their collegiate experience. This approach is the person-environment fit theory of John L. Holland (1966, 1973, 1985a, 1997). We believe that reliance on Holland's theory would help address our concern that contemporary efforts to understand student success in postsecondary education are likely to have only moderate success because they lack sufficiently systematic theoretical guidance, focus disproportionately on the predispositions and behaviors of college students, and tend to ignore the socialization influences of college environments. We do not offer Holland's theory as a complete panacea for possible weaknesses and deficiencies of the current traditions,

but rather seek to show the advantages of a theory-based approach that has direct applicability to the investigation of student success.

Theoretical Guidance. Greater attention to Holland's theory in efforts to understand student success would clearly alleviate our initial concern about certain deficiencies in full-scale theoretical guidance in contemporary efforts. The point we wish to emphasize here is the direct appropriateness of Holland's theory to guide such efforts. While initially proposed as a theory of careers to assist individuals in their selection of occupations in which they have the greatest likelihood of vocational stability (persistence), satisfaction, and success, Holland has consistently and repeatedly noted that "the hypotheses about educational behaviors ... 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, emphasis added). Thus, Holland's theory can be applied to either vocational or educational success.

Balanced Attention to Psychological and Sociological Components. Holland's theory places equal emphasis on both psychological and sociological considerations in efforts to understand vocational and educational stability, satisfaction, and achievement. This aspect of the theory addresses our concern about the imbalance that exists in contemporary efforts where attention to psychological considerations (e.g., student predispositions and behaviors) far surpasses attention to sociological considerations (e.g., college environments). As a theory of person-environments fit, equal attention is given to the attributes of individuals and to the fundamental nature of their educational and occupational environments in understanding their subsequent levels of educational or vocational success.

Specificity of Incorporated Constructs. Holland's theory provides specific theoretical attention to the attributes of individuals, their environments, and the fit or congruence between individuals and environments. As discussed in the next section, Holland's theory assumes that individuals (the psychological component) may be classified in terms of their similarity to six personality types. It proposes six analogous work or educational environments (the sociological component), and offers a hexagonal model to assess the level of fit or congruence between individuals and their environments (the congruence component). Such specificity in the constructs of the theory helps counter the atheoretical empirical search for factors associated with student success that is characteristic of some contemporary efforts.

Psychometrically Sound Measures of Incorporated Constructs. Holland and his associates have developed psychometrically sound instruments for the measurement of individuals' personality types and the analogous model environments (Holland, 1997). In addition, established theory-based procedures have been developed to determine the level of fit or congruence between individuals and their environments. The existence of valid instruments to measure the constructs incorporated in Holland's theory stands in clear contrast to the scarcity of reputable measures of the major constructs incorporated in the "college impact" models that are central to contemporary efforts to understand student success.

Concluding Observations

We believe that the collective attributes of Holland's theory just noted (and discussed in more depth in the following section) would enhance contemporary efforts to understand student success in a variety of ways. As noted earlier, we do not offer Holland's theory as a panacea for any weaknesses and deficiencies of the current traditions, but rather seek to show the advantages of a theory-based approach that has direct applicability to the investigation of student success. We believe Holland's theory has great applicability because it (1) primarily focuses on crucial components in any generic definition of student success, (2) provides a basis for the consideration of both individuals and their environments since both

have been shown to be essential in successful efforts to understand student success, (3) provides a basis for the selection of theory-based constructs to guide inquiry on student success and accepted measurement instruments for those constructs, and (4) provides guidance for the use of appropriate analytic procedures to reveal more precise estimates of student-success measures. In sum, reliance on Holland's theory would provide a theoretical linkage between variations in patterns of student success and students' learning experiences as well as their interactions with different academic environments. We will revisit these theoretical linkages and how they would be manifested in studies to understand student success following our overview of Holland's theory in the next section.

Section 2. Overview of Holland's Theory

The personal-environment fit theory of John Holland (l966, 1973, l985a, l997) is one of the most frequently cited contributions to the social science research literature (Citation Classics, 1980), and the validity of its basic tenets is supported by the findings of literally hundreds of studies (e.g., Assouline & Meir, 1987; Spokane, 1985; Spokane, Meir, & Catalano, 2000; Tsabari, Tziner, & Meir, 2005). Such evidence attests to the scholarly credibility of Holland's theory and its potential to provide a theory-based approach for research on student success in postsecondary education. Furthermore, Holland's theory has both a psychological and a sociological component, and thus has the breadth to encompass both predispositions and behaviors of college students (i.e., the psychological component) and attributes of college and university environments (i.e., the sociological component). This attribute of Holland's theory reduces the dominant reliance of attention on the characteristics and behaviors of college students inherent in the psychological research paradigm that largely guides contemporary research efforts. Finally, the sociological component of the theory fully recognizes the multiple components of college and university environments and permits exploration of how separate sectors of the overall institutional environment differentially contribute to student success or failure. This particular characteristic of the theory assures theory-based attention to college and university environments in studies of student success in postsecondary education.

Holland's Theory: Essential Components and Fundamental Assumptions

Individual/Psychological Component. Holland's theory assumes that the choice of a vocation or a college major is an expression of personality and that most people can be classified as one of six primary personality types (Realistic, Investigative, Artistic, Social, Enterprising, Conventional). Thorough definitions of the salient attitudes, interests, and competencies of each personality type have been developed over the past four decades by Holland (1966, 1973, 1985a, 1997). For example, Investigative types tend to be critical, intellectual, and reserved; to possess strong mathematical and scientific competencies; and to value scholarly and scientific achievements. In contrast, Enterprising types tend to be self-confident, pleasure-seeking, and sociable; to possess strong public speaking and leadership competencies; and to value political and economic achievements. Exhibit 1 presents an illustrative listing of the distinctive attributes of each of the six personality types that constitute the *psychological component* of Holland's theory.

Exhibit 1. Salient attributes of the six personality types from Holland's theory

REALISTIC people prefer activities that involve the explicit, ordered, and systematic manipulation of objects, tools, machines, and animals, and avoid educational and interpersonal activities. These behavioral tendencies of Realistic people lead, in turn, to the acquisition of manual, mechanical, agricultural, electrical, and technical competencies and to a deficit in social and educational

competencies. Realistic people perceive themselves as practical and conservative, having mechanical, technical, and athletic abilities, and as lacking ability in social skills. They value material rewards—money, power, and status—for tangible accomplishments.

INVESTIGATIVE people prefer activities that involve the observational, symbolic, systematic, and creative investigation of physical, biological, and cultural phenomena in order to understand and control such phenomena, and avoid persuasive, social, and repetitive activities. These behavioral tendencies of Investigative people lead, in turn, to the acquisition of scientific and mathematical competencies and to a deficit in persuasive and leadership abilities. Investigative people perceive themselves as cautious, critical, complex, curious, independent, precise, rational, and scholarly, and value the development or acquisition of knowledge.

ARTISTIC people prefer ambiguous, free, and unsystematized activities that involve the manipulation of physical, verbal, or human materials to create art forms or products, and avoid routine activities and conformity to established rules. These behavioral tendencies of Artistic people lead, in turn, to the acquisition of artistic competencies—language, art, music, drama, writing—and to a deficit in clerical and business system competencies. Artistic people perceive themselves as expressive, original, intuitive, nonconforming, introspective, independent, emotional, and sensitive, and value the creative expression of ideas, emotions, or sentiments.

SOCIAL people prefer activities that involve the manipulation of others to inform, train, develop, cure, or enlighten others, and avoid explicit, ordered, systematic activities involving materials, tools, or machines. These behavioral tendencies of Social people lead, in turn, to the acquisition of human relations competencies (e.g., interpersonal and educational skills) and to a deficit in manual and technical ability. Social people perceive themselves as cooperative, empathetic, generous, helpful, idealistic, responsible, tactful, understanding, and warm, and value fostering the welfare of others and social service.

ENTERPRISING people prefer activities that involve the manipulation of others to attain organizational goals or economic gain, and avoid scientific, intellectual, and abstruse activities. These behavioral tendencies of Enterprising people lead, in turn, to an acquisition of leadership, interpersonal, speaking, and persuasive competencies and to a deficit in scientific ability. Enterprising people perceive themselves as aggressive, ambitious, domineering, energetic, extroverted, optimistic, popular, self-confident, sociable, and talkative, and value material accomplishment and social status.

Exhibit 1. Salient attributes of the six personality types from Holland's theory—Continued

CONVENTIONAL people prefer activities that involve the explicit, ordered, systematic manipulation of data—such as keeping records, filing and reproducing materials, and organizing written and numerical data according to a prescribed plan—and avoid ambiguous and unstructured undertakings. These behavioral tendencies of Conventional people lead, in turn, to the acquisition of clerical, computational, and business system competencies and to a deficit in artistic competencies. Conventional people perceive themselves as careful, conforming, orderly, and as having clerical and numerical ability. They value material and financial accomplishment and power in social, business, and political arenas.

Holland (1997) notes that a variety of qualitative and quantitative methods may be used to assess a person's personality type. Among the *qualitative* methods is the observation of a person's expression of vocational preferences for, or actual employment in, an occupation that is characteristic of a type, or a person's preference for, or actual engagement in, educational training that is characteristic of a type. For example, a person may want to become a chemical engineer, currently be employed as a chemical engineer, plan to major in chemical engineering, or currently be enrolled as a chemical engineering major. Any one or combinations of these four kinds of information results in being classified as an Investigative personality type because "chemical engineering" is one of the occupations and academic majors that define the Investigative type. Thus, using the qualitative methods noted by Holland, an individual's personality type is defined by his or her preference for or selection of a particular occupation or academic major that has been shown to be representative of the respective personality types.

Holland and his colleagues have developed a number of resources that may be used to identify occupations and academic majors associated with each personality type. For example, the *Dictionary of Holland Occupational Codes* (DHOC) developed by Gottfredson and Holland (1996), may be used to identify the occupations associated with each personality type. The DHOC classifies all occupations included in the entire *Dictionary of Occupational Titles* (U. S. Department of Labor, 1977) into the six personality types included in Holland's theory. Similarly, *The College Majors Finder* (Rosen, Holmberg, & Holland, 1989) and *The Educational Opportunities Finder* (Rosen, Holmberg, & Holland, 1997) classify over 900 college majors according to their resemblance to the distinctive interests, skills, and abilities of the six personality types and may be used to identify academic majors associated with each personality type.

Among the *quantitative* methods that may be used to assess a person's personality type are scores on selected scales of personality and interest inventories such as the Self-Directed Search (SDS) (Holland, Powell, & Fritzsche, 1994), the Vocational Preference Inventory (VPI) (Holland, 1985b), the Strong-Campbell Interest Inventory (SCII) (Campbell & Hansen, 1981), and the Strong Vocational Interest Blank (SVIB) (Campbell & Hansen, 1981). Specifically, the six theme scores of the SCII, the composite activities, competencies, occupations, and self-rating scales from the SDS, and the occupational preference scales of the VPI may be used to assess a person's resemblance to the six personality types.

Although Holland (1997, p. 29) acknowledges that "no single assessment technique stands out as being the most advantageous for all purposes," he suggests that the use of selected scales of established personality and interest inventories and the use of current preferences for occupations and academic majors "have either produced more coherent results or have special advantages by virtue of their simplicity or theoretical construction." In sum, he suggests that it is preferable to use both inventory and occupational data to determine personality types.

Environmental/Sociological Component. The theory further proposes six analogous model environments reflecting the prevailing physical and social settings in society. That is, for each personality type there is a logically related environment characterized by the atmosphere created by the people who dominate it (e.g., Investigative environments are dominated by Investigative people and foster the development of the distinctive attitudes, interests, values, and competencies of Investigative people; Enterprising environments are dominated by Enterprising people and foster the development of the distinctive attitudes, interests, values, and competencies of Enterprising people). Exhibit 2 presents an illustrative listing of the distinctive attributes of each of the six model environments that constitute the *sociological component* of Holland's theory.

Exhibit 2. Salient attributes of the six model environments from Holland's theory

REALISTIC environments emphasize concrete, practical activities and the use of machines, tools, and materials. These behavioral tendencies of Realistic environments lead, in turn, to the acquisition of mechanical and technical competencies and to a deficit in human relations skills. People in Realistic environments are encouraged to perceive themselves as having practical, productive, and concrete values. Realistic environments reward people for the display of conforming behavior and practical accomplishment.

INVESTIGATIVE environments emphasize analytical or intellectual activities aimed at the creation and use of knowledge. Such environments devote little attention to persuasive, social, and repetitive activities. These behavioral tendencies in Investigative environments lead, in turn, to the acquisition of analytical, scientific, and mathematical competencies and to a deficit in persuasive and leadership abilities. People in Investigative environments are encouraged to perceive themselves as cautious, critical, complex, curious, independent, precise, rational, and scholarly. Investigative environments reward people for skepticism and persistence in problem solving, documentation of new knowledge, and understanding solutions of common problems.

