

# Discriminating Among Educational Majors and Career Aspirations in Taiwanese Undergraduates: The Contribution of Personality and Self-Efficacy

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The purpose of this study was to determine whether the Big Five personality factors, measured by the NEO Personality Inventory Five-Factor Inventory (Costa & McCrae, 1992), and vocational confidence across Holland's hexagon, measured by the Skills Confidence Inventory (SCI; Betz, Borgen, & Harmon, 2005), were useful in discriminating among educational majors and career aspirations for 312 Taiwanese university students. The Big Five and confidence, in combination, significantly differentiated among 4 college majors and 7 career aspirations in a Taiwanese university sample. Big Five Agreeableness and SCI Realistic, Investigative, and Conventional confidence emerged as most salient in the discrimination. Differences by sex, major, and career aspiration were mostly consistent with social cognitive career theory, Holland's theory, and prior U.S. research.

*Keywords:* Big Five, vocational self-efficacy, Taiwanese undergraduates, educational major, career aspirations

Understanding what influences a student's career aspirations and the educational major she or he chooses in college is important for both vocational scholars and vocational counselors. Many college students need help choosing educational majors and subsequent careers that match their values, interests, personalities, and abilities (e.g., Borgen, 1999). However, most of the relevant research has been conducted in the United States. The purpose of this investigation was to examine the educational major and career aspiration processes of Taiwanese undergraduates. Specifically, we examined the incremental effects of personality and self-efficacy in differentiating among students' educational majors and among their career aspirations. Researching the Big Five personality factors and vocational confidence across Holland's (1997) hexagon with the goal of predicting individuals' major choices and career aspirations in Asian countries may be especially important for two reasons. First, individuals of Asian descent comprise 60%

of the world's population ("World Population," 2007). In the United States, the number of immigrants (e.g., Asian) has increased (Leong & Ponterotto, 2003), and the Asian American population is expected to reach 20 million by the year 2020 (Sue & Sue, 1999). Second, there is a need for research to determine if measures of personality traits and self-efficacy across Holland's Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC) typology, as used in the United States, are also salient predictors of vocational choice in a Taiwanese context. Therefore, results from Taiwanese studies not only could expand this vocational literature beyond the United States but also could provide valuable information for career counseling, training, and supervision with Chinese American students.

The predominant model used in this study is the social cognitive career theory (SCCT; Lent, Brown, & Hackett, 1994). In SCCT, Lent and colleagues provide a theoretical model to explain how students choose their majors and aspire toward different careers. The act of choosing a major is considered a *choice action*, defined simply as an action in which a choice has been implemented (Lent et al., 1994). Likewise, an aspiration to pursue a particular career path, such as the desire to become an engineer, is viewed as a *choice goal* because it represents an intention to act in the near future (Lent et al., 1994). Both choice goals and choice actions are indirectly influenced by personality and self-efficacy. Personality is considered a predisposition that is labeled in the model as a person input. Personality, along with contextual affordances, influences learning experiences, which in turn influence self-efficacy and outcome expectancies. Self-efficacy and outcome expectancies then impact the development of interests, which in turn influence choice goals and, subsequently, choice actions.

The hexagonal model of interests articulated by Holland (1997) has been applied to self-efficacy (Betz, Borgen, & Harmon, 1996, 2005). *Vocational confidence*, or *self-efficacy*, is defined by Betz and colleagues (1996) as the confidence to engage in educational

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and vocational activities within each of the six themes (i.e., Realistic [constructing, repairing, using tools], Investigative [researching, solving abstract problems], Artistic [composing, creating, writing], Social [teaching, helping, serving], Enterprising [selling, managing, persuading], and Conventional [setting up procedures, organizing, operating computers]) commonly referred to as the RIASEC model (Holland, 1997). Self-efficacy across the RIASEC has been measured by the six General Confidence Themes (GCTs) of the Skills Confidence Inventory (SCI; Betz et al., 1996, 2005). Researchers have provided evidence that the confidence themes are moderately to strongly related to the analogous General Occupational Themes of the Strong Interest Inventory (Donnay & Borgen, 1999; Harmon, Hansen, Borgen, & Hammer, 1994; Rottinghaus, Larson, & Borgen, 2003).

The empirical evidence supports the theoretical linkage between self-efficacy and both choice actions and choice goals posited by SCCT. For example, many studies sampling U.S. college students have demonstrated that self-efficacy across the RIASEC predicts (a) choice of educational major (Bailey, Larson, & Borgen, 2004; Betz et al., 2003; Rottinghaus, Betz, & Borgen, 2003); (b) choice of college, such as liberal arts, engineering, or business (Bailey et al., 2004; Rottinghaus, Betz, et al., 2003); (c) choice of occupation (Betz, Borgen, & Harmon, 2006; Betz et al., 2003; Donnay & Borgen, 1999); (d) educational aspirations (Rottinghaus, Lindley, Green, & Borgen, 2002); and (e) career aspirations (Bailey et al., 2004; Rottinghaus, Betz, et al., 2003). In all these studies, self-efficacy across the RIASEC was measured by the six GCTs of the SCI. The six GCTs accounted for substantial variation in differentiating among these choice goals and choice actions. Also, Ackerman and Beier (2003) examined the association between previous college major and current self-efficacy in an adult sample from Ackerman (2000). Ackerman and Beier provided evidence that domain-specific (i.e., math, science, spatial, and verbal) self-efficacy, which they labeled as *self-concept*, differed by college major (i.e., physical sciences, arts and humanities, social sciences, and business).

Consistent with SCCT and Holland (1997), as well as with the empirical literature, we would expect that self-efficacy across the RIASEC would discriminate among choice actions (i.e., educational majors) and among choice goals (i.e., career aspirations) in a Taiwanese sample as well. Jin (1986), sampling 880 Taiwanese high school students and using a Chinese version of the Self-Directed Search, provided evidence that the RIASEC model of interest was supported in Taiwan. Specifically, we expected that (a) realistic confidence would be useful in differentiating engineering majors and career aspirations, (b) investigative confidence would assist in differentiating medical or science majors and career aspirations, (c) artistic confidence would be useful for differentiating artistic majors and career aspirations, (d) social and enterprising confidence would help differentiate social service and business majors and career aspirations, and (e) conventional confidence would be useful in differentiating majors or career aspirations involving organization or data management. The SCI had not been used in Taiwan. We undertook a rigorous translation process, with permission of and in collaboration with the publisher and authors.

The five-factor model of personality (Costa & McCrae, 1992) was used to define the Big Five. The Big Five model of personality has generated extensive research and consensus on five overarch-

ing traits, namely, Neuroticism, Extraversion, Openness to Experience (Openness), Agreeableness, and Conscientiousness (Costa & McCrae, 1992). We measured the Big Five using the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992). Costa and McCrae defined *Neuroticism* as emotional instability; *Extraversion* as characterizing sociability, assertiveness, and activity; *Openness* as imagination, aesthetic sensitivity, and intellectual curiosity; *Agreeableness* as altruism, sympathy to others, and eagerness to help; and *Conscientiousness* as being purposeful, being strong-willed, and determined. The Big Five factor structure has been replicated in Chinese student samples in Hong Kong (McCrae, Costa, & Yik, 1996; McCrae, Yik, Trapnell, Bond, & Paulhus, 1998).