ARTISTIC environments emphasize ambiguous, free, and unsystematized activities that involve emotionally expressive interactions with others. These environments devote little attention to explicit, systematic, and ordered activities. These behavioral tendencies in Artistic environments lead, in turn, to the acquisition of innovative and creative competencies—language, art, music, drama, writing—and to a deficit in clerical and business system competencies. People in Artistic environments are encouraged to perceive themselves as having unconventional ideas or manners and possessing aesthetic values. Artistic environments reward people for imagination in literary, artistic, or musical accomplishments.

SOCIAL environments emphasize activities that involve the mentoring, treating, healing, or teaching of others. These environments devote little attention to explicit, ordered, systematic activities involving materials, tools, or machines. These behavioral tendencies in Social environments lead, in turn, to the acquisition of interpersonal competencies and to a deficit in manual and technical competencies. People in Social environments are encouraged to perceive themselves as cooperative, empathetic, generous, helpful, idealistic, responsible, tactful, understanding, and having concern for the welfare of others. Social environments reward people for the display of empathy, humanitarianism, sociability, and friendliness.

Exhibit 2. Salient attributes of the six model environments from Holland's theory—Continued

ENTERPRISING environments emphasize activities that involve the manipulation of others to attain organizational goals or economic gain. These environments devote little attention to observational, symbolic, and systematic activities. These behavioral tendencies in Enterprising environments lead, in turn, to an acquisition of leadership, interpersonal, speaking, and persuasive competencies and to a deficit in scientific competencies. People in Enterprising environments are encouraged to perceive themselves as aggressive, ambitious, domineering, energetic, extroverted, optimistic, popular, self-confident, sociable, and talkative. Enterprising environments reward people for the display of initiative in the pursuit of financial or material accomplishments, dominance, and self-confidence.

CONVENTIONAL environments emphasize activities that involve the explicit, ordered, systematic manipulation of data to meet predictable organizational demands or specified standards. The behavioral tendencies in Conventional environments lead, in turn, to the acquisition of clerical, computational, and business system competencies necessary to meet precise performance standards and to a deficit in artistic competencies. People in Conventional environments are encouraged to perceive themselves as having a conventional outlook and concern for orderliness and routines. Conventional environments reward people for the display of dependability, conformity, and organizational skills.

SOURCE: Adapted from J. L. Holland (1997) and G. D. Gottfredson & Holland (1991).

The distinguishing characteristics of educational and work environments can be discerned in a rather straightforward manner given Holland's (1997, p. 48) assumption that "many of the psychologically important features of the environment consist of or are transmitted by the people in it." This straightforward manner is known as the Environmental Assessment Technique (EAT), and entails a simple census of the occupations, training preferences, and vocational preferences of individuals who constitute an environment.

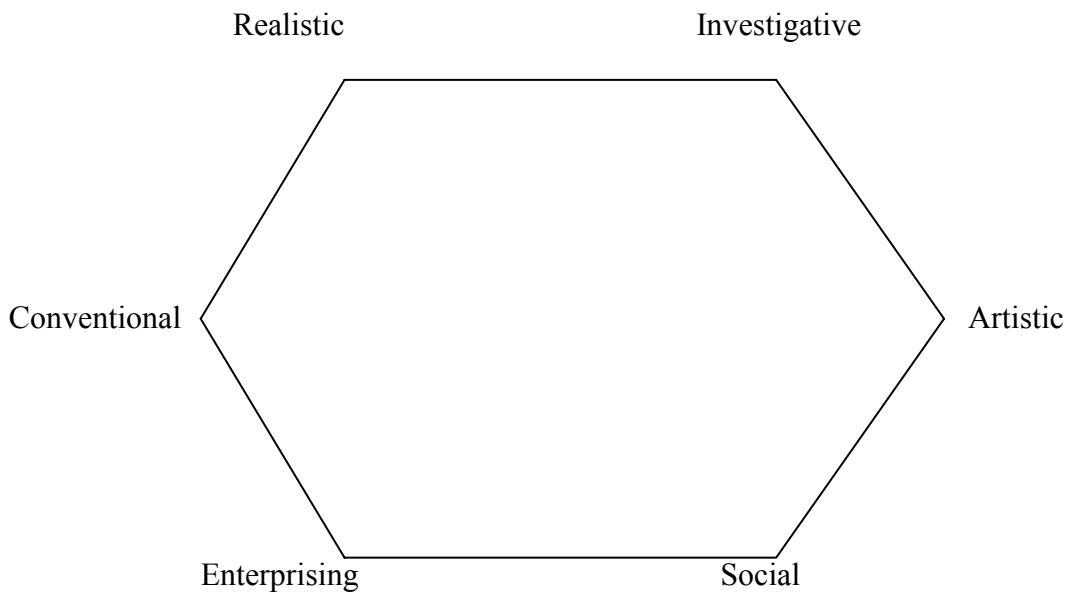
The *Dictionary of Holland Occupational Codes* may also be used to take a census of the distribution of individual personality types in work settings or organizations. The DHOC classifies all occupations included in the entire *Dictionary of Occupational Titles* (U. S. Department of Labor, 1977) into the six personality types included in Holland's theory. Similarly, *The College Majors Finder* (Rosen, Holmberg, & Holland, 1989) and *The Educational Opportunities Finder* (Rosen, Holmberg, & Holland, 1997), which classify over 900 college majors according to their resemblance to the distinctive interests, skills, and abilities of the six personality types, may be used to determine the environmental profiles of educational settings such as colleges and universities.

In addition to the EAT census approach, Gottfredson and Holland (1991) have developed the Position Classification Inventory (PCI) to classify occupational environments. The PCI, which focuses on environmental demands and rewards rather than on a census of environmental inhabitants, is an 84-item assessment of job requirements, skills, perspectives, values, personal characteristics, talents, and key behaviors commonly performed in a job. This instrument yields a total of nine scales, including estimates of the extent to which an environment resembles each of the six hypothesized environmental models.

Congruence Component. Holland and his colleagues have also defined the "psychological resemblances" among the six personality types and environments and the "fit" or congruence between personality types and model environments through the use of a hexagonal model in which the personality types and environments are arranged on the hexagon in the following clockwise order: Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (Holland, Whitney, Cole, & Richards,

1969). The relative similarity of the types and environments is inversely proportional to the distance between any pair in the model (i.e., the shorter the distance between any two environments, the greater their psychological resemblance). In addition, the level of fit or congruence between individuals and their environments is inversely proportional to the distance between any pair in the model (i.e., Investigative people in Investigative environments represent a perfect fit, Investigative people in Artistic and Realistic environments represent a moderately high level of fit, Investigative people in Social and Conventional environments represent a moderately low level of fit, while Investigative people in Enterprising environments represents a low level of fit). The hexagonal model shown in figure 1 represents the *congruence component* of Holland's theory that reflects the interactions between individuals and their environments.

Figure 1. Hexagonal model for defining psychological resemblances among personality types and academic environments



Fundamental Assumptions of Holland's Theory. There are three basic assumptions or premises of Holland's theory, each associated with one of the three components of the theory—individuals, environments, and congruence. The *self-selection assumption* assumes that individuals (e.g., college students) choose occupational and educational environments (e.g., major fields of study) that are compatible with their personality types because such environments afford them with opportunities to take on agreeable roles, to engage in preferred activities, and to respect and reward their values, self-perceptions, and personality traits. The *socialization assumption* is that the model environments (e.g., clusters of academic majors) require, reinforce, and reward individuals for their possession and display their attitudes, values, interests, and competencies that are consistent with the attitudes, values, interests, and competencies of the personality types who dominate the respective environments. Finally, the *congruence assumption* suggests that vocational and educational stability, satisfaction, and achievement are a function of the "fit" or congruence between individuals and their environments.

There is voluminous empirical evidence that generally supports the validity of each of these three fundamental assumptions of Holland's theory, though the amount and strength of the evidence varies across the three assumptions and the respective personality types and model environments (see, for

example, Assouline & Meir, 1987; Spokane, 1985; Spokane, Meir, & Catalano, 2000; Tsabari, Tziner, & Meir, 2005). The vast majority of this evidence, however, does not appear in the higher education literature, but rather in the psychological literature. We have noted elsewhere, that "whereas Holland's theory has achieved considerable distinction within the broader social science research community . . . it has received little attention or use by higher education scholars" as evidenced by the "virtual absence of citations to the theory in such general, mainline higher education journals as the *Journal of Higher Education*, *Research in Higher Education*, *Higher Education*, and *The Review of Higher Education*" (Smart, Feldman, & Ethington, 2000, p. 32).

The lack of attention given to Holland's theory by higher education scholars is regrettable because of its basic success in advancing knowledge of factors associated with vocational stability, satisfaction, and success and its potential to advance our knowledge of factors associated with the persistence, satisfaction, and success of college students. At the same time, this neglect is understandable in that Holland's theory was advanced initially by a psychologist and is intended primarily to assist individuals in their selection of careers in which they have the greatest likelihood of success, and thus the vast majority of research based on the theory has been conducted by psychologists and has appeared primarily in psychology journals. Although in principle the theory balances both psychological and sociological components, in practice the psychological (and social psychological) components rather than the sociological components have been emphasized in the research that has been done.

Section 3. New Directions for Research on Student Success

Preliminary Considerations: Definition of Selected Terms in Holland's Theory and Patterns of Student Success

The central purpose of our efforts is to illustrate the direct relevance of Holland's theory to the understanding and enhancement of student success in postsecondary education. Our current efforts are an extension of our previous collaborative studies over the past decade that have led us to see the potential of Holland's theory to understand and enhance student success in a manner that has not emerged from the efforts of other scholars whose research is based on the theory. We provide below definitions of selected key terms and constructs that are central to Holland's theory and to our innovative use of the theory to discern *two distinctive patterns of student success* that flow from alternative hypotheses and assumptions of the theory. These definitions and the associated discussion are intended to serve as "advance organizers" to alert readers to important terms and constructs used throughout the remainder of this report.

Students' Initially Prominent Characteristics. *Initially prominent characteristics* defining characteristics of students assigned to each of the six personality types in Holland's theory at the time they enter college. For example, students with a Realistic personality type prefer activities that involve the explicit, ordered, and systematic manipulation of objects, tools, machines, and animals; have strong manual, mechanical, and technical competencies; perceive themselves as practical and conservative; and value material rewards for tangible accomplishments. In contrast, students with a Social personality type prefer activities that involve the manipulation of people to inform, train, and develop others; have strong interpersonal and human relations competencies; perceive themselves as cooperative, empathetic, helpful, and understanding; and value fostering the development and welfare of others. These unique repertoires of distinctive preferred activities, competencies, self-perceptions, and values of students assigned to each of the personality types in Holland's theory at the time they enter college are what we mean when we refer to students' initially prominent characteristics.

Key Assumptions of Holland's Theory. Of Holland's three major assumptions, two are the bases for two alternative patterns of student success in postsecondary education based on what students learn and do not learn as a result of their educational endeavors. The first is the *congruence assumption* that assumes that student success is a function of the fit or congruence between students' personality type and their chosen academic environments (i.e., academic majors). This is the traditional approach that has historically been used by scholars and seeks to determine whether person-environment congruence contributes to student learning in terms of growth in their initially prominent characteristics at the time they entered college. The second is the *socialization assumption* of Holland's theory that assumes that student success is determined by the extent to which students learn the distinctive patterns of attitudes, interests, and abilities that are required, reinforced, and rewarded by their chosen academic environments, irrespective of the fit or congruence between students' personality types and their chosen academic environments (i.e., academic majors). The validity of the socialization assumption has received much less attention by scholars who use Holland's theory than the validity of the congruence assumption.

Alternative Patterns of Student Success in Postsecondary Education. We will show that reliance on these two key or central assumptions leads to two very different patterns of student success in postsecondary education. The first pattern of student success, based on the congruence assumption of the theory, results in a *more peaked and highly differentiated profile* of student learning in that students grow or enhance their initially prominent characteristics while remaining stable or declining (sometimes substantially) in other repertoires of attitudes, interests, and abilities that are characteristic of other personality types and academic environments. For example, students in artistic fields of study further develop their Artistic attitudes, interests, and abilities, and remain essentially stable or decline in terms of their Realistic, Investigative, Social, Enterprising, and Conventional attitudes, interests, and abilities. The second pattern of student success, based on the socialization assumption of the theory, results in a *more balanced or less peaked profile* of student learning in that students "grow" in terms of the attitudes, interests, and abilities of their chosen academic environment (academic major)—irrespective of their fit or congruence with those environments—even while remaining essentially the same in terms of their initially prominent characteristics. For example, Investigative students who major in an Enterprising academic environment grow in terms of their Enterprising attitudes, interests, and abilities while remaining essentially stable (or declining slightly) in their initially prominent characteristics (i.e., Investigative attitudes, interests, and abilities). Their resulting profile thus is more balanced or less peaked because they have two areas of strength reflected in the repertoire of attitudes, interests, and abilities reinforced and rewarded by their chosen academic environment and their initially prominent characteristics.

Our primary purpose in the current project is to illustrate the direct relevance of Holland's theory to the understanding and enhancement of student success in postsecondary education. Thus, our definition of student success is based on longitudinal patterns of change and stability in the salient attitudes, interests, and abilities of the personality types in academic environments of the theory and the findings that result from reliance on the congruence and socialization assumptions of Holland's theory. Previous research on Holland's theory has focused almost entirely on student success defined in terms of the congruence assumption and the traditional way in which the validity of that assumption has been tested. These collective efforts have resulted in a large body of evidence that supports one definition of student success based on longitudinal change and stability in students' initially prominent characteristics. We, however, pay equal attention to the socialization assumption of Holland's theory, and our attention to this assumption leads us to identify a second pattern of student success that considers not only longitudinal change and stability in students' initially prominent characteristics, but also the set of attitudes, interests, and abilities reinforced and rewarded by students' chosen academic environment. Our focus on the socialization assumption of Holland's theory and subsequent identification of a second pattern of student success based on this assumption constitute a clearly distinctive contribution in terms of the potential of Holland's theory to assist both scholars in understanding the factors that contribute to multiple forms of

student success and campus leaders and governmental officials seeking to enhance student success within the parameters of either the congruence or socialization assumptions of Holland's theory.

Holland's Theory Revisited

Because Holland's theory intends to explain vocational behavior, most evidence of the validity of the basic assumptions of the theory has been derived from studies of employed adults. Moreover, attention has been directed primarily to the initial career choices of individuals and the significance of these choices for their subsequent vocational stability, satisfaction, and success. This dominant focus on individuals may be understood as a consequence of the primary focus of the theory itself and the scholarly interests of those who have conducted much of the relevant research. As a theory of careers, Holland's work is intended primarily to be of assistance to individuals in their search for careers that are satisfying and rewarding, and the research on the theory reflects this orientation toward individuals.

The vast bulk of the research literature in this area concentrates on the validity of the personality types and their searching behaviors (the self-selection assumption) and on the consequences of individuals' choices of congruent or incongruent vocational environments (the congruence assumption) rather than on the reward and reinforcement patterns of vocational environments (the socialization assumption). Holland (1997, p. 160) has acknowledged this differential emphasis in the research literature, noting that "the environmental models are only occasionally studied." As Walsh and Holland (1992, p. 63) have put it, "We view the theory as primarily psychological in nature and one in which the personality variables are the most powerful and influential. . . . The theory tends to emphasize person variables and [to be] lean on the concept of reinforcement . . .. " Given the psychological orientation of those who have conducted most of the research on the theory, it is not surprising that work environments (in general) and the interpersonal and social structural patterns of environmental reinforcement (in particular) have not been of central interest.

While his theory is intended to explain vocational behavior, Holland has noted repeatedly that the theory and its basic assumptions are equally applicable to educational settings such as college and universities. For example, Holland (1997) notes explicitly that "the hypotheses about educational behaviors ... resemble those for vocational behavior. The choice of, stability in, satisfaction with, and achievement in a field of training or study follow rules <u>identical</u> to those outlined for vocational behavior" (p. 71, emphasis added). The research evidence supporting the basic assumptions of Holland's theory is sparser as it pertains to college students; even so, two or three dozen relevant studies have been conducted over the past three decades (as reviewed in Smart et al., 2000). While Smart and his colleagues conducted a substantial portion of these earlier studies, there is growing evidence that interest in Holland's theory is expanding among higher education scholars. The contributions by Umbach and his colleagues on enhancing college students' sensitivity to and appreciation of issues associated with racial and ethnic diversity on campus (e.g., Milem & Umbach, 2003, 2004; Milem, Umbach & Liang, 2004; Umbach, 2006), Porter and Umbach (2006) and Pike (in press) on understanding students' choices of academic majors, Huang and Healy (1997) on students' work values, Antony (1998) on entry into medical fields, and Wolniak and Pascarella (2005) on the job satisfaction of college graduates are all examples of a growing interest in Holland's theory among higher education scholars. Nonetheless, reliance on Holland's theory in efforts to understand multiple manifestations of student success in postsecondary education remains the focus of only a limited number of higher education scholars.

Like the studies of employed adults, evidence gained from the educational behaviors of college students reflects an emphasis on assessing separately the validity of each of the three assumptions of Holland's theory. Compared to the studies of employed adults, however, scholars who have used Holland's theory to study the educational abilities and interests of college students have generally given

more attention to the socialization assumption, which in this case is to assume that different academic environments (for example, different clusters of academic majors) are likely to reinforce and reward different patterns of student abilities and interests.

In our own work over the past decade, we have examined the validity of all three basic assumptions of Holland's theory. The collective evidence from our longitudinal studies of 2,309 students in over 300 college and universities generally supports the validity of all three of these assumptions. Of particular interest in our findings is that the sociological component of Holland's theory (i.e., the socialization assumption) is at least as important in explaining the change and stability of students' educational abilities and interests as the more psychological components of the theory (the self-selection and congruence assumptions). Our collective findings clearly support the proposition that the likelihood of students increasing their *initially prominent characteristics* over a 4-year period is largely a function of whether or not they choose an academic environment that is congruent with their dominant personality type at the time they enter college (Smart et al., 2000; Feldman et al., 1999). At the same time, equal, if not more compelling, evidence supports the socialization assumption of Holland's theory in that college students, irrespective of their dominant personality types as freshmen, are equally influenced by the prevailing norms and values of whatever academic environment they select (Smart et al., 2000; Feldman, Ethington, & Smart, 2001; Feldman, Smart, & Ethington, 2004). We found that academic environments were in a sense equally successful in socializing students to their distinctive set of preferred abilities and interests for students with both congruent and incongruent dominant personality types (Feldman, Ethington, & Smart, 2001; Feldman, Smart, & Ethington, 2004).

A Growing Focus on the Centrality of the Sociological Assumption of Holland's Theory

Even though Holland has maintained that his theory of careers (including its basic assumptions) is equally applicable in educational settings, we nevertheless wonder whether the ways it has been used to explain vocational behavior might differ from the ways in which the theory is used by scholars who embrace different research paradigms. As noted, most research to date on the validity of the basic assumptions of Holland's theory has focused on the explanation of vocational behavior and been conducted primarily by psychologists. The fundamental interest in this line of inquiry has been to "suggest some practical ideas to help young, middle-aged, and older people select jobs, and attain vocational satisfaction" (Holland, 1997, p. 12), and in accord with this guiding interest, primary attention has been given to the self-selection and congruence assumptions of the theory.

A concern we have about the appropriateness of the congruence assumption, particularly when it is applied to educational settings, stems from its view that the extent to which person-environment fit contributes to "successful" vocational behavior is to be judged solely by the degree to which individuals enhance their initially prominent characteristics—for example, the extent to which person-environment fit enhances the Investigative abilities and interests of individuals with a dominant Investigative personality type. This criterion is silent about the extent to which individuals of certain personality types (for example, those with an initially dominant Investigative personality type) grow and change in terms of *other* abilities and interests (for example, Artistic, Social, and Enterprising abilities and interests).

The emphasis on the congruence assumption and the criteria used to judge "success'' in explaining vocational behaviors and interests, while perhaps sensible or appropriate in vocational contexts, becomes problematic when the focus is on educational behaviors and interests of college students. We say this because colleges and universities have historically sought to promote student growth and development in a broad repertoire of competencies and interests, regardless of the initially prominent characteristics of their entering students. This historically grounded emphasis is manifested in the general education distribution requirements of virtually all colleges and universities and is especially apparent in liberal arts

colleges with their distinctive emphasis on the premises of liberal or general education (Astin, 1970a, 1970b; Bowen, 1977; Lenning, Lee, Micek, & Service, 1977; Ewell, 1984; Association of American Colleges, 1985).

It seems to us that an implication in the writing of scholars who examine the consequences of the congruence assumption within the parameters of Holland's theory is that personality traits (including interests and abilities) are immutable, and thus individuals who fail to select work or academic environments congruent with their dominant personality type are doomed to some degree of failure or unhappiness in their vocational or academic careers. But our own findings (Smart et al., 2000; Feldman et al., 2001, 2004) suggest that this is not necessarily the case. For example, although students who do not choose an academic environment congruent with their dominant personality type may well hamper (if not sacrifice) their potential to develop further their *initially prominent characteristics*, the powerful socialization effects of whatever academic environment they enter make it likely that any lack of increase in initially prominent characteristics—that is, either stability or decline in these characteristics—will be compensated for, or offset by, the enhancement of other abilities and interests. We are doubtful that such a change in the overall patterns of losses, stability, and growth across multiple domains of abilities and interests would be considered negative or a "loss" by college officials who seek to facilitate the growth and development of a more comprehensive repertoire of abilities and interests in students.

Alternative Patterns of Student Success Within the Context of Holland's Theory

Our series of collaborative inquiries has led us to believe that Holland's theory can be used to identify different patterns of student success in postsecondary education. These patterns are derived from the relative emphasis that scholars using Holland's theory place on the congruence assumption versus the socialization assumption of the theory. The following discussion provides an in-depth understanding of the alternative patterns of student success in postsecondary education based on reliance on the congruence and the socialization assumptions of the theory.

Student Success Derived From the Congruence Assumption of Holland's Theory. As noted above, scholars who base their inquiries on, and seek to assess the validity of, the congruence assumption in Holland's theory define student success solely in terms of the degree to which students enhance their initially prominent characteristics—that is to say, the distinctive repertoire of competencies and interests associated with their respective dominant personality types—as a consequence of their college experiences. In principle, this emphasis on the individual in his or her academic environment reflects a psychological orientation—or perhaps more precisely a social psychological orientation underlying the congruence assumption, one that blends considerations of the personality type of students with the reinforcement efforts of faculty in the respective academic environments. According to the congruence assumption, the likelihood of a student developing any specific repertoire of competencies and values is *jointly dependent* on the student's own personality type and the congruence or fit between it and the student's entry into an academic environment that requires, reinforces, and rewards that particular repertoire. Thus, both the student's personality type and the substantive nature of academic environments are essential components in assisting individual students in the selection of educational settings in which they presumably have the greatest potential to further develop their initially prominent characteristics.

The underlying logic of the person-environment fit (congruence) assumption is that students are most likely to be successful in terms of further developing their initially prominent characteristics in an academic environment having the same label because such an environment would provide opportunities, activities, tasks, and roles congruent with the competencies, interests, and self-perceptions of its parallel personality type. By the same token, students who enroll in incongruent academic environments would not be as successful in terms of developing their initially prominent characteristics because the

environment would provide opportunities, activities, tasks, and roles that are not congruent with the competencies, interests, and self-perceptions of the students' dominant personality types. Consideration of both the individual and the environment is presumably essential to understanding the potential consequences of individual behavior in academic settings. We might call this the psychological (or, perhaps, the social psychological) component of Holland's theory.

Student Success Derived From the Socialization Assumption of Holland's Theory. In contrast to the congruence assumption, the socialization assumption of Holland's theory postulates that the key element in promoting student acquisition of one rather than another set of interests, competencies, and talents is the academic environments (i.e., departments) that students enter. Here, the roles of faculty members and their collective efforts to socialize students to the prevailing norms and values of their respective academic environments is the primary component, and the personality types and associated initial abilities and interests of students—that is, their initially prominent characteristics—are of less importance and perhaps even irrelevant. That is to say, for example, that the likelihood of students collectively developing any specific repertoire of competencies, interests, and values is *singularly dependent* upon their entry into an academic environment that requires, reinforces, and rewards that particular repertoire.

Within the parameters of the socialization assumption, "student success" is judged by the extent to which students grow in terms of the abilities and interests reinforced and rewarded by their chosen environment (say, their academic major) rather than enhancing their initially prominent characteristics. For example, while students who select academic majors that are incongruent with their personality type may remain the same or decline in their initially prominent characteristics, they may gain or grow in the abilities and interests reinforced and rewarded by their chosen academic environment (i.e., major field of study). In this respect, the socialization assumption has a decided sociological orientation because of its focus on the collective group effects of academic environments. The effects of academic environments in Holland's theory are not assumed to be inherently dependent on the attributes of individual students who enter them. The respective academic environments are assumed to have similar or uniform effects on all students irrespective of the students' personality types.

Juxtaposing the Alternative Perspectives on Student Success Within Holland's Theory. Some might regard these two perspectives of student success in postsecondary education as being inconsistent or contradictory. We do not see them as being in conflict, but rather as being directed toward two distinct but related questions.