We located only two studies that included personality traits as one set of predictors of choice of educational major (Ackerman & Beier, 2003; Bailey et al., 2004), with Bailey et al. also examining career aspirations. Both studies used the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982, 2000; Tellegen & Waller, in press), which identifies 11 primary traits, some of which have been used as markers of the Big Five. Bailey et al. found that the 11 MPQ personality traits, as a set, significantly discriminated among educational majors and career aspirations in a college sample in the United States. Ackerman and Beier showed that adults' personalities varied based on their prior college major. Specifically, they showed that Social Potency and Social Closeness, markers of extraversion, were higher for business majors and lower for physical science majors. Also, Absorption, a marker of openness, was higher for the arts and humanities majors and lower for the business majors. Ackerman and Beier's findings provide evidence that markers of Extraversion and Openness are useful in discriminating choice of educational major. These studies have broken new ground in linking personality with important career outcomes defined by SCCT as choice actions (choosing an educational major) and choice goals (career aspirations).

Although SCCT suggests that personality is a determinant of choice actions and goals, it is not explicit as to which personality traits would be important in discriminating among specific majors. For that level of specificity, we relied on the Big Five conceptual writings (e.g., Costa & McCrae, 1992) and empirical findings. In general, we anticipated that the Big Five would differentiate educational majors (choice actions) and career aspirations (choice goals) in Taiwan. Specifically, we expected that (a) Extraversion would help differentiate more social and entrepreneurial majors and occupations (Ackerman & Beier, 2003; Bailey et al., 2004; Costa & McCrae, 1992), (b) Openness would be useful in differentiating more flexible or artistic majors or occupations (Ackerman & Beier, 2003; Costa & McCrae, 1992; Rottinghaus et al., 2002), (c) Agreeableness would be useful in differentiating more service-oriented (helping-oriented) majors and occupations (e.g., Costa & McCrae, 1992; Larson, Rottinghaus, & Borgen, 2002), and (d) Conscientiousness might be useful in differentiating those majors and occupations that are more structured and require attention to detail (Costa & McCrae, 1992; Holland, 1997; Staggs, Larson, & Borgen, in press). We did not expect Neuroticism to be salient, although it may be useful in discriminating men who do not want to pursue engineering or science majors (Rottinghaus et al., 2002). The NEO-FFI has not been measured in Taiwan, with the exception of one study that measured the Big Five using a simplified Chinese version in which the items and the scaling were

altered (Yeh & Bedford, 2003). Because the NEO-FFI had not been translated into traditional Chinese for use in Taiwan, we undertook a rigorous translation process with permission of and in collaboration with the publisher.

### Examination of Personality and Self-Efficacy Simultaneously

The authors of SCCT identify personality traits and confidence themes as unique sets that are vital to helping clients choose majors and identify career aspirations. In addition, they imply that personality traits followed by self-efficacy across the RIASEC as predictor sets would provide more precision in the identification of a major or career aspiration tailored to a particular individual. Over the past decade, there have been numerous attempts to simultaneously examine individual difference variables (e.g., personality traits, ability, self-efficacy, self-concept, interests) that are important in understanding the unique individual who seeks vocational assistance. This work has included conceptual models (e.g., Ackerman & Heggestad, 1997), as well as empirical reviews showing the relationships between personality and interest (Barrick, Mount, & Gupta, 2003; Larson et al., 2002; Staggs et al., in press); interest and self-efficacy (Rottinghaus, Larson, et al., 2003); and personality and self-efficacy (e.g., Larson & Borgen, 2006). Vocational scholars and counselors need to understand that a client's personality, interests, abilities, and self-efficacy should all be considered because they are related in specific ways. For example, extraverted clients are more likely to have enterprising interests (e.g., Barrick et al., 2003; Larson et al., 2002; Staggs et al., in press), to have enterprising and social confidence (Larson & Borgen, 2006), and to perform less well in the physical and biological sciences (Ackerman, Bowen, Beier, & Kanfer, 2001). This more unified, precise understanding of the client may assist the counselor in helping the client choose an educational major.

The intent of this study was to determine if the simultaneous examination of Big Five personality traits and self-efficacy across the RIASEC collectively are useful in differentiating among college majors and career aspirations in Taiwan. Two U.S. studies bear directly on the current study by examining personality and self-efficacy as determinants of educational major (Ackerman & Beier, 2003; Bailey et al., 2004) and career aspirations (Bailey et al., 2004). Ackerman and Beier's study used Ackerman and Heggestad's (1997) conceptual model and Ackerman's (2000) data to examine educational major. The data set included measures of self-efficacy (i.e., domain-specific self-concept), personality, and fluid and crystallized intelligence. Ackerman and Beier added the *z* scores of the personality, self-efficacy, and ability measures to form composite scores representing three of Ackerman and Heggestad's trait complexes, namely, Science/Math (math, science, and spatial self-concepts; fluid intelligence), Social (Social Closeness and Social Potency), and Intellectual/Cultural (verbal self-concept and crystallized intelligence; typical intellectual engagement [a personality trait]). They provided evidence that physical science majors had the highest Science/Math composite score, business majors had the highest Social composite score, and arts and humanities majors had the highest Intellectual/Cultural composite score. (The three-trait-complex composite score for the social science majors was near 0.) Bailey and colleagues included a measure of personality and vocational confidence in differenti-

ating among students' college majors and career aspirations. In their conference paper, they did not report means, but they did provide evidence that personality and confidence variables entered as a group into the discriminant analysis and were significant in discriminating among educational majors and career aspirations. However, the set of self-efficacy predictors was more salient.

Given the intent to examine personality and confidence simultaneously in a Taiwanese college sample, it was important to ascertain if prior researchers sampling college students had accurately determined potential areas of overlap between the two constructs. Two studies with U.S. samples do provide crucial information, relevant to the current study, regarding the potential overlap of the Big Five and vocational confidence across the RIASEC (Larson & Borgen, 2006; Rottinghaus et al., 2002). Extraversion (MPQ Social Potency and MPQ Social Closeness) was related to enterprising confidence and social confidence (Larson & Borgen, 2006; Rottinghaus et al., 2002). Openness (MPQ Absorption) was moderately related to artistic confidence (Larson & Borgen, 2006; Rottinghaus et al., 2002). Neuroticism (MPQ Stress Reaction), for the most part, did not overlap with confidence across the RIASEC (Larson & Borgen, 2006; Rottinghaus et al., 2002).

Finally, we anticipated that sex differences would be present in this Taiwanese sample. First, some majors are not equally distributed across sex; for example, it is likely that more men than women will be engineering majors. Second, within SCCT, self-efficacy has been demonstrated to be lower for women in the realistic, investigative, and conventional domains (Bailey et al., 2004; Betz et al., 1996). Finally, Costa and McCrae's (1992) conceptualization of the Big Five, and their subsequent work, have shown that women were more agreeable than men in U.S. samples (e.g., Costa & McCrae, 1992) and in a Hong Kong sample (Wan, Luk, & Lai, 2000).

### Hypotheses

We posited two hypotheses, the first concerning college major and the second concerning career aspirations. The first hypothesis was that the Big Five and self-efficacy across the RIASEC would, separately and combined, discriminate Taiwanese students' college major significantly better than chance. That is, we expected that the Big Five, as a set, and self-efficacy across the RIASEC, as a set, would separately differentiate choice of major. However, we also expected that adding self-efficacy across the RIASEC as a predictor set to the Big Five predictor set would provide more discrimination than the personality set alone. Specifically, we expected that all of the Big Five and all six of the GCTs would be significant in discriminating among the educational majors. When both sets were entered together, we placed the personality traits first because SCCT places personality as a predisposition that precedes self-efficacy in the determination of the specific choice action of choosing an educational major (Lent et al., 1994). The second hypothesis was that the Big Five, as a set, and self-efficacy across the RIASEC, as a set, would separately differentiate among career aspirations significantly better than chance. However, we also expected that adding self-efficacy across the RIASEC as a predictor set to the Big Five predictor set would provide more discrimination than the personality set alone. Specifically, we expected that all of the Big Five and all six of the GCTs would be

significant in discriminating among the career aspirations. When both sets (personality and self-efficacy) were entered together, we placed personality first based on SCCT.

Discriminant analysis was chosen as the appropriate multivariate technique for predicting nominal (discrete) categories such as major and career aspirations, with sets of continuous variables measuring personality and confidence (Betz, 1987; Sherry, 2006). The analysis provides a hit rate of the number of people correctly identified as belonging to the major groups or career aspiration groups. The analysis also gives some indication as to which of the predictor sets (i.e., personality traits as one set and the six GCTs as the second set) are significant.

## Method

### Participants

A total of 312 Taiwanese college students participated in this study. There were 179 (57%) women and 133 (43%) men, with an average age of 20.23 years ( $SD = 1.32$ ). They were recruited from four Taiwanese universities and comprised four different majors: finance ( $n = 95$ ), counseling and guidance ( $n = 88$ ), mechanical and electrical engineering ( $n = 74$ ), and pharmacy ( $n = 55$ ). Participants included 1 freshman, 145 sophomores, 131 juniors, 33 seniors, and 2 students who did not indicate their year in school.

### Measures

**Personality.** The NEO-FFI (Costa & McCrae, 1992), a short form of the NEO Personality Inventory-Revised (NEO PI-R), was used to assess an individual's personality traits. Each of the NEO-FFI's five domains of personality includes 12 five-point items, with higher raw scores in each domain representing a stronger endorsement of that trait. The Cronbach coefficient alphas of the NEO-FFI ranged from .68 (Agreeableness) to .86 (Neuroticism) for the U.S. working adult sample reported by Costa and McCrae. The Cronbach coefficient alphas in the current Taiwanese sample ranged from .60 (Agreeableness) to .84 (Conscientiousness). Evidence has accumulated supporting the construct and criterion validity of the NEO-FFI in university students in the United States (e.g., Costa & McCrae, 1992), in Hong Kong (Wan et al., 2000), and in Mainland China (Zhang, 2005). For example, self-ratings and observer ratings significantly correlate, ranging from .24 to .67 (Costa & McCrae, 1992). The NEO-FFI has not been measured in Taiwan, with the exception of one study that used a modified Hong Kong version of the NEO-FFI in which the items and the scaling were altered (Yeh & Bedford, 2003). The Hong Kong version is a simplified Chinese version that has been used in Mainland China (Zhang, 2005); whereas in Taiwan, traditional Chinese writing is used.<sup>1</sup>

**Vocational confidence.** The SCI (Betz et al., 1996) is used to assess an individual's confidence or self-efficacy in vocational activities, and it includes six subscales (i.e., the GCTs) to represent Holland's six themes. Each subscale includes 10 five-point items, with higher scores in each subscale indicating more confidence. The Cronbach coefficient alphas of the SCI scales in one U.S. college sample ranged from .84 to .87 (Betz, Borgen, Kaplan, & Harmon, 1998). The Cronbach coefficient alphas in the current Taiwanese sample ranged from .82 to .86. Concurrent validity has

been well established, in that the SCI has been shown to predict (a) college major and college membership (Rottinghaus, Betz, et al., 2003), (b) career choice and aspirations (Donnay & Borgen, 1999; Rottinghaus, Betz, et al., 2003), and (c) educational aspirations (Rottinghaus et al., 2002).

**Career aspirations.** Participants' career aspirations were ascertained by asking participants to describe what kinds of jobs or careers they intended to pursue after graduation. The first and second authors independently coded participants' answers into career aspiration clusters. Seven clusters emerged with sufficient sample size; the interrater reliability was .90. The seven career aspiration clusters (with sample sizes) were engineering ( $n = 44$ ), drug/medical ( $n = 39$ ), teaching ( $n = 35$ ), counseling and guidance ( $n = 37$ ), finance/investing ( $n = 41$ ), entrepreneurial ( $n = 18$ ), and accounting ( $n = 23$ ).<sup>2</sup> Some career aspiration clusters were too small to be examined and were treated as missing.<sup>3</sup>

**Demographic variables.** Students supplied information about their ages, their universities, their majors, their satisfaction with their majors, and their families' satisfaction with their majors.

**Translation process.** The NEO-FFI and the SCI were translated from English into traditional Chinese versions by following three procedures (Brislin, 1980; Cull et al., 2002). First, the second author and an associate (with a PhD outside of psychology), both bilingual, translated these two scales from English into Chinese. Second, another licensed Asian psychologist who is bilingual back-translated the two scales from Chinese into English. Third, these back-translated English versions were sent to the original authors, who checked the equivalence of the original and the back-translated English versions. We identified items that were not equivalent, and the entire translation process was repeated until, for both the NEO-FFI and the SCI, the original developers of the scale agreed that the two English versions were equivalent.

### Procedure

Participants were recruited from four Taiwanese universities in three different geographical areas (i.e., the northern, central, and southern regions of Taiwan). Each of the four majors was represented by a different university. Two of the universities specialized in a specific college (i.e., College of Business [finance majors] and Medical School [pharmacy majors]). The remaining two universities (which contributed engineering majors and counseling and guidance majors) contained multiple colleges. Students who were mechanical and electrical engineering majors completed their surveys in an engineering mathematics course, with a response rate of 74%; finance students completed surveys in an applied statistics

<sup>1</sup> After the completion of this study, Chou and Chen (2005) translated the longer version, the NEO PI-R, into traditional Chinese.

<sup>2</sup> To ensure that major choice and career aspirations were not redundant, a cross-tabulation table was examined using the nominal by nominal Goodman and Kruskal tau correlation (men:  $\tau = .32$ ; women:  $\tau = .30$ ).

<sup>3</sup> Entrepreneurial career aspirations concerned general entrepreneurial endeavors, such as starting one's own business; accounting included more conventional professions, including careers as bank tellers and insurance actuaries; finance/investing careers were concerned with the stock market. The categories with fewer than 10 people resulted in insufficient sample sizes; these included graduate school, open/undecided, miscellaneous, and government.

and economics course, with a response rate of 95%; counseling and guidance students completed surveys in a statistics and educational and psychological tests course, with a response rate of 88%; and pharmacy students filled out the survey in a pharmacy-related course, with a response rate of 92%. In Taiwan, becoming a licensed pharmacist requires only a bachelor's degree and the passing of a licensure exam. To practice as a counselor requires a master's degree and the passing of a licensure exam. The students receiving bachelor's degrees in counseling would not be able to practice as counselors unless they continued their education. No personal identifying information was requested on the research packet. One faculty member from each university was identified as a designated person to administer the research packets to students in classroom settings. After reading the informed consent form, students voluntarily completed the demographic form, the NEO-FFI, and the SCI in about 20–30 minutes.