From the *individual* perspective, the congruence assumption hypothesizes a differential pattern of longitudinal change and stability in initially prominent characteristics for comparable students (i.e., those with similar personality profiles) entering similar and dissimilar academic environments: those entering congruent academic environments will grow or gain more in terms of their initially prominent characteristics than those entering incongruent environments. If the question is the extent to which academic environments are tools to perpetuate the initially prominent characteristics of students at the time they enter college, then the answer is, "yes they are." Those initially prominent characteristics will be enhanced if, and only if, students enter academic environments that reinforce and reward those specific abilities and interests (see Feldman et al., 1999; Smart et al., 2000, pp. 172-209). But the congruence assumption is silent as to the collective effects of the respective academic environments on students in them with different personality profiles because the fundamental concern of the congruence assumption is the pattern of change and stability in the initially prominent characteristics of individual students within the different academic environments.

From the *group* perspective, the socialization assumption implicitly postulates a uniform pattern of reinforcement and reward by faculty members in the respective academic environments, or, at the very

least, does not consider potentially different patterns of longitudinal change and stability in student abilities and interests depending on students' congruence or incongruence with the environment because the focal concern of the socialization assumption is on the collective actions and effects of academic environments. This is a decidedly different question concerning the extent to which academic environments are successful in their efforts to socialize a disparate collection of students to the distinctive pattern of preferred abilities and interests of the environments. Research grounded in the socialization assumption seeks to determine whether academic environments are as "effective" with students who begin with lower levels of commensurate abilities and interests (i.e., students whose personality types are incongruent with the environment) as those with higher levels of commensurate abilities and interests that are reinforced and rewarded by the environment (i.e., students whose personality types are congruent with the environment). The evidence we have provided in earlier studies (Smart et al., 2000, pp. 210-233; Feldman et al., 2001, 2004) provides the basis for an affirmative response: that is, the impacts of academic environments do appear to be comparable for students whose personality types are congruent or incongruent with the respective environments. Thus, we do not find the two sets of findings to be in conflict, but rather directed toward two distinct but related questions.

Reliance on these two distinct but related components of Holland's theory yields very different patterns of "student success" in postsecondary education. For example, from the *individual* perspective, grounded in the self-selection and congruence assumptions of Holland's theory, the success of colleges and universities in fostering the growth and development of college students is judged solely by their effectiveness in further developing students' initially prominent characteristics. Students would be encouraged to select academic environments (i.e., majors) that are congruent with their dominant personality type at the time they enter college, and the reinforcement and reward patterns of those environments would assist students in the further development of their initially defining repertoire of abilities and interests at the time they entered college. The consequence of this logic yields a profile of student success that is highly peaked or skewed in one particular set of abilities and interests with little or no consideration given to students' acquisition of other sets of abilities and interests. On the other hand, from the *group* perspective, grounded in the socialization assumption of Holland's theory, the success of college and universities in contributing to the growth and development of college students is judged solely by the extent to which students acquire the distinctive cluster of abilities, interests, and values that are required, reinforced, and rewarded by whatever academic environment (i.e., major) they select. Students would not necessarily be advised to select academic environments that are congruent with their personality types at the time they enter college, but rather to have their choices of academic environments informed by the distinctive repertoire of abilities, interests, and values that the respective environments expect and subsequently reinforce and reward.

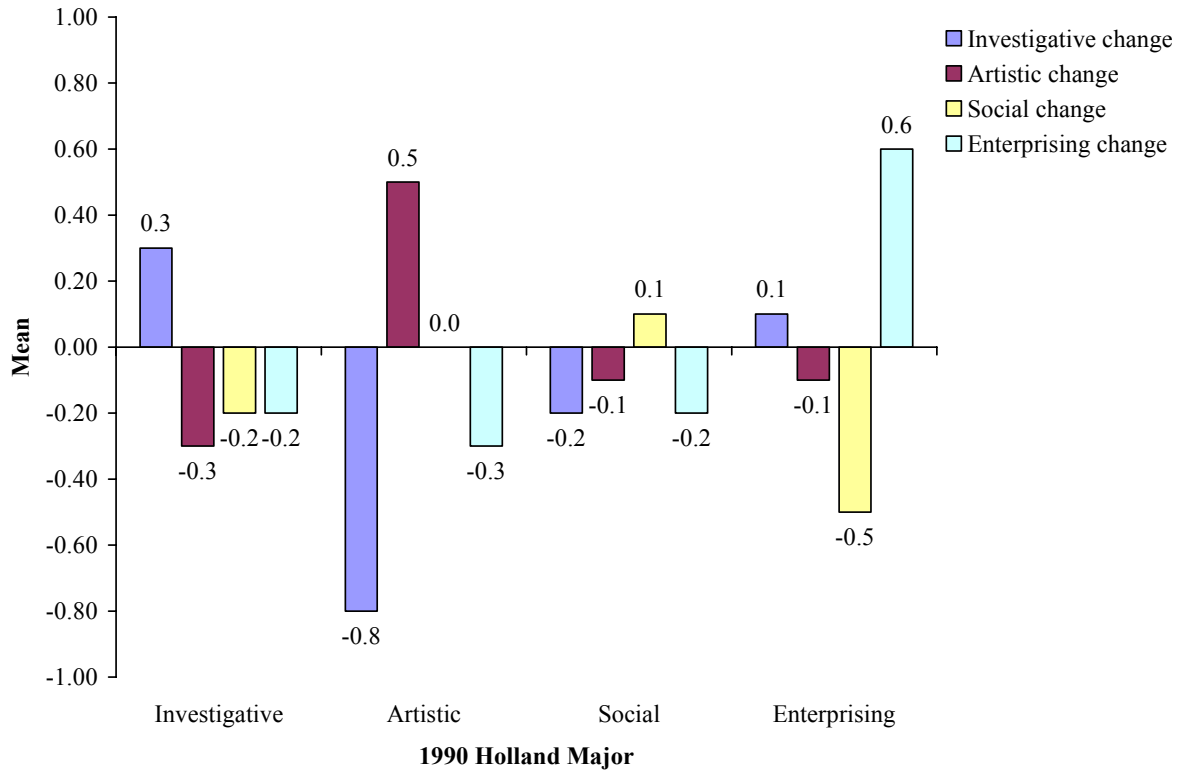
Students would then select academic majors (i.e., environments) that are most likely to assist them in subsequently developing whatever cluster of abilities, interests, and values they wish to acquire. The consequence of this logic yields a profile of student success that is more balanced across two or more clusters of abilities, interests, and values. The assumption underlying this perspective is that while students who select academic environments that are incongruent with their dominant personality type may remain the same or decline in their initially prominent characteristics, they will gain or grow in the distinctive cluster of abilities and interests reinforced and rewarded by their chosen academic environment.

Section 4. Illustration of Alternative Patterns of Student Success

In this section, we provide illustrative examples of the alternative patterns of student success in postsecondary education based on the congruence and socialization assumptions of Holland's theory described above. The sample of students and the variables for our present analyses are essentially the

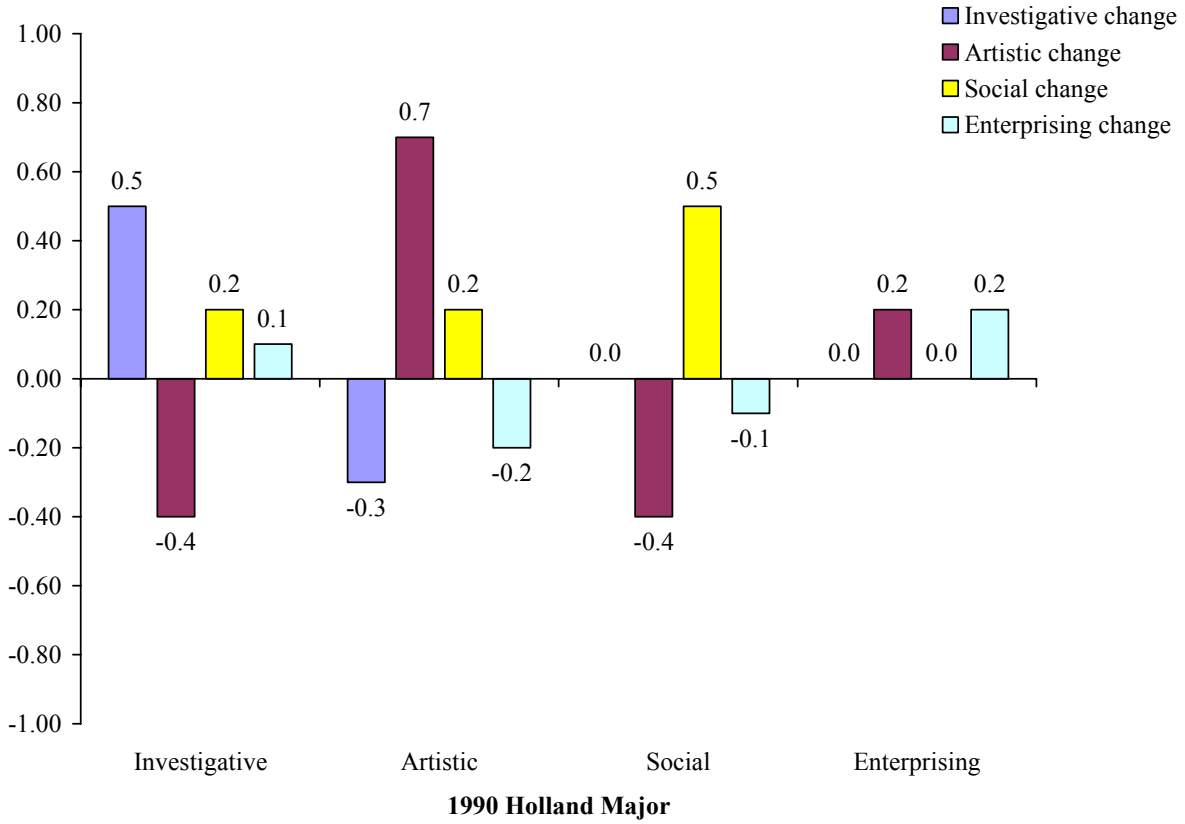
same as those of our previous analyses (Smart et al., 2000; Feldman et al., 1999, 2001, 2004). Although some of the data in this section have been presented in our earlier work, we now include additional data not presented before. Moreover, visual displays (figures 2–5) are new. These figures present changes between 1986 and 1990 in standard deviation units for students with dominant Investigative (figure 2), Artistic (figure 3), Social (figure 4), and Enterprising (figure 5) personality types who majored in each of the four academic environments on each of the ability and interest scales shown in table 1.

Figure 2. Investigative personalities: Change in traits from 1986 to 1990 in standard deviations



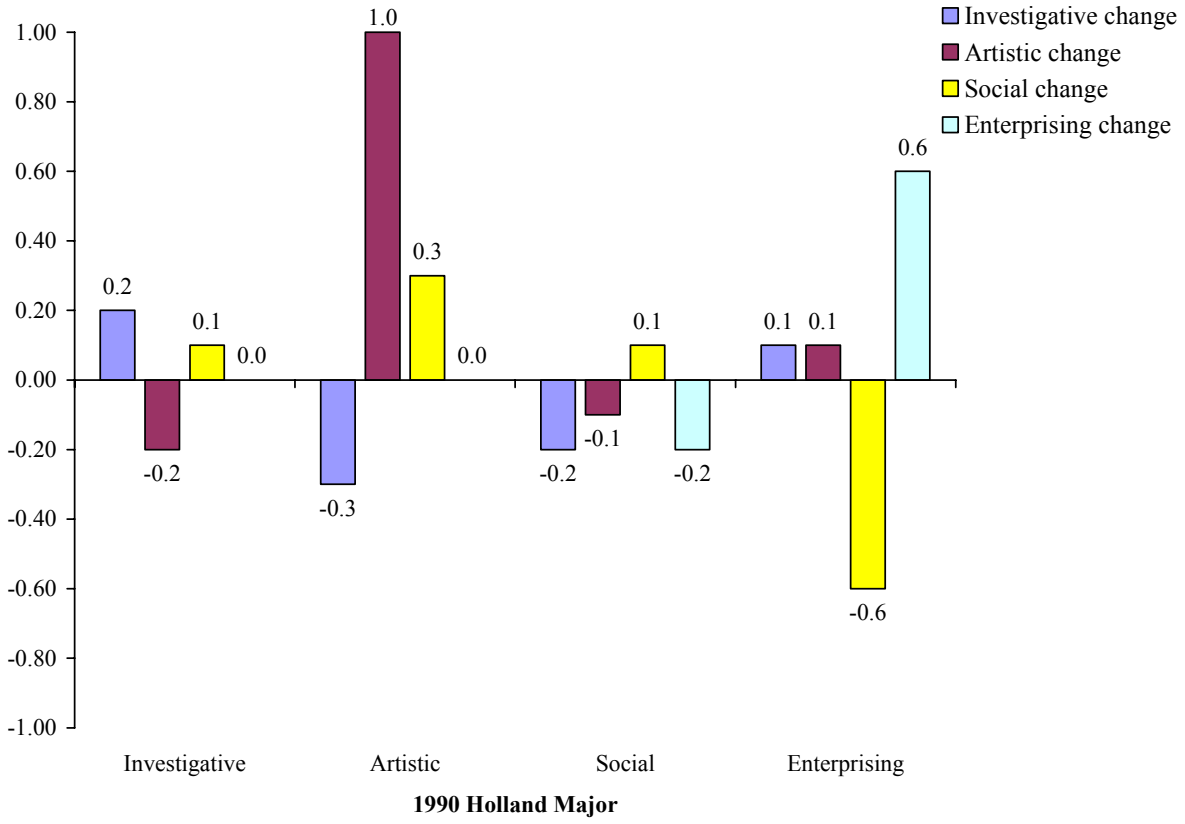
SOURCE: Higher Education Research Institute at the University of California, Los Angeles, 1986 and 1990 Cooperative Institutional Research Program surveys.