## Results

Because this was the first Taiwanese sample to report scores for the NEO-FFI and the SCI, we wanted to examine significant mean differences for descriptive purposes. We conducted *t* tests using a *p* value of .01 to compare these means with an undergraduate sample's means reported in the SCI manual (Betz et al., 1996; men, *n* = 261; women, *n* = 445); and the NEO-FFI manual (Costa & McCrae, 1992; men, *n* = 148; women, *n* = 241). It should be noted that Betz and colleagues did not report a total mean; moreover, neither manual included correlation tables, which are necessary for comparing covariance matrices. These Taiwanese women were significantly less extraverted than the sample of U.S. women. (The female Extraversion unstandardized mean in the current study was *M* = 28.75, *SD* = 7.13, as compared with *M* = 31.27, *SD* = 5.64, in the study conducted by Costa & McCrae, 1992.) Taiwanese men and women reported significantly less investiga-

tive confidence than the men and women in Betz et al. (The male Investigative GCT mean in the current study was *M* = 3.14, *SD* = 0.65, as compared with *M* = 3.4, *SD* = 0.73, in the study conducted by Betz et al., 1996. The female Investigative GCT mean in the current study was *M* = 2.67, *SD* = .65, as compared with *M* = 3.0, *SD* = 0.76, in Betz et al., 1996.) Taiwanese women also reported significantly less social confidence compared with the women reported in Betz et al. (The female Social GCT mean in the current study was *M* = 3.27, *SD* = 0.58, as compared with *M* = 3.7, *SD* = 0.61, in Betz et al.)

## Choice of Major

*Preliminary analyses.* We examined the means and the correlations of the major variables under investigation. We conducted 11 two (sex) by four (major) analyses of variance (ANOVAs), with the five NEO-FFI factors and the six GCTs as the dependent variables. A Bonferroni adjustment was done to control for multiple tests (*p* < .005). Follow-up Tukey tests were conducted for major main effects using a Bonferroni adjustment of *p* < .01. Regarding the NEO-FFI, as shown in Table 1, there were no main effects for major at the .005 level; only Agreeableness yielded main effects for sex, *F*(1, 304) = 14.29, *p* < .0001. Female students expressed more Agreeableness than male students. There were no significant Sex × Major interactions. Regarding the SCI, there were sex main effects for the Realistic GCT, *F*(1, 304) = 14.39, *p* < .0001, and the Enterprising GCT, *F*(1, 312) = 11.61, *p* < .001, as shown in Table 2. That is, male students, compared with female students, expressed more realistic confidence and enterprising confidence. There were main effects for major for the Realistic GCT, *F*(3, 304) = 5.90, *p* < .001, and the Investigative GCT, *F*(3, 304) = 10.56, *p* < .0001. As shown in Table 2, engineering majors, compared with students in the other three

Table 1  
Means and Standard Deviations of NEO-FFI by Major and by Sex

Major	Neuroticism			Extraversion			Openness			Agreeableness			Conscientiousness		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total
FIN															
<i>M</i>	27.18 <sub>a</sub>	26.05	26.32	27.50	29.33	28.90	27.32	27.46	27.43	<b>25.82</b>	<b>30.21<sub>b</sub></b>	29.19	29.41	28.62	28.80
<i>SD</i>	5.51	8.02	7.50	6.01	6.92	6.74	5.56	5.15	5.22	5.40	4.77	5.23	6.40	6.73	6.63
COU															
<i>M</i>	21.58	25.14	24.37	29.79	28.81	29.02	30.32	29.23	29.47	<b>28.68</b>	<b>32.75<sub>a</sub></b>	31.88	30.32	29.87	29.97
<i>SD</i>	7.85	7.11	7.38	5.58	7.58	7.17	5.20	5.62	5.52	4.91	4.76	5.06	6.78	6.80	6.76
ENG															
<i>M</i>	23.93	26.17	24.11	28.29	29.67	28.41	28.62	31.00	28.81	29.34	30.33	29.42	27.88	24.50	27.60
<i>SD</i>	7.31	7.44	7.30	6.56	8.14	6.65	5.73	7.27	5.84	3.98	7.76	4.33	6.14	7.34	6.26
PHA															
<i>M</i>	20.22 <sub>b</sub>	25.56	23.23	30.08	27.06	28.38	28.63	29.86	29.32	27.88	29.45 <sub>b</sub>	28.76	30.79	31.24	31.05
<i>SD</i>	6.41	6.57	6.98	6.41	6.45	6.55	5.85	4.63	5.19	4.87	4.66	4.77	5.88	6.68	6.29
Total															
<i>M</i>	23.46	25.62	24.70	28.70	28.75	28.73	28.65	28.68	28.67	<b>28.40</b>	<b>31.06</b>	29.93	29.00	29.42	29.24
<i>SD</i>	7.24	7.37	7.38	6.31	7.13	6.78	5.65	5.39	5.49	4.66	5.01	5.03	6.28	6.84	6.60

*Note.* Numbers in bold indicate significant mean differences by sex at the *p* < .01 level, except in the Total row, in which numbers in bold indicate significant mean differences by sex at the *p* < .005 level. Subscripts in the columns indicate significant mean differences from each other among the corresponding majors at the *p* < .01 level. NEO-FFI = NEO Personality Inventory Five-Factor Inventory; M = male students; F = female students; FIN = finance (male *n* = 22; female *n* = 73); COU = counseling and guidance (male *n* = 19; female *n* = 69); ENG = mechanical and electrical engineering (male *n* = 68; female *n* = 6); PHA = pharmacy (male *n* = 24; female *n* = 31).

Table 2  
Means and Standard Deviations of the Skills Confidence Inventory by Major and by Sex

Major	RGCT			IGCT			AGCT			SGCT			EGCT			CGCT		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
FIN																		
<i>M</i>	<b>3.16<sub>a</sub></b>	<b>2.67<sub>a</sub></b>	2.78 <sub>b</sub>	<b>3.02</b>	<b>2.49<sub>a</sub></b>	2.61 <sub>a</sub>	2.95	2.89	2.90	3.19	3.22	3.21	3.40	3.14	3.20	3.34	3.15 <sub>a</sub>	3.20
<i>SD</i>	0.57	0.59	0.61	0.69	0.60	0.66	0.77	0.64	0.67	0.50	0.61	0.58	0.52	0.63	0.61	0.63	0.54	0.57
COU																		
<i>M</i>	<b>3.25</b>	<b>2.78<sub>a</sub></b>	2.88 <sub>b</sub>	<b>3.00</b>	<b>2.55<sub>a</sub></b>	2.64 <sub>a</sub>	3.40	3.10	3.16	3.64 <sub>a</sub>	3.39	3.44	<b>3.39</b>	<b>3.02</b>	3.10	3.23	2.84 <sub>b</sub>	2.92
<i>SD</i>	0.60	0.59	0.62	0.62	0.56	0.60	0.72	0.73	0.73	0.41	0.55	0.53	0.42	0.60	0.58	0.50	0.64	0.63
ENG																		
<i>M</i>	3.63 <sub>b</sub>	3.48 <sub>b</sub>	3.62 <sub>a</sub>	3.19	3.35 <sub>b</sub>	3.20 <sub>b</sub>	2.86	3.22	2.89	3.09 <sub>b</sub>	3.07	3.09	3.05	2.88	3.03	3.33	3.23	3.32
<i>SD</i>	0.70	0.46	0.68	0.69	0.26	0.67	0.78	0.64	0.77	0.72	0.51	0.71	0.66	0.40	0.64	0.63	0.31	0.61
PHA																		
<i>M</i>	3.25	2.88	3.05 <sub>b</sub>	3.24	3.28 <sub>b</sub>	3.26 <sub>b</sub>	2.87	2.93	2.90	3.39	3.13	3.25	<b>3.32</b>	<b>2.84</b>	3.05	3.42	3.16	3.27
<i>SD</i>	0.78	0.62	0.71	0.55	0.58	0.56	0.70	0.64	0.66	0.59	0.57	0.59	0.62	0.61	0.65	0.71	0.70	0.71
Total																		
<i>M</i>	<b>3.43</b>	<b>2.78</b>	3.05	3.14	2.67	2.87	2.95	2.99	2.97	3.24	3.27	3.25	<b>3.20</b>	<b>3.03</b>	3.10	3.33	3.03	3.16
<i>SD</i>	0.71	0.61	0.73	0.65	0.65	0.69	0.77	0.68	0.72	0.65	0.58	0.61	0.62	0.61	0.62	0.62	0.62	0.64

Note. *N* = 312. Numbers in bold indicate significant mean differences by sex at the *p* < .01 level, except in the Total row, in which numbers in bold indicate significant mean differences by sex at the *p* < .005 level. Subscripts in the columns indicate significant mean differences from each other among the corresponding majors at the *p* < .01 level. RGCT = Realistic General Confidence Theme; IGCT = Investigative General Confidence Theme; AGCT = Artistic General Confidence Theme; SGCT = Social General Confidence Theme; EGCT = Enterprising General Confidence Theme; CGCT = Conventional General Confidence Theme; M = male students; F = female students; T = total; FIN = finance (male *n* = 22; female *n* = 73); COU = counseling and guidance (male *n* = 19; female *n* = 69); ENG = mechanical and electrical engineering (male *n* = 68; female *n* = 6); PHA = pharmacy (male *n* = 24; female *n* = 31).

majors, expressed more realistic confidence and investigative confidence. There were no significant interactions.

The zero-order personality/confidence correlations by sex and the total sample are presented in Table 3. Two correlations differed by sex at the *p* < .01 level: For women only, Neuroticism negatively correlated with the Enterprising GCT. For men only, Agreeableness positively correlated with the Realistic GCT. These sex differences in the correlations, combined with the sex mean differences by major, support separate discriminant analyses by sex for college major.

*Discriminant analyses.* The first hypothesis was that the five NEO–FFI factors and the six GCTs, separately and as a group, would yield a significantly higher percentage of correct classifications of the four majors than would be expected by chance (25%). Moreover, we posited that the addition of the predictor set, the six GCTs, combined with the personality set, would contribute significantly more variance than the personality set alone. For each analysis, a priori expectations were set as all groups equal, to balance out the effects of different numbers in each major. To test this hypothesis, three discriminant analyses were conducted. Because of significant sex differences, we conducted the first set of discriminant analyses separately for the women and men, with educational major as the criterion variable. In the first set of discriminant analyses, the criterion variable was educational major (*k* = 4) and the predictor sets were the five NEO–FFI factors alone, the six SCI GCTs alone, and the five NEO–FFI factors combined with the six GCTs. Table 4 presents the hit rates, the jackknife hit rates, the squared canonical correlations, and the Wilks’s lambdas. The jackknife procedure generates a new hit rate by rerunning the analyses multiple times, by removing a case and then replacing it. This procedure provides a cross-validated estimate of the model parameters; it is an attempt to correct for

inflated hit rates due to overweighting of sample specific error (Efron, 1983). The squared canonical correlation is the proportion of variance of the unstandardized first discriminant function scores that is explained by the differences in groups (i.e., the four majors).

As shown by Table 4, the five NEO–FFI factors alone significantly differentiated participants’ college majors for both men (*p* < .01) and women (*p* < .001), with a hit rate of 45.1% for men and 38.5% for women. The six GCTs alone also significantly differentiated participants’ college majors for men (*p* < .001) and women (*p* < .001), with a hit rate of 53.4% for men and 54.7% for women. Finally, when both of the predictor sets were entered, they collectively differentiated college major to a significant extent for both men (56.4%) and women (55.9%). The first hypothesis was supported. The more conservative jackknife procedure also provided support for the hypothesis, with a combined hit rate of 48.1% for the men and 50.8% for the women. The hit rate for differentiating majors using the five NEO–FFI factors alone, the six GCTs alone, or the two predictor sets combined improved upon the chance probability of randomly selecting a major among the four majors ( $\frac{1}{4}$  = 25%). In order to test the significant improvement of the hit rates as a result of adding the six GCTs into the five NEO–FFI factor predictors, we followed J. W. Frane’s (personal communication, August 3, 1977) and Tabachnick and Fidell’s (2001) suggestions and calculated whether there was a significant difference between the two values of Wilks’s lambda (i.e., five NEO–FFI alone vs. five NEO–FFI and six GCTs). The results indicated that for both men,  $F(33, 351.28) = 1.31, p < .001$ , and women,  $F(33, 486.79) = 2.81, p < .001$ , the additional predictors (i.e., the six GCTs) significantly improved the hit rates for participants’ college majors. This finding also supports the first hypothesis.

Table 3  
Correlations Between the NEO-FFI and SCI by Total and by Sex

	1	2	3	4	5	6	7	8	9	10	11
NEO-FFI											
1. Neuroticism		<b>-49</b> (-44, -53)	<b>04</b> (-03, 10)	<b>-28</b> (-40, -28)	<b>-28</b> (-32, -27)	<b>-17</b> (-13, -10)	<b>-24</b> (-22, -19)	<b>-07</b> (-05, -10)	<b>-11</b> (-01, -20)	<b>-25</b> (-07, -35) <sup>a</sup>	<b>-24</b> (-11, -29)
2. Extraversion			<b>15</b> (28, 06)	<b>33</b> (28, 38)	<b>35</b> (35, 35)	<b>14</b> (16, 15)	<b>21</b> (23, 23)	<b>35</b> (46, 27)	<b>41</b> (30, 50)	<b>57</b> (49, 64)	<b>24</b> (09, 35)
3. Openness				<b>09</b> (10, 08)	<b>17</b> (23, 12)	<b>12</b> (05, 22)	<b>29</b> (19, 39)	<b>46</b> (38, 53)	<b>27</b> (18, 35)	<b>19</b> (22, 17)	<b>02</b> (03, 01)
4. Agreeableness					<b>23</b> (22, 23)	<b>-04</b> (26, -04) <sup>a</sup>	<b>-09</b> (05, -03)	<b>17</b> (11, 21)	<b>20</b> (07, 31)	<b>-01</b> (-11, 12)	<b>-04</b> (01, 03)
5. Conscientiousness						<b>06</b> (12, 06)	<b>27</b> (31, 28)	<b>23</b> (22, 24)	<b>40</b> (37, 43)	<b>32</b> (31, 35)	<b>31</b> (32, 32)
SCI											
6. Realistic GCT							<b>61</b> (51, 59)	<b>25</b> (23, 35)	<b>16</b> (16, 23)	<b>29</b> (20, 30)	<b>47</b> (49, 37)
7. Investigative GCT								<b>29</b> (29, 33)	<b>26</b> (31, 27)	<b>29</b> (33, 21)	<b>48</b> (50, 39)
8. Artistic GCT									<b>46</b> (43, 49)	<b>48</b> (57, 42)	<b>17</b> (17, 18)
9. Social GCT										<b>53</b> (50, 57)	<b>26</b> (27, 29)
10. Enterprising GCT											<b>47</b> (38, 50)
11. Conventional GCT											

Note. *N* = 312; male *n* = 133; female *n* = 179. Decimal points have been omitted. Correlations equal to or greater than |.20| are in bold and are significant at *p* < .001. Correlations for female students greater than |.19| and for male students greater than |.22| are significant at *p* < .01. Male and female correlation coefficients are presented in parentheses below the combined correlation coefficients by male, female. NEO-FFI = NEO Personality Inventory Five-Factor Inventory; SCI = Skills Confidence Inventory; GCT = General Confidence Theme.