Figure 3. Artistic personalities: Change in traits from 1986 to 1990 in standard deviations



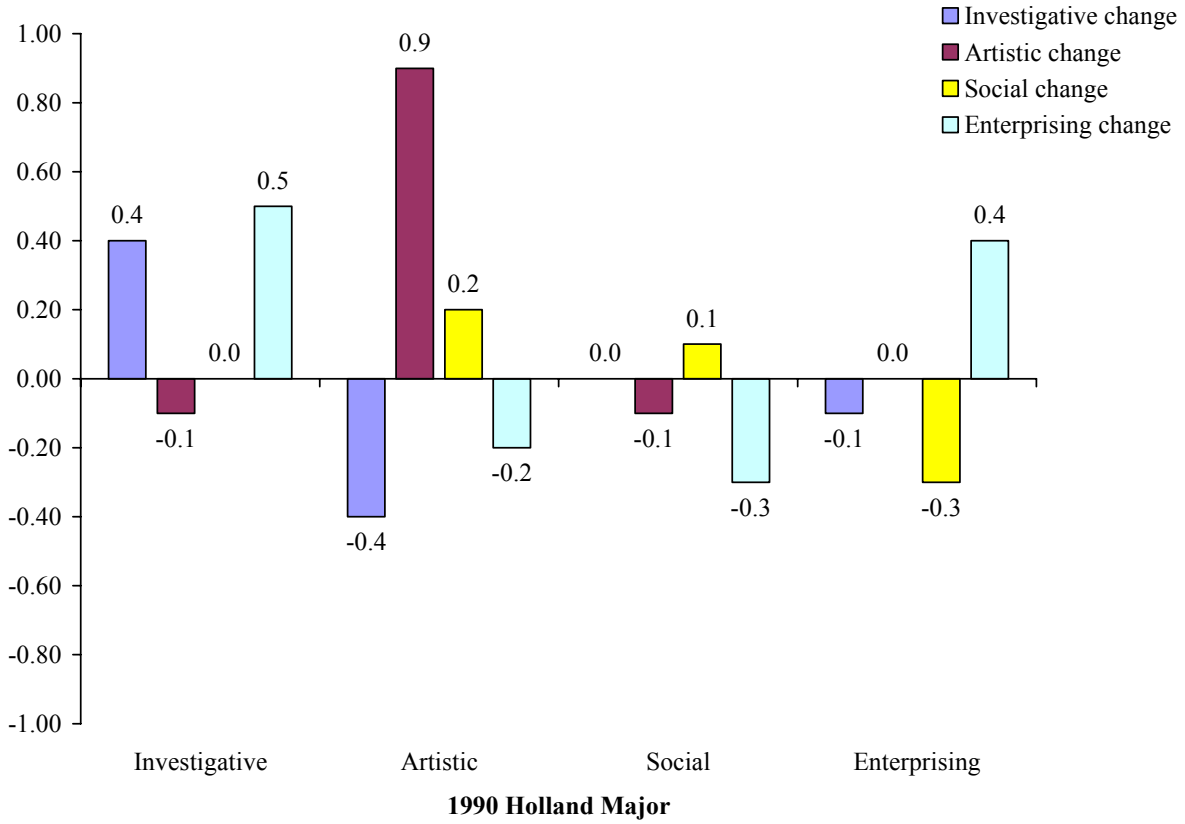
SOURCE: Higher Education Research Institute at the University of California, Los Angeles, 1986 and 1990 Cooperative Institutional Research Program surveys.

Figure 4. Social personalities: Change in traits from 1986 to 1990 in standard deviations



SOURCE: Higher Education Research Institute at the University of California, Los Angeles, 1986 and 1990 Cooperative Institutional Research Program surveys.

Figure 5. Enterprising personalities: Change in traits from 1986 to 1990 in standard deviations



SOURCE: Higher Education Research Institute at the University of California, Los Angeles, 1986 and 1990 Cooperative Institutional Research Program surveys.

Table 1. Student ability and interest scales, 1986 and 1990

1986 and 1990 Investigative Scales	Reliability
Self rating: Self-confidence (intellectual)	$\alpha = .682$ (1986)
Self-rating: Academic ability	$\alpha = .630$ (1990)
Self-rating: Mathematical ability	
Self-rating: Drive to achieve	
Goal: Making a theoretical contribution to science	
1986 and 1990 Artistic Scales	**Reliability**
Self-rating: Artistic ability	$\alpha = .683$ (1986)
Self-rating: Writing ability	$\alpha = .697$ (1990)
Goal: Becoming accomplished in one of the performing arts (acting, dancing, etc.)	
Goal: Writing original works (poems, novels, short stories, etc.)	
Goal: Creating artistic work (painting, sculpture, decorating, etc.)	
Goal: Developing a meaningful philosophy of life	
1986 and 1990 Social Scales	**Reliability**
Goal: Influencing the political structure	$\alpha = .750$ (1986)
Goal: Influencing social values	$\alpha = .794$ (1990)
Goal: Helping others who are in difficulty	
Goal: Becoming involved in programs to clean up the environment	
Goal: Participating in a community action program	
Goal: Helping to promote racial understanding	
1986 and 1990 Enterprising Scales	**Reliability**
Self-rating: Leadership ability	$\alpha = .752$ (1986)
Self-rating: Popularity	$\alpha = .762$ (1990)
Self-rating: Self-confidence (social)	
Goal: Become an authority in my field	
Goal: Obtaining recognition from my colleagues for contributions to my special field	
Goal: Having administrative responsibility for the work of others	
Goal: Being very well off financially	
Goal: Being successful in a business of my own	
Goal: Becoming an expert on finance and commerce	

NOTE: For the self-rating items, students responded to the prompt "Rate yourself on each of the following traits as compared with the average person your age" using a scale of 1 = Lowest 10 percent; 2 = Below average; 3 = Average; 4 = Above average; 5 = Highest 10 percent. For the goal items, students responded to the prompt "Indicate the importance to you personally of each of the following" using a scale of 1 = Not important; 2 = Somewhat important; 3 = Very important; 4 = Essential.

Research Procedures

Sample. Our data came from the 1986 and 1990 surveys of the Cooperative Institutional Research Program (CIRP) sponsored by the Higher Education Research Institute at the University of California, Los Angeles. The overall CIRP sample consisted of 4,408 students attending 360 different postsecondary institutions. Students completed the standard CIRP freshman survey upon entering college in the fall of 1986 and a follow-up survey in the winter of 1990. The latter survey obtained information about the experiences of these students at college and how thy felt they had changed during the 4 years. Our analyses are based on the responses of 2,309 students who were enrolled for all 4 years, whose academic major is included in Holland's (1997) classification of academic majors, and who provided complete information on the variables under investigation.

Variables. Our present analyses are based on three major sets of variables: students' academic environments (i.e., clusters of academic majors), measures of students' abilities and interests in 1986 and 1990, and students' dominant personality types. The following provides a description of each of these three major sets of variables.

Academic Environments. The 1986 freshman survey asked students to select their "probable field of study," and the 1990 follow-up survey asked students to select their "current/last field of study" from a listing of academic disciplines/majors. We classified these academic majors into the six academic environments proposed by Holland by using *The College Majors Finder* (Rosen, Holmberg, & Holland, 1989). Sixty-four of the 76 majors selected by the students could be thus classified. The Realistic and Conventional categories, however, had a combined total of only four academic majors with too few students to be useful in our analyses; consequently, these two categories are not included in our research. The number of students in each of the remaining four groups of academic majors is Investigative (n = 672), Artistic (n = 334), Social (n = 788), and Enterprising (n = 515). A listing of which academic majors are classified into which of the four groups can be found in Smart et al. (2000) (also see Feldman et al., 1999, 2001).

Ability and Interest Scales. The 1986 and 1990 CIRP surveys asked students to rate themselves compared with the average person their age on 12 different abilities (e.g., mathematical ability, social self-confidence, etc.) on a scale with 1 = lowest 10 percent, 2 = below average, 3 = average, 4 = above average, and 5 = highest 10 percent. Students were also asked to indicate the importance of 18 general goals and values (e.g., creating artistic work, being very well off financially, etc.) using a scale of 1 = not important, 2 = somewhat important, 3 = very important, and 4 = essential. From these items, we picked out those that were characteristic of adjectives used to describe the four Holland personality types considered in our analyses (Holland, 1997). We used 26 items to create precollege (1986) and follow-up (1990) scales reflecting the distinctive abilities, interests, and goals that each of the four groups of academic majors, classified according to Holland's theory, are hypothesized to require, reinforce, and reward. These scales, then, represent students' self-reported abilities and interests at the time they began college (1986 scores on the Investigative, Artistic, Social, and Enterprising scales) and 4 years later (1990 scores on these scales). The 1986 and 1990 scales are shown in table 1.

Each of these scales (in both years) was created by standardizing the items and computing the average across items. Student scores were converted to T-scores with a mean of 50 and a standard deviation of 10. The number of items in each of these scales and the alpha reliability of each scale are as follows: Investigative Ability and Interest, five items (α = 0.682 (1986) and 0.630 (1990)); Artistic Ability and Interest, six items (α = 0. 683 (1986) and 0.697 (1990)); Social Ability and Interest, six items (α = 0.750 (1986) and 0.794 (1990)); Enterprising Ability and Interest, nine items (α = 0.752 [1986] and 0.762 [1990]). The exact wording of these items can be found in Smart et al. (2000) as well as in Feldman et al. (1999, 2001).

Students' Personality Types. Holland (1997, pp. 28-31) has noted that an individual's personality type may be measured by his or her responses to ability and interest scales. We used the four 1986 ability and interest scales just described to determine each student's *primary personality type*. The profile for each of the 2,309 students was obtained and, in accordance with a suggestion by Holland (1997, p. 28), students were assigned to the personality type for which they had the highest scale score (in 1986). This procedure, which is consistent with scoring of student responses to established occupational and personality inventories such as the Self-Directed Search, Vocational Preference Inventory, and the Strong-Campbell Interest Inventory, resulted in the following distribution of students across the personality types: Investigative (n = 789), Artistic (n = 377), Social (n = 553), and Enterprising (n = 590).

Analyses. Data presented in this report are based on means on the 1986 and 1990 ability and interest scales for each of the four student personality types. We adapted a procedure developed by Roberts (1980) to adjust initial scores for regression-to-the-mean bias (as described in greater detail in Smart et al., 2000 and Feldman et al., 2001). Dependent samples *t*-tests were used to determine the statistical significance of students' change from 1986 to 1990 on each of the ability and interest scales. In table 2—which gives the means, changes in means, and effect sizes for those changes—statistically significant changes ($p < .05$) are indicated by asterisks. In part, we focus our discussion of these results around the magnitude of the effect sizes, which represent the change from 1986 to 1990 in standard deviation units. The data in table 2 are the basis for figures 2–5.

Findings

We portray findings from our current analyses in figures 2 through 5, which reflect changes in standard deviation units (i.e., effect sizes) of students' scores on each of the four ability and interest scales shown in table 1 for students of each of the four personality types whose academic majors were in each of the four academic environments of Holland's theory. Figure 2, for example, shows changes in the effect size and direction in the four ability and interest scales for students with an Investigative personality type whose academic majors were classified according to the four academic environments. Figures 3 through 5 provide similar information for students with Artistic, Social, and Enterprising personality types, respectively.

Discussion

We turn now to a discussion of two alternative patterns of student success in higher education within the context of Holland's theory based on the patterns of change and stability shown in table 2 and figures 2 through 5. The first pattern is grounded in the congruence assumption of the theory, which has a decided psychological orientation; the second pattern is grounded in the socialization assumption of the theory, which is decidedly sociological in nature.

The Congruence Assumption and College Student Success. The profiles for the patterns of change and stability between 1986 and 1990 in the four sets of abilities and interests for each of the four personality types who entered the four academic environments provide support for the definition of college student success within the context of the congruence assumption of Holland's theory in that subsequent growth in their initially prominent characteristics is basically contingent on their selection of a congruent, as opposed to incongruent, academic environment. This common pattern is evident in the four profiles for students with an Investigative personality type (see figure 2) who essentially grew in Investigative abilities and interests only if they entered Investigative academic environments and remained essentially stable, or declined in Investigative abilities and interests if they entered any of the three other academic environments. To be more specific, those Investigative personality types who entered congruent (i.e., Investigative) environments grew in Investigative abilities and interests (effects size = .32, see table 2) and remained stable or declined in these abilities and interests if they selected an incongruent academic environment (effect sizes for those entering Artistic, Social, and Enterprising environments are -.84, -.17, and .09, respectively). This same general pattern is evident for students with Artistic, Social, and Enterprising personality types, though there are a couple of exceptions. One

Table 2. Average change in abilities and interests for students with different dominant personality types majoring in academic disciplines expressed as standardized scores and in standard deviation units (effect sizes)[1]

Investigative Personality Majoring in:	Change in Investigative Abilities and Interests	Change in Artistic Abilities and Interests	Change in Social Abilities and Interests	Change in Enterprising Abilities and Interests
Investigative Fields	+1.67 (56.94 to 58.62) **.32***	-1.12 (48.11 to 46.99) **(-).27***	-1.05 (48.32 to 47.27) **(-).20***	-1.08 (49.03 to 47.95) **(-).20***
Artistic Fields	-4.12 (55.48 to 51.36)**(-).84***	+2.35 (51.69 to 54.04) **.48***	-0.19 (47.44 to 47.25) **(-).04**	-1.47 (47.52 to 46.05) **(-).30**
Social Fields	-1.07 (54.01 to 52.94) **(-).17**	-0.75 (47.76 to 47.01) **(-).12**	+0.67 (48.27 to 48.94) **.11**	-1.28 (47.76 to 46.48) **(-).21***
Enterprising Fields	+0.48 (54.87 to 55.35) **.09**	-0.29 (47.31 to 47.02) **(-).05**	-2.55 (46.99 to 44.44) **(-).45***	+3.17 (48.55 to 51.72) **.56***

Artistic Personality Majoring in:	Change in Artistic Abilities and Interests	Change in Investigative Abilities and Interests	Change in Social Abilities and Interests	Change in Enterprising Abilities and Interests
Artistic Fields	+4.18 (58.59 to 62.77) **.72***	-1.70 (48.58 to 46.88)**(-).29***	+0.99 (49.05 to 50.04) **.17**	-1.32 (47.17 to 45.85) **(-).23***
Investigative Fields	-2.10 (57.01 to 54.91)**(-).39***	+2.82 (50.34 to 53.16) **.52***	+1.27 (49.47to 50.74) **.23**	+0.51 (47.21 to 47.72) **.09**
Social Fields	-2.19 (56.11 to 53.92)**(-).35***	+0.18 (47.31 to 47.49) **.03**	+2.88 (49.33 to 52.21) **.46***	-0.77 (47.43 to 46.66) **(-).12**
Enterprising Fields	+0.94 (55.72 to 56.65) **.16**	-0.21 (45.65 to 45.44) **(-).04**	-0.22 (48.66 to 48.44) **(-) .04**	+0.94 (48.27 to 49.21) **.17**

Social Personality Majoring in:	Change in Social Abilities and Interests	Change in Investigative Abilities and Interests	Change in Artistic Abilities and Interests	Change in Enterprising Abilities and Interests
Social Fields	+0.81 (53.80 to 54.61) **.13**	-1.19 (46.74 to 45.55) **(-).19***	-0.54 (47.75 to 47.21) **(-).09**	-1.17 (48.13 to 46.96) **(-).18***
Investigative Fields	+0.25 (54.33 to 54.58) **.05**	+0.84 (49.22 to 50.06) **.15**	-1.23 (48.31 to 47.08) **(-).23***	+0.16 (48.69 to 48.85) **.03**
Artistic Fields	+1.43 (55.30 to 56.73) **.29**	-1.65 (48.36 to 46.71) **(-).34**	+4.71 (52.38 to 57.09) **.96***	+0.10 (49.46 to 49.56) **.02**
Enterprising Fields	-3.09 (53.42 to 50.33)**(-).55***	+0.79 (46.09 to 46.88) **.14**	+0.51 (47.32 to 47.83) **.09**	+3.25 (49.18 to 52.43) **.58***

Enterprising Personality Majoring in:	Change in Enterprising Abilities and Interests	Change in Investigative Abilities and Interests	Change in Social Abilities and Interests	Change in Artistic Abilities and Interests
Enterprising Fields	+2.20 (55.19 to 57.39) **.38***	-0.64 (47.70 to 47.06) **(-).11**	-1.70 (49.18 to 47.48) **(-).30***	-0.03 (46.55 to 46.52) **(-).01**
Investigative Fields	+2.67 (55.99 to 58.66) **.49***	+2.31 (50.42 to 52.73) **.43***	-0.07 (49.15 5o 49.08) **(-).01**	-0.66 (46.09 to 45.43) **(-).12**
Social Fields	-1.91 (54.29 to 52. 38)**(-).31***	-0.23 (47.82 to 47.59) **(-).04**	+0.43 (48.79 to 49.22) **.07**	-0.30 (46.61 to 46.31) **(-).05**
Artistic Fields	-0.87 (56.43 to 55.56) **(-).18**	-2.07 (50.57 to 48.50) **(-).42**	+0.99 (49.45 to 50.44) **.20**	+4.57 (50.10 to 54.67) **.93***

* Difference is significant at $\alpha = .05$.

[1]In each cell, average change is given first, with 1986 and 1990 scores following (in parentheses) and then effect sizes (in bold).

exception is that while Enterprising types who entered Enterprising academic environments did gain in enterprising abilities and interests (effect size = .38), so did Enterprising types who entered Investigative academic environments (effect size = .49). A second exception is that although Social types who entered Social academic environments did show increases in Social abilities and interests, this increase was not statistically significant. However, consistent with the congruence assumption, Social types who entered the other three academic environments remained stable or decreased in Social abilities and interests. The exceptions aside, the data in table 2 (and in figures 2 through 5) are consistent with and support the definition of college student success within the context of the congruence assumption of Holland's theory; that is, students' likelihood of growth in their initially prominent characteristics is *jointly dependent* on the student's own personality type and the congruence or fit between it and the student's entry into an academic environment that requires, reinforces, and rewards that particular repertoire of abilities and interests.

The Socialization Assumption and College Student Success. Figures 2 through 5 (as well as table 2) collectively provide clear evidence in support of the socialization assumption of Holland's theory 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. Take, for example, the profiles in figure 2 for students with an Investigative personality type. These profiles show that any appreciable growth in the four sets of abilities and interests is, for the most part or for most students, dependent on the academic environment of their major field of study, and that they tend to either remain stable or decline, in some instances very dramatically, in the three other sets of abilities and interests that are not reinforced or rewarded by the academic environment of their major field of study. For example, their substantial growth in Investigative abilities and interests is dependent on their entry into Investigative environments (effect size = .32, see table 2), growth in Artistic abilities and interests is evident only for those in Artistic environments (effect size = .48), and growth in Enterprising abilities and interests is characteristic of only those who enter Enterprising environments (effect size = .56). (Note that Investigative types who entered Social academic environments also show increases in Social abilities and interests, but these increases are not statistically significant.) The pattern of findings for Investigative types is generally true for students with Artistic, Social, and Enterprising personality types, thus offering further support for the socialization assumption.

Observations and Conclusions Regarding Alternative Patterns of Student Success

Our findings presented above, in conjunction with those from our earlier collaborative work (Feldman et al., 1999, 2001, 2004; Smart & Feldman, 1998; Smart, Feldman, & Ethington, 2000), point to the absolute centrality of academic environments, as defined in Holland's theory, as a primary influence on longitudinal change and stability in patterns of college student success across a broad repertoire of abilities, interests, and values. In general, our collective findings support the conclusion reached by Pace (1990b, p. 76) that academic environments (disciplines) are a primary influence on "the extent and direction of student progress in college." In essence, we have found that students learn what they study, which is to say the distinctive repertoire of professional and personal self-perceptions, competencies, attitudes, interests, and values that their respective academic environments distinctly reinforce and reward.

While there is abundant evidence supporting the congruence assumption of Holland's theory (see, for example, the meta-analytic findings of Assouline & Meir, 1987; Spokane, 1985; Spokane, Meir, & Catalano, 2000; Tsabari, Tziner, & Meir, 2005), our findings suggest a stronger socialization than psychological dynamic at work in Holland's theory given the consistent and pervasive effects of academic environments on both congruent and incongruent students (see especially Feldman et al., 2004).

While we have, in general, found consistent support for the congruence assumption of Holland's theory, i.e., the psychological component of the theory (see especially Feldman et al., 1999), we now regard those findings as simply reflecting the success of academic environments, i.e., the sociological component of the theory, in their efforts to assist congruent students to acquire the distinctive pattern of abilities and interests they respectively seek to reinforce and reward. But we have also found these same academic environments to be equally successful in their efforts in assisting incongruent students to acquire the distinctive pattern of abilities and interests they seek to reinforce and reward (see especially Feldman et al., 2001, 2004).

This leads us to the fundamental conclusion that it is really the sociological component of Holland's theory, i.e., the academic environment, which is the primary vehicle driving the entire theory. Academic environments are not only central to the established validity of the socialization assumption of the theory, they are also of fundamental importance to the established validity of the self-selection and congruence assumptions of the theory. For example, students could not make informed choices among the plethora of potential academic majors (i.e., environments) if those environments did not establish their relatively unique public persona by their distinctive reinforcement and reward patterns and their efforts to recruit students who possess the distinctive patterns of abilities and interests they hope to reinforce and reward. In addition, as noted above, the validity of the congruence assumption would not be possible without the successful reinforcement and reward efforts of academic environments in their interactions with congruent students.

Our collective findings concerning both the congruence and socialization assumptions of Holland's theory suggest two broad general patterns of student success in postsecondary education. The first pattern is based on the congruence assumption in which student success is defined in terms of the likelihood of students' enhancing their initially prominent characteristics. The congruence assumption stipulates that this likelihood is contingent on students' entering academic environments that are congruent with their personality types. Our findings in figures 2 through 5 and in table 2 of the present study, and our earlier findings (Feldman et al., 1999; Smart et al., 2000), suggest that the profile of student success that emerges from the congruence assumption is a more peaked or highly differentiated profile reflecting further growth in students' initially prominent characteristics and either stability or decline in their three other sets of abilities and interests. This general pattern, for example, is evident in the findings for Investigative type students, in which those that enter congruent (i.e., Investigative) environments grow in Investigative abilities and interests and remain stable or decline in these abilities and interests if they select an incongruent academic environment. These Investigative type students entered college in 1986 with a higher Investigative ability and interest mean score than their Artistic, Social, and Enterprising type peers and, 4 years later, there is a clear pattern of further accentuation of these freshman year differences in terms of their initially prominent characteristics. This general pattern is also evident for the three other personality types with the exceptions noted earlier. Thus, student success within the context of the congruence assumption leads to further accentuation of freshman year differences on students' initially prominent characteristics, and results in a more peaked or highly differentiated profile as a result of students' college experiences. Put otherwise, students become better at what they were best at the time they enter college and remain stable or decline in their other abilities and interests.

The second pattern of student success is grounded in the socialization assumption in which student success is defined in terms of the distinctive patterns of abilities and interests that are reinforced and rewarded by whatever academic environment they choose. As noted earlier, our data show that any appreciable growth in the four sets of abilities and interests is, for the most part or for most students, dependent on the academic environment of their major field of study, and that students tend to remain either stable or decline in the three other sets of abilities that are not reinforced or rewarded by the academic environment of their major field of study.

For students in incongruent environments, the pattern of consistent gains in the abilities and interests of students in their chosen (but incongruent) academic environments offsetting or compensating for the stability or modest decline in their initially prominent characteristics results in a more balanced or less differentiated overall profile of abilities and interests at the time of graduation than at the time of college entry. Even so, as it is important to note, these students' initially prominent characteristics at time of college entry generally remain an important component in their overall profile across the four ability and interest scales at time of graduation. In fact, these students' initially prominent characteristics at time of college entry remain their ultimate prominent characteristic at time of graduation in all but two instances (Social students in Artistic and Enterprising academic environments). Thus, the more balanced or less differentiated profile based on the socialization assumption of Holland's theory has less to do with "losses" in their initially prominent characteristic than with increases in the repertoire of abilities and interests reinforced and rewarded by their chosen (but incongruent) academic environment.