<sup>a</sup> Statistically significant difference between male and female students at the *p* < .01 level.

Table 4  
*Discriminant Function Results for Predictor Sets Examining College Students' Major and Career Aspiration*

Sets of predictors	Hit rate (%)	Jackknife (%)	Squared canonical correlations <sup>a</sup>	Wilks's $\lambda$	Number of significant discriminants
Educational majors <sup>b</sup> ( $N = 312$ )					
5 NEO-FFI					
Males	45.1	33.1	.121	.782*	1
Females	38.5	32.4	.098	.810**	2
6 SCI GCTs					
Males	53.4	43.6	.224	.685**	1
Females	54.7	50.3	.334	.553**	2
5 NEO-FFI + 6 SCI GCTs					
Males	56.4	48.1	.284	.555**	2
Females	55.9	50.8	.341	.489**	2
Career aspirations <sup>c</sup> ( $N = 237$ )					
Sex + 5 NEO-FFI	34.6	26.2	.332	.540**	2
Sex + 6 SCI GCTs	42.6	38.0	.419	.383**	3
Sex + 5 NEO-FFI + 6 SCI GCTs	47.3	32.5	.434	.332**	2

Note. Male  $n = 133$  and female  $n = 179$  for the educational major analyses. NEO-FFI = NEO Personality Inventory Five-Factor Inventory; SCI GCTs = Skills Confidence Inventory General Confidence Themes.

<sup>a</sup> The squared canonical correlation is the proportion of variance of the unstandardized first discriminant function scores that is explained by the differences in groups. <sup>b</sup> Educational majors ( $k = 4$ ) were finance (male  $n = 22$ ; female  $n = 73$ ), counseling and guidance (male  $n = 19$ ; female  $n = 69$ ), mechanical and electrical engineering (male  $n = 68$ ; female  $n = 6$ ), and pharmacy (male  $n = 24$ ; female  $n = 31$ ). <sup>c</sup> Career aspirations ( $k = 7$ ) were entrepreneurial ( $n = 18$ ), teaching ( $n = 35$ ), guidance ( $n = 37$ ), engineering ( $n = 44$ ), drug/medical ( $n = 39$ ), accounting ( $n = 23$ ), and finance/investing ( $n = 41$ ). \*  $p < .01$ . \*\*  $p < .001$ .

Table 5 provides the group centroids for the two significant functions and the structure matrix by sex, to provide more specific information regarding which of the NEO-FFI factors or GCTs contributed to discrimination among the majors. For men, the first function separated the engineering majors from the other majors. An examination of the structure matrix reveals that the Realistic GCT and the Social and Enterprising GCTs (negative weights) had the highest correlations with the function. An examination of the means in Table 2 reveals that male engineering majors had the highest realistic confidence mean and the lowest enterprising and social confidence means among the four majors. The second function discriminated finance majors from counseling and guidance majors. The highest correlations with the function in the structure matrix for the second function were Neuroticism and Agreeableness (negative weight). Table 1 confirms this: Male finance majors had the highest mean on Neuroticism and the lowest Agreeableness mean; conversely, the male counseling majors had the next to lowest Neuroticism mean and the next to highest Agreeableness mean.

For women, as seen in Table 5, the first function separated engineering and pharmacy majors from counseling and finance majors. The highest correlation with the function was the Investigative GCT. An examination of the means in Table 2 reveals that female engineering and pharmacy majors had more investigative confidence than female counseling and finance majors. The second discriminant function separated finance majors from counseling majors. The highest correlations with the function in the structure matrix were Agreeableness and the Conventional GCT (negative weight). As seen by Tables 1 and 2, female counseling majors were more agreeable and had less conventional confidence than female finance majors.

### Career Aspirations

*Preliminary analyses.* Given the cell sizes in the seven career aspirations by sex, we were unable to conduct Sex  $\times$  Career Aspiration ANOVAs. However, we conducted one-way ANOVAs for sex and for career aspirations separately. A Bonferroni adjustment was made because of multiple comparisons ( $ps < .005$ ). Follow-up Tukey tests were conducted using a Bonferroni adjustment of  $p < .01$  for career aspiration. As can be seen in Table 6, for the NEO-FFI, only Agreeableness was significantly different across career aspirations,  $F(6, 230) = 5.13, p < .001$ . Students who expected to be guidance counselors were more agreeable than students who aspired to be in the finance/investing area or in engineering; students who aspired to be teachers, as compared with those in the finance area, were more agreeable. Moreover, Agreeableness yielded the only significant sex difference,  $F(1, 235) = 22.49, p < .001$ . Women were more agreeable than men; within the different career aspiration groups, the only significant sex difference was in the guidance group.

For the SCI, there were career aspiration main effects for the Realistic GCT,  $F(6, 230) = 9.36, p < .001$ ; the Investigative GCT,  $F(6, 230) = 9.67, p < .001$ ; and the Conventional GCT,  $F(6, 230) = 5.13, p < .001$ . As the reader can see in Table 7, students aspiring to be engineers, compared with students planning other careers, expressed more realistic confidence. Moreover, students intending to be engineers or intending to enter drug/medical careers, compared with students endorsing all other aspirations except entrepreneurial, expressed more investigative confidence. Finally, students intending to pursue engineering, drug/medical careers, or finance/investing careers, compared with students intending to be teachers, expressed more conventional confidence. There were sex main effects for the Realistic GCT,  $F(1, 235) =$



Table 5  
Group Centroids and Discriminant Structure Matrix for  
Discriminant Analyses of the NEO–FFI and SCI Among  
Taiwanese College Students' Major Choices

Group or variable	Discriminant function			
	Males		Females	
	1	2	1	2
Group centroids				
Finance	–0.373	0.897	–0.290	–0.547
Counseling	–0.951	–0.548	–0.436	0.532
Engineering	0.585	–0.100	1.980	0.106
Pharmacy	–0.563	–0.106	1.422	0.084
Structure matrix				
NEO–FFI				
Neuroticism	.185	.577	.010	–.112
Extraversion	–.138	–.233	–.126	–.082
Openness	–.069	–.315	.161	.331
Agreeableness	.261	–.534	–.248	.453
Conscientiousness	–.302	–.017	.079	.178
SCI				
Realistic GCT	.458	–.265	.225	.206
Investigative GCT	.118	–.088	.756	.201
Artistic GCT	–.281	–.205	–.039	.281
Social GCT	–.461	–.295	–.194	.244
Enterprising GCT	–.416	.186	–.209	–.213
Conventional GCT	.018	.060	.186	–.459

Note.  $N = 312$  (male  $n = 133$ ; female  $n = 179$ ). NEO–FFI = NEO Personality Inventory Five-Factor Inventory; SCI = Skills Confidence Inventory; GCT = General Confidence Theme.

75.05,  $p < .001$ ; the Investigative GCT,  $F(1, 235) = 36.21$ ,  $p < .001$ ; and the Conventional GCT,  $F(1, 235) = 20.26$ ,  $p < .001$ . As seen in Table 7, men had more realistic confidence and investigative confidence than women in the entrepreneurial group and in the finance/investing group.