We conclude from these data that academic environments are an absolutely essential component in Holland's theory *and* in efforts to understand student success in postsecondary education. Within the context of Holland's theory, the effects of academic environments on students' acquisition of the specific repertoire of abilities and interests that they seek to reinforce and reward are uniform—that is, generally equivalent for students who are congruent or incongruent with their academic environment. The contribution of academic environments to student success in postsecondary education depends on one's definition of "success." Within the more traditional perspective of the congruence assumption of Holland's theory, academic environments play an instrumental role in assisting students' subsequent growth in their initially prominent characteristics, leading to a more peaked or highly differentiated profile across multiple clusters of abilities and interests. Within the context of the less traditional perspective of the socialization assumption of Holland's theory that characterizes our most recent efforts (Feldman et al., 2001, 2004), academic environments play an instrumental role of assisting students in their development of whatever repertoire of abilities and interests their chosen (but incongruent) environments seek to reinforce and reward, leading to a more balanced or less differentiated profile across multiple clusters of abilities and interests.

Section 5: Research, Policy, and Practical Implications

The two alternative patterns of student success that flow from Holland's theory (presented in section 4) in effect reflect an ongoing debate within the American academic community. This debate contrasts the relative merits of (1) the more traditional liberal arts perspective of student success grounded in the pursuit of knowledge "for its own sake" (which includes the educational preparation of students to acquire a broad repertoire of talents that would enable them to function successfully in positions of power and influence in a democratic society) with (2) the more contemporary perspective of student success reflected in "market-based utilitarianism" (which emphasizes assisting students in their development of a more limited set of practical talents necessary for success in their subsequent occupational or vocational careers) (Brint, 2002; Brint, Riddle, Turk-Bicakci, & Levy, 2005; Grubb & Lazerson, 2005). This debate, which has been ongoing for decades if not longer, has been rekindled by contemporary research evidence showing, for example, that the proportion of students majoring in professional programs (e.g., business, engineering, education) has grown dramatically in recent decades at the expense of more traditional arts and sciences programs (e.g., chemistry, economics, philosophy) (Adelman, 1995; Hashem, 2002); that the proportion of students interested in "developing a meaningful philosophy of life" declined by 45 percent between 1967 and 1987, while the proportion of students interested in "becoming well-off financially" grew by 40 percent over the same period (Astin, 1998); and that there has been a substantial decline from the 1960s to the 1990s in the self-reported gains of college students in such important liberal arts areas as

an understanding and appreciating science, literature, and the arts, awareness of different philosophies and cultures, and personal development (Kuh, 1999).

Our intent here is not to enter the debate about the relative merits of these two perspectives of student success in higher education, but rather to show that Holland's theory has meaning in the efforts of scholars to understand the primary factors contributing to student success and in the efforts of institutional and governmental officials to design programs and policies intended to foster student success, irrespective of one's comfort with or adherence to either perspective. On the one hand, the more psychologically oriented component in Holland's theory, manifested in the congruence assumption, leads to a more peaked profile of student success in which students' initially prominent characteristics become more pronounced and their other sets of abilities and interests tend to remain essentially stable or to decline. This profile has more in common with the vocational or occupational perspective of student success in that it is wholly reflective of the most common application of Holland's theory, which intends to assist individuals in selecting careers where they have the greatest likelihood of success. On the other hand, the more sociologically oriented component in Holland's theory, manifested in the socialization assumption, leads to a more balanced profile of student success in which students remain stable or decline slightly in their initially prominent characteristics and grow considerably, sometimes dramatically, in the set of abilities and interests reinforced and rewarded by their chosen, but oftentimes incongruent, academic environment. The more balanced profile of student success that emerges from greater attention to the socialization assumption of the theory has more in common with the liberal arts perspective of student success, which emphasizes the need for students to develop a broader repertoire of competencies and interests to function successfully as citizens of a democratic society.

What has become increasingly evident in our collective inquiries throughout the past decade, and is equally present in our current findings and analyses, is the absolute centrality of academic environments in understanding and facilitating student success regardless of one's adherence to either the more contemporary occupational (vocational) perspective or the more traditional liberal arts perspective of student success. Thus, faculty, campus officials, and representatives of governmental agencies whose intent is to foster student success need to pay greater attention to academic environments.

We have two objectives in this final section. First, we suggest several initiatives that, in our opinion, would advance the theoretical and methodological sophistication of the efforts of scholars to understand the primary factors that contribute to student success. Second, we seek to enumerate some practical, programmatic, and policy initiatives that flow from reliance on Holland's theory as institutional and governmental officials seek to foster student success within the context of either the more contemporary occupational (vocational) perspective or the more traditional liberal arts perspective of student success. While we separate these two objectives in our discussion, we want to emphasize that they are interrelated. Practical, programmatic, and policy initiatives of institutional and governmental officials have implications for the research agendas of scholars, just as the findings of scholarly inquiries have implications for the efforts of institutional and governmental officials.

Holland's Theory and Student Success: Research Implications

As noted earlier, we do not offer Holland's theory as a panacea for our perceptions of certain weaknesses and deficiencies of current traditions that guide much research on student success, but rather seek to show the advantages of a theory-based approach that has direct applicability to the investigation of student success. We now elaborate on our perceptions of the benefits that would accrue from reliance on Holland's theory in efforts to understand student success in postsecondary education, and provide some specific examples of how such reliance might be manifested in subsequent research in the area.

Holland's Theory as a Theory of the Educational and Vocational Success of Individuals in Organizational Settings. A major limitation to current attempts to understand and promote student success is that many of them use conceptual models that are either overly broad or insufficiently developed theoretically. We wish to emphasize here the direct appropriateness of Holland's theory as a full-fledged explanation of the educational and vocational success of individuals in organizational settings. While Holland initially proposed his theory of careers to assist individuals in their selection of occupations in which they have the greatest likelihood of vocational success, he has repeatedly noted that "the hypotheses about educational behaviors ... 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, emphasis added). Holland's theory thus focuses specifically on salient components of most any definition of the vocational or educational success of individuals in organizational settings (see, for example, Kuh, Kinzie, Schuh, Whitt, & Associates, 2005).

Given the direct applicability of Holland's theory to student success in postsecondary education and our own perspective of the need for greater reliance on full-fledged theories in efforts to understand and promote student success, the rather limited reliance to date on Holland's theory to guide this line of inquiry remains something of a mystery. We believe that reliance on Holland's theory, or any other full-fledged appropriate theory, would provide coherence and continuity among studies to advance the evolution of systematic knowledge about the phenomenon under consideration.

Holland's theory need not be used to the exclusion of other theories or models that have guided research on student success in postsecondary education. Indeed, one useful approach would be to incorporate constructs in Holland's theory (e.g., students' personality types, academic environments created primarily by faculty members) into less fully developed theories and models grounded in the premise that student success in postsecondary education is a function of both the efforts of students and the programs, policies, and services of institutions they attend (e.g., Astin, 1984, 1996; Chickering & Gamson, 1987; Pace, 1984, 1990b; Tinto, 1975, 1993). Holland's theory of person-environment fit and its hexagonal model (see figure 1) provide an excellent theory-based mechanism by which to assess the extent to which students become integrated into the academic and social systems of their institutions (Tinto, 1975, 1993), the degree of students' physical and psychological involvement in their collegiate experiences (Astin, 1984, 1996), and the quality of students' effort at their institutions (Pace, 1984, 1990b). For example, a recent series of studies illustrates how salient constructs from Holland's theory may be incorporated into broader research designs to promote understanding of student success in terms of important and commonly investigated student outcomes (see Milem & Hakuta, 2000; Milem & Umbach, 2003; Milem, Umbach, & Liang, 2004; Umbach & Milem, 2004).

Balanced Attention to Both Psychological and Sociological Components of Student Success Provided in Holland's Theory. Holland's theory places equal emphasis on both psychological and sociological considerations in efforts to understand student success in postsecondary education, whether that success is defined in terms of either a balanced or a peaked profile of change as a result of their educational endeavors. This aspect of the theory would alleviate our concern about the imbalance that exists in contemporary efforts where attention to psychological considerations (e.g., student predispositions and behaviors) far surpasses attention to sociological considerations (e.g., academic environments). As a theory of person-environment fit, equal attention is devoted to the attributes of individuals and to the fundamental nature of their academic environments in understanding their subsequent levels of educational stability, satisfaction, or achievement.

While Holland's theory gives equal attention to the influences of individuals and their environments in understanding student success, perhaps the most unique and important contribution of our collective efforts over the past decade and the findings we have given in this report is the consistent and uniform influence of academic environments on the success of similar (congruent) and dissimilar

(incongruent) students in those environments. These findings are distinctive in that they run counter to the prevailing knowledge that has evolved from over three decades of research on the factors that are most critical in explaining how colleges affect students. For example, Pascarella and Terenzini (2005) concluded that, "One of the most unequivocal conclusions drawn from both our previous synthesis and the research during the 1990s is that the impact of college is largely determined by individual effort and involvement in the academic, interpersonal, and extracurricular offerings on a campus" (p. 602, emphasis added).

As we noted elsewhere, "what scholars find in their inquiries may be influenced by what they look for" (Smart et al., 2000, p. 238), and the consensus of evidence that has evolved regarding the dominant importance of student integration, involvement, and effort may well be a function of the dominant reliance on the use of student-centered models and traditions that have guided most inquiries over the past three decades. This possibility emphasizes the need for theories and conceptual models, like Holland's theory, that contain both psychological and sociological components.

The importance of our current findings (see also Feldman et al., 2004), based on a theory that has both psychological (individuals) and sociological (environments) components, is that the influence of academic environments appears greater than the effects of the individual's own predispositions. This conclusion suggests that efforts to determine the factors contributing to student success in postsecondary education should be guided by theories or conceptual models that take into consideration both the predispositions and behaviors of students and the norms, values, and expectations that their environments seek to reinforce and reward. We believe that the dominant reliance on student-centered research paradigms that has guided scholarly efforts over the past three decades may well have contributed to an overestimation of the importance of student predispositions and behaviors. Similarly, reliance on research paradigms that stress the centrality only of environmental attributes would likely result in an overestimation of environmental influences. Balance between individual and environmental components is the key to assessing the relative importance of individual predisposition or behaviors and environmental reinforcement or reward patterns on student success, and such balance is evident in Holland's theory. We believe the incorporation of key constructs of Holland's theory into existing student-centered research paradigms would help alleviate the current imbalance.

Specificity of and Psychometrically Sound Measures of Incorporated Constructs in Holland's Theory. Holland's theory and subsequent efforts by Holland and his colleagues provide a balance between individual and environmental considerations by incorporating individual and environmental constructs in the theory, providing a mechanism in the theory to ascertain the relationships between the constructs, and encouraging the development of psychometrically sound instruments to measure relevant individual and environmental attributes. The theory provides specific theoretical attention to the salient attributes of individuals, their environments, and the fit or congruence between individuals and environments. As described earlier, the theory assumes that individuals may be classified in terms of their similarity to six personality types, proposes six analogous work or academic environments, and offers a hexagonal model, shown in figure 1, to assess the level of fit or congruence between individuals and their environments (the congruence component). In addition, Holland and his associates have developed psychometrically sound instruments for the measurement of individuals' personality types (e.g., *Self-Directed Search*, Holland, Powell, & Fritzsche, 1994) and the analogous model environments (e.g., *Position Classification Inventory*, Gottfredson & Holland, 1991). Finally, theory-based procedures have been developed to determine the level of fit or congruence between individuals and their environments (see, for example, Brown & Gore, 1994).

These attributes of Holland's theory have important implications for subsequent inquiry on student success in that they provide scholars with guidance in terms of theory-based constructs to be used in their inquiries, theory-based hypothesized relationships among the constructs, and psychometrically sound

measures of those constructs. We believe that the use of the individual and environmental constructs in Holland's theory and the associated measurement instruments would represent a major theoretical and measurement advancement in scholarship on student success in postsecondary education. Such theoretical and measurement sophistication would help counter the more atheoretical empirical search for factors associated with student success.

Holland's Theory and the Importance of Conditional Effects. Most of the research based on Holland's theory, as well as parallel efforts prior to 1990 to discern how college affects students, has been based largely on "'traditional' White undergraduates, ages 18 to 22, who attended four-year institutions full-time, lived on campus, did not work, and had few, if any, family responsibilities" (Pascarella & Terenzini, 2005, p. 2). While there has been increasing attention to "nontraditional" students in the intervening years, Pascarella and Terenzini suggest that "to some extent, this bias still exits in the research base of the 1990s" (p. 2). There remains a clear need to discern the extent to which extant findings based primarily on studies of traditional college students are applicable to their nontraditional peers.

Holland (1997, p. 13), in noting that his theory "cannot be applied successfully without the observation of a few boundary conditions," offers the general caveat that the validity of the basic assumptions of the theory is conditional on the premise of "other things being equal." He refers specifically to the need to consider such factors as the "intelligence, social class, gender, and educational level" (p. 40) of individuals in research on the validity of the assumptions of the theory, and explicitly notes that "the 'other things being equal' clause in the theory needs more attention" (p. 166).