**Discriminant analyses.** The second hypothesis was that the five NEO–FFI factors separately and the six GCTs separately would discriminate among the seven career aspirations significantly better than chance (14.28%). Furthermore, we anticipated that adding the six GCTs as a predictor set to the personality predictor set would provide significantly better discrimination of the career aspiration clusters than using the personality set alone. Because of the small number of men or women in some clusters of career aspirations and the larger number of categories ( $k = 7$ ), we combined the male and female data sets into one data set in running the second set of discriminant analyses.<sup>4</sup> However, given the sex differences by educational major, we chose to control for sex by entering sex as the first predictor in each discriminant analysis. The criterion variable was career aspiration ( $k = 7$ ), and the predictor sets were (a) sex and the five NEO–FFI factors; (b) sex and the six SCI GCTs; and (c) sex, the five NEO–FFI factors, and the six GCTs. Table 4 also presents the hit rates, the jackknife hit rates, the squared canonical correlation, and the Wilks's lambdas for the career aspirations.

The results indicate that sex and the five NEO–FFI factors (Wilks's  $\lambda = .540$ ,  $p < .001$ ) and sex and the six GCTs (Wilks's  $\lambda = .383$ ,  $p < .001$ ) significantly predicted participants' career

aspirations, as expected. That is, the second hypothesis was supported. As shown by Table 4, the hit rate for differentiating participants' career aspirations using sex and the five NEO–FFI factors was 34.6%, and the hit rate was 42.6% when sex and the six GCTs were the predictor sets. When the three predictor sets were combined (controlling for sex), the hit rate was 47.3%, which was more than three times the probability of randomly selecting a career aspiration among the seven clusters ( $\frac{1}{7} = 14.3\%$ ). Moreover, the hit rate for the combined set of sex, the five NEO–FFI factors, and the six GCTs was a significant improvement over the hit rate for sex and the five NEO–FFI factors,  $F(72, 1197.16) = 1.56$ ,  $p < .01$ . These results support the second hypothesis.

Table 8 provides the group centroids for the two significant functions and the structure matrix in the combined discriminant analysis (sex, 5 NEO–FFI factors, 6 GCTs), to provide more specific information regarding which of the NEO–FFI factors or GCTs contributed to discrimination among the career aspirations. The first function discriminated engineering career aspirations from guidance, accounting, and teaching aspirations. The highest positive loading was sex, and the highest negative loadings were the Realistic GCT and the Investigative GCT. An examination of the means and the cell sizes by sex in Tables 6 and 7 reveals that Taiwanese students who were aspiring to be in engineering careers were predominantly male, whereas students aspiring to be guidance counselors, teachers, or accountants were more likely to be female. Moreover, students with engineering aspirations reported significantly more realistic confidence and investigative confidence than those aspiring to be guidance counselors, teachers, or accountants.

The second discriminant function separated entrepreneurial aspirations and finance/investing aspirations from teaching and guidance aspirations. The highest positive loading was the Conventional GCT, and the highest negative loadings were Agreeableness and Openness. By examining the means in Tables 6 and 7, we can see that those students aspiring to entrepreneurial careers or finance/investing careers were more confident in the Conventional domain and less open and agreeable than those students aspiring to be guidance counselors or teachers.

## Discussion

The first and second hypotheses asserted that the Big Five and confidence across the RIASEC would significantly discriminate among current majors and career aspirations in Taiwanese college students. Both hypotheses were supported. The Big Five as a set and the six confidence themes as a set independently discriminated among the four educational majors and the seven career aspirations significantly better than chance. These findings support some evidence from U.S. samples that personality traits discriminated choice of major (Ackerman & Beier, 2003; Bailey et al., 2004) and career aspirations (Bailey et al., 2004). Moreover, these Taiwanese findings are consistent with evidence from U.S. college samples that the six self-efficacy themes differentiated choice of educational major (Bailey et al., 2004; Betz et al., 2003; Rottinghaus, Betz, et al., 2003); choice of college (e.g., liberal arts, engineering,

<sup>4</sup> We did run discriminant analyses separately by sex, and these results are available from the first author.

Table 6  
Means and Standard Deviations of NEO–FFI by Career Aspiration and by Sex

Aspiration	n (M, F)	Neuroticism			Extraversion			Openness			Agreeableness			Conscientiousness		
		M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total
ENG	44 (41, 3)															
<i>M</i>		23.66	29.33	24.05	28.29	26.67	28.18	28.32	30.33	28.46	29.39	27.00	29.23 <sub>a,b</sub>	28.50	22.67	28.11
<i>SD</i>		8.25	7.51	8.25	6.85	11.37	7.06	5.01	8.74	5.21	3.60	9.85	4.11	6.95	5.69	6.97
DRU	39 (14, 25)															
<i>M</i>		20.66	25.54	23.79	29.50	27.24	28.05	28.57	28.92	28.79	29.00	29.76	29.48	31.43	30.60	30.90
<i>SD</i>		5.18	6.81	6.64	5.88	6.92	6.58	7.00	4.42	5.39	4.71	4.71	4.66	6.65	6.81	6.68
TEA	35 (10, 25)															
<i>M</i>		19.30	24.16	22.77	32.10	30.48	30.94	33.10	29.48	30.51	29.50	33.80	32.57 <sub>a,c</sub>	33.70	30.96	31.74
<i>SD</i>		6.46	6.36	6.67	5.78	6.49	6.25	5.36	5.67	5.75	5.08	4.81	5.20	4.83	6.56	6.18
GUI	37 (5, 32)															
<i>M</i>		27.40	24.09	24.53	26.00	29.53	29.05	26.20	29.84	29.35	<b>26.00</b>	<b>34.06<sub>c</sub></b>	32.97 <sub>c</sub>	29.40	30.41	30.27
<i>SD</i>		10.01	6.98	7.38	3.67	7.95	7.58	2.77	6.58	6.30	6.00	4.10	5.12	1.14	6.63	7.17
ENT	18 (10, 8)															
<i>M</i>		20.00	29.13	24.06	31.60	32.25	31.89	27.00	27.00	27.00	27.60	29.25	28.33	31.80	27.25	29.77
<i>SD</i>		7.92	8.82	9.33	5.70	6.04	5.69	3.83	3.34	3.51	4.72	6.25	5.35	4.92	5.39	5.49
FIN	41 (12, 29)															
<i>M</i>		25.33	25.00	25.10	28.17	29.14	28.85	27.83	26.48	26.87	26.17	29.69 <sub>a</sub>	28.66 <sub>b</sub>	30.42	29.17	29.54
<i>SD</i>		6.79	9.71	8.87	6.45	7.24	6.96	6.04	5.65	5.73	5.56	4.89	5.28	6.29	7.73	7.28
ACC	23 (3, 20)															
<i>M</i>		29.33	26.00	26.43	25.67	30.00	29.43	23.33	27.55	27.00	28.33	31.50	31.09	22.00	30.60	29.48
<i>SD</i>		1.53	6.52	6.19	2.52	6.88	6.61	5.51	5.58	5.63	2.08	3.83	3.78	4.58	6.70	7.03
Total	237															
<i>M</i>		22.96	25.21	24.31	29.00	29.37	29.22	28.39	28.46	28.43	<b>28.54</b>	<b>31.58</b>	30.36	29.91	29.97	29.95
<i>SD</i>		7.67	7.51	7.64	6.29	7.17	6.82	5.53	5.68	5.61	4.48	5.08	5.06	6.44	6.84	6.67

*Note.* Numbers in bold indicate significant mean differences by sex at the  $p < .01$  level, except in the Total row, in which numbers in bold indicate significant mean differences by sex at the  $p < .005$  level. Subscripts in the columns indicate significant mean level differences from each other among the corresponding career aspiration clusters at the  $p < .01$  level. NEO–FFI = NEO Personality Inventory Five-Factor Inventory; M = male students; F = female students; Aspiration = career aspiration; ENG = engineering; DRU = drug/medical; TEA = teaching; GUI = guidance; ENT = entrepreneurial; FIN = finance/investing; ACC = accounting.

business; Bailey et al., 2004; Rottinghaus, Betz, et al., 2003); choice of occupation (Betz et al., 2003, 2006; Donnay & Borgen, 1999); educational aspirations (Rottinghaus et al., 2002); and career aspirations (Bailey et al., 2004; Rottinghaus, Betz, et al., 2003). Finally, Jin (1986) having shown that the RIASEC interest domains fit for Taiwanese high school students, the current findings provide support for the proposition that these Taiwanese college students also seek out vocational domains in which they are confident.