Our response to this caution (in our own efforts over the past decade) has been to examine the extent to which our findings were equally true for male and female students and for those with similar ("primary recruits") and dissimilar ("secondary recruits") initial and final choices of academic majors. Our findings have revealed several instances of differences between male and female students and between primary and secondary recruits, though, as we repeatedly noted, these differences were basically in the magnitude of change rather than in the substance of the patterns of change. Nonetheless, we believe that our collective set of findings affirms the wisdom of Holland's warning that other things may not always be equal; and we suggest that subsequent research on Holland's theory also use research designs that enable scholars to examine possible conditional effects. Given our findings and the changing nature of contemporary college students, we specifically encourage those who use Holland's theory to study student success in postsecondary education to examine the extent to which their findings are equally applicable for students who differ in terms of gender, race and ethnicity, full- or part-time enrollment, and commuting or residential status.

It is true that extensive research exists on the validity of measures to ascertain the personality types of individuals within the context of Holland's theory as well as gender and racial/ethnic similarities and differences in the structure or pattern of occupational interests. The vast majority of this work, however, has been based on samples of employed adults rather than college students. Although most of this research is too technical to deal with in an in-depth manner at this point, we can point out that Fouad and Mohler's (2004) findings of "minimal differences based on racial/ethnic group membership (i.e., Asian American, African American, Caucasian, Hispanic, Native American) but more meaningful group differences based on gender" (p. 437) are generally representative of findings to date. In general, men indicated a stronger preference for Realistic occupations and women indicated a greater preference for Artistic and Social occupations based on scales included in the Strong Interest Inventory. The findings of Day and Rounds (1998), Day, Rounds, and Swaney (1998), Fouad (2002), Fouad, Harmon, and Borgen (1997), and Lattimore and Borgen (1999) also support the conclusion that patterns of occupational interests do not vary significantly across various racial/ethnic groups.

The point we wish to make is that scholars who use Holland's theory to study the occupational stability, satisfaction, and success of employed adults are sensitive to the possibility of gender and racial/ethnic bias in their studies and have made concerted efforts to examine the possibility of gender and racial/ethnic conditional effects in their findings. We suggest the need for comparable sensitivity to such effects, as well as those stemming from full- versus part-time attendance and residential versus commuting status, when assessing the factors that contribute to student success in postsecondary education.

Holland's Theory and Student Success: Practical, Programmatic, and Policy Implications

To illustrate the variety of practical consequences that flow from Holland's theory and the findings from our own collective inquiries over the past decade, we begin with two examples related to student affairs personnel, then turn to implications for those responsible for student outcomes assessment, and end with implications for faculty and academic administrators in their efforts to understand and promote student success at the academic department level. We present these examples in order to illustrate the applicability of Holland's theory to the tasks of institutional and governmental officials responsible for diverse aspects of undergraduate education. While Holland's theory, since its inception, has been used most often by student affairs professionals, we believe it has equally important implications for academic leaders and faculty members in their quest to facilitate student success.

Implications for Student Affairs Personnel. The practical implications of our current findings and analyses are perhaps most clear in terms of efforts to assist college students in their selection of "appropriate" academic majors (i.e., environments). Past reliance on the psychological perspective in Holland's theory has led to encouraging students to select academic majors that are congruent with their dominant personality type so as to maximize the likelihood of their subsequent success in their chosen areas of study. In a sense, student choice is constrained by students' existing personality profiles at the time they enter college, and their choices are limited to those academic majors that are most likely to maximize their existing prominent characteristics. Our collective findings (see especially Feldman et al., 2001, 2004) supporting the sociological perspective of Holland's theory suggest that the advice provided students need not be constrained by students' past or present personality profiles, but rather can be grounded in a more developmentally and futuristically oriented perspective based on the broad repertoire of competencies and interests that students desire to develop as a result of their collegiate experiences. This approach, which is much less restrictive and constraining, focuses the advice given students on what they hope to be rather than what they presently are.

Reardon and Bullock (2004) recently proposed a three-tiered "service-delivery model" to assist academic advisors and career counselors in their efforts to help students make informed choices among alternative academic majors and career choices based on this more developmentally and futuristically oriented utilization of Holland's theory. Their model is predicated on the following premise: "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). Reardon and Bullock use the four vignettes we developed (Smart et al., 2000, pp. 97-101) to summarize extant research findings on the distinctive competencies, interests, attitudes, and behaviors that faculty in Investigative, Artistic, Social, and Enterprising academic environments seek to reinforce and reward as the basis for their three-tiered service-delivery model. The vignettes serve as narrative descriptions of the alternative academic environments within Holland's theory and are used to assist students to make more informed choices among the environments based on their desired or preferred learning and career objectives. The information presented in each tier of the "self-delivery model" and the amount and nature of direct involvement by academic advisors and career counselors are based on the

level of student "readiness for educational and career decision making." "Self-help services" are suggested for students with high readiness; "brief staff-assisted services" are provided for students with moderate readiness; and "individual case-managed services" are most applicable for students with low readiness (pp. 118-119). The contribution of Reardon and Bullock illustrates how academic advisors and career counselors may use Holland's theory and the collective research based on the theory in a less restrictive and more developmentally and futuristically oriented manner than it has been used in the past to foster students' subsequent success in their college careers.

We concur with Reardon and Bullock (2004) that Holland's theory, and the findings from a limited number of studies about academic environments of the theory, has the potential to assist students in more readily recognizing, differentiating, and understanding the norms and values of the diverse academic environments that are so integral to what they subsequently learn and do not learn. We further share their belief that the vignettes we initially developed are illustrative of narrative descriptions of academic environments that could be used by academic advisors, career counselors, and others to assist students in making more informed choices regarding their ultimate selection of an academic major where they have the greatest likelihood of developing the repertoire of personal and occupational competencies, interests, attitudes, and behaviors they desire.

We urge institutional and governmental officials to encourage and support the development, dissemination, and use of such descriptive materials (grounded in extant research findings) about alternative academic environments in colleges and universities to assist students in their selection of academic majors that are most analogous to their personal and professional goals and objectives. Such materials should be available to students at the time they begin their college careers. We further suggest that institutional and governmental officials initiate the necessary training and development programs for academic advisors, career counselors, faculty, and others who assist students in their selection of academic majors.

Holland's theory also has implications in terms of the development of institutional marketing and recruitment strategies. Cruickshank and Haan (2005), in noting the increasingly competitive environment of colleges and universities and the multiplicity of marketing strategies used by institutions in their efforts to recruit prospective students, suggest a variety of ways that Holland's theory might be used by admissions representatives and other institutional officials to better target and recruit students to their institutions. Their particular suggestions are based primarily on greater reliance on and more informed use of information routinely available to institutions using the ACT Assessment battery. Of particular interest within this comprehensive assessment battery is the information provided by the Student Profile and Interest Inventory (UNIACT) sections (Prediger, 2002; Swaney, 1995). For example, the UNIACT section comprises 90 items that yield scores on 6 scales of 15 items each that correspond to each of the 6 Holland personality types.

Cruickshank and Haan (2005) have developed hypothetical case studies based upon data from the UNIACT and Student Profile sections of the ACT Assessment battery to illustrate how institutions can convey to prospective students the multiplicity of ways in which the programs and services of their institutions are related to their predispositions. A straightforward example is that institutions, having first determined their prospective students' personality profiles from the UNIACT section, can then tailor correspondence that describes the academic majors and related co-curricular programs and activities at the institution to those students in ways congruent with the students' expressed self-assessments of interests, needs, and values at the time of college entry. In short, Cruickshank and Haan provide numerous examples of how Holland's theory can be applied in the recruitment process by using information routinely available in the UNIACT and Student Profile sections of the ACT Assessment battery to help students determine the extent to which the programs and services offered by institutions match their own needs and interests.

We suggest that institutional and governmental officials initiate and support programs to train college and university admission personnel to use the routinely available information from various assessment batteries of students' characteristics (the ACT Assessment battery being only one example) in their communications with and advising of prospective students to assist them in selecting institutions. Such efforts have the potential to benefit both students and institutions by enhancing the likelihood of subsequent student stability, satisfaction, and success at the institutions they ultimately decide to attend.

Implications for Student Outcomes Assessment. Assessing student learning outcomes is an integral component in establishing institutional effectiveness for accountability and accreditation purposes (Ewell, 2005; Napoli & Raymond, 2004). Our collective findings previously reported (see especially Feldman et al. 2001, 2004; Smart & Feldman, 1998) and those presented in this report support the conclusion reached by Pace (1990b) that academic environments (disciplines) are a primary influence on "the extent and direction of student progress in college" (p. 76). We have consistently found that students learn what they study, which is to say the distinctive repertoire of professional and personal self-perceptions, competencies, attitudes, interests, and values that their respective academic environments distinctly reinforce and reward.

These findings strongly suggest that academic environments should be a key element in institutional efforts to assess changes in self-perceptions, interests, and values as a result of academic environments, and that outcomes should be defined more broadly than just content knowledge since the academic environments seek to influence students' self-perceptions, attitudes, interests, and values, as well as their sheer acquisition of disciplinary content knowledge. Our knowledge and experience suggest, however, that this is not the common practice in typical institutional efforts to assess student outcomes. Seldom are the criteria used to assess student outcomes associated with the distinctive cognitive *and* affective outcomes that students' respective fields of study seek to reinforce and reward. Rather, the more typical practice is to develop a common or uniform set of criteria and to assess student learning across these multiple criteria, through either self-report or standardized measures, without regard to students' respective fields of study.

We believe that such current efforts to assess student outcomes have not taken sufficient heed of the consistent evidence based on Holland's theory that academic environments are a primary influence on what students do and do not learn, and that such practices may well have decided practical consequences in efforts to assess and compare the educational performance of institutions or the academic departments within them. Simply and practically put, it is possible that comparisons of the performance of institutions across a diverse set of student learning outcomes may well be influenced to some extent by the proportional distribution of students in the respective institutions across major fields of study (i.e., academic environments) that seek to reinforce and reward the criteria chosen to assess student outcomes. For example, institutions with an uncommonly large proportion of students in Investigative fields of study might well be advantaged by the use of assessment criteria associated with student learning in terms of mathematical and scientific competencies or their acquisition of scholarly and scientific values and attitudes, while institutions with a large proportion of students in Enterprising fields of study could be advantaged in situations where assessment criteria focused on student learning in terms of interpersonal and leadership competencies or their acquisition of such traditional values and goals as economic and political achievement and high self-esteem. An analogous situation would exist *within* institutions in efforts to assess the performance of students in various academic programs (i.e., environments) on a common or uniform set of criteria for student outcomes. That is, programs that seek to reinforce and reward students for their growth in areas more commensurate with the learning outcomes assessed would be advantaged, while those that seek to reinforce and reward students in areas less commensurate with the learning outcomes assessed would be at a disadvantage.

We are thus led to reaffirm our conviction that academic environments must be an integral component in inter- and intrainstitutional efforts to assess student outcomes. If academic environments are a primary influence on what students do and do not learn, then their omission from such critical efforts to establish institutional (and departmental) effectiveness for accountability and accreditation purposes seriously compromises the validity and integrity of such efforts. It seems to us, then, that the common practices inherent in contemporary institutional level efforts to assess student outcomes have limits in yielding meaningful assessment results given that they largely ignore variability in student success or performance measures associated with their chosen academic environments. We urge institutional and governmental officials to focus such assessment efforts at the subenvironmental (i.e., academic environment) level, and that the choices of assessment criteria and interpretation of student performance be based on students' academic majors.

Implications for Faculty Understanding of Student Success. Our previous findings supporting the socialization assumption of Holland's theory clearly show that the diverse academic environments are equally successful in their efforts to assist students whose personality types are congruent and incongruent with the environment to acquire the unique repertoire of interests, abilities, and values that the respective environments seek to reinforce and reward. This is most vividly shown in the parallel (though not identical) lines reflecting the magnitude of growth of congruent and incongruent students in the distinctive repertoire of interests, abilities, and values that Investigative, Artistic, Social, and Enterprising environments seek to reinforce and reward (see especially figures 1 – 5 in Feldman et al., 2001). While the patterns of growth by congruent and incongruent students in each of the four academic environments are remarkably equivalent, in all instances incongruent students (who do "learn" as much as their congruent peers over a 4-year period) begin and end their college careers with lower scores on the respective sets of interests, abilities, and values that each of the four academic environments seek to reinforce and reward. Are these students then less "successful"? We think not. In short, what faculty members and academic leaders must understand is that student performance, and ultimate success, should be judged in relation to students' possession of the interests, abilities, and values that the respective academic environments seek to reinforce and reward at the time they enter the program.

In sum, student success is a matter of learning, growth, or value added rather than simple performance in terms of test scores and grades. Holland's theory and the information routinely available to colleges and universities—say, for example, through the UNIACT and Student Profile sections of the ACT Assessment battery —can be useful to faculty members and academic leaders in their efforts to assess student success in their courses and programs. Once again, we would encourage institutional and governmental officials to initiate and support programs to assist faculty members and academic leaders in the use of Holland's theory and the information available from commonly used assessment batteries in their efforts to understand and assess student success in their academic programs.

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