Moreover, the personality traits and confidence themes as a combined set also discriminated among both the majors and the career aspirations. Adding vocational confidence to personality increased the hit rate substantially and significantly in discriminating among current educational major for both sexes, and for discriminating among Taiwanese students' career aspirations. These results support the hypotheses that were grounded in SCCT. As expected, self-efficacy contributed significant additional discrimination in students' choice actions (choosing majors) and in their choice goals (career aspirations), beyond that contributed by personality traits alone, because self-efficacy across the RIASEC is a more proximal determinant of choice of major and of career aspirations than is personality.

These Taiwanese findings are also consistent with previous studies showing that personality traits and vocational self-efficacy themes, when combined, can significantly discriminate U.S. students' college majors (Ackerman & Beier, 2003; Bailey et al.,

2004), career aspirations (Bailey et al., 2004), and educational aspirations (Rottinghaus et al., 2002). In short, although some scholars (e.g., Lindley, 2006) have questioned the utility of person variables (e.g., personality, self-efficacy) as predictors of vocational outcomes in cultures that are more collectivist (e.g., Chinese culture), these results provide empirical evidence to support and to expand the examination of personality factors and vocational confidence as contributors to vocational outcomes in a Taiwanese sample. Even though Taiwanese young people may attend to their extended families' wishes (e.g., Ma & Yeh, 2005; Tang, Fouad, & Smith, 1999), it seems clear from the current study that these students also make career choices that fit their personality styles, and that they also choose to pursue career domains in which they are confident they can be successful.

These Taiwanese findings add cross-cultural validity to Ackerman and Heggstad's (1997) argument that integrating individual differences like personality and self-efficacy provides a more heuristic view of the career client. For the counselor to conceptualize the client's strengths and weakness in terms of clusters or patterns may be quite useful. There were several findings in this Taiwanese sample of undergraduates that confirmed Ackerman and Beier's (2003) report of math, science, and spatial self-concept being part of a Science/Math trait complex that differentiated physical sciences majors from everyone else. First, for men, realistic confidence was useful in discriminating engineering majors from students in the other three majors. Second, for women,

Table 7  
Means and Standard Deviations of Skills Confidence Inventory by Career Aspiration and by Sex

Aspiration	n (M, F)	RGCT			IGCT			AGCT			SGCT			EGCT			CGCT		
		M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
ENG	44 (41, 3)																		
<i>M</i>		3.70	3.50	3.68 <sub>a</sub>	3.26	3.27	3.26 <sub>b</sub>	2.85	3.27	2.89	3.21	3.10	3.20	3.06	2.67	3.03	3.39	3.03	3.37 <sub>b</sub>
<i>SD</i>		0.69	0.20	0.67	0.66	0.38	0.64	0.80	0.90	0.80	0.70	0.50	0.69	0.65	0.49	0.64	0.65	0.25	0.64
DRU	39 (14, 25)																		
<i>M</i>		3.40	2.87	3.06 <sub>b</sub>	3.26	3.24 <sub>b</sub>	3.24 <sub>b</sub>	2.88	2.85	2.86	3.41	3.10	3.21	3.30	2.86	3.02	3.56	3.21	3.34 <sub>b</sub>
<i>SD</i>		0.80	0.63	0.73	0.55	0.54	0.53	0.72	0.53	0.60	0.70	0.50	0.59	0.59	0.58	0.61	0.70	0.64	0.67
TEA	35 (10, 25)																		
<i>M</i>		3.06	2.75	2.84 <sub>b</sub>	3.02	2.52 <sub>a</sub>	2.66 <sub>a</sub>	3.58	3.13	3.26	3.62	3.46	3.50	3.42	3.02	3.13	3.05	2.75 <sub>a</sub>	2.83 <sub>a</sub>
<i>SD</i>		0.70	0.69	0.69	0.66	0.54	0.61	0.92	0.76	0.82	0.56	0.50	0.52	0.29	0.60	0.60	0.57	0.68	0.66
GUI	37 (5, 32)																		
<i>M</i>		3.48	2.77	2.86 <sub>b</sub>	2.58	2.59 <sub>a</sub>	2.59 <sub>a</sub>	3.10	3.18	3.17	3.58	3.43	3.45	3.38	3.07	3.11	3.36	2.88	2.94
<i>SD</i>		0.53	0.58	0.62	0.62	0.57	0.56	0.48	0.65	0.62	0.41	0.51	0.50	0.57	0.52	0.53	0.45	0.47	0.49
ENT	18 (10, 8)																		
<i>M</i>		<b>3.39</b>	<b>2.48</b>	2.98 <sub>b</sub>	<b>3.28</b>	<b>2.41<sub>a</sub></b>	2.89	2.86	2.83	2.84	3.29	3.08	3.19	3.68	3.20	3.47	3.71	3.04	3.41
<i>SD</i>		0.58	0.55	0.72	0.61	0.63	0.74	0.67	0.59	0.62	0.81	0.80	0.79	0.61	0.33	0.55	0.75	0.39	0.69
FIN	41 (12, 29)																		
<i>M</i>		<b>3.31</b>	<b>2.60</b>	2.80 <sub>b</sub>	<b>3.10</b>	<b>2.54<sub>a</sub></b>	2.70 <sub>a</sub>	3.02	2.85	2.90	3.16	3.21	3.19	3.50	3.17	3.26	3.54	3.29 <sub>b</sub>	3.36 <sub>b</sub>
<i>SD</i>		0.54	0.61	0.67	0.46	0.63	0.64	0.81	0.67	0.71	0.56	0.66	0.60	0.46	0.72	0.67	0.37	0.52	0.49
ACC	23 (3, 20)																		
<i>M</i>		3.10	2.66	2.72 <sub>b</sub>	2.73	2.41 <sub>a</sub>	2.45 <sub>a</sub>	2.57	2.94	2.89	3.03	3.32	3.28	2.93	3.12	3.10	2.87	3.20	3.15
<i>SD</i>		0.61	0.58	0.59	0.96	0.56	0.61	1.04	0.66	0.70	0.35	0.56	0.54	0.35	0.60	0.57	0.57	0.52	0.53
Total	237																		
<i>M</i>		<b>3.47</b>	<b>2.73</b>	3.03	<b>3.16</b>	<b>2.66</b>	2.86	2.96	2.99	2.98	3.30	3.29	3.29	3.27	3.05	3.14	<b>3.41</b>	<b>3.05</b>	3.20
<i>SD</i>		0.69	0.62	0.74	0.63	0.63	0.68	0.79	0.66	0.72	0.67	0.57	0.61	0.61	0.59	0.61	0.63	0.58	0.63

Note. Numbers in bold indicate significant mean differences by sex at the  $p < .01$  level, except for the Total row, in which numbers in bold indicate significant mean differences by sex at the  $p < .005$  level. Subscripts in the columns indicate significant mean level differences from each other among the corresponding career aspiration clusters at the  $p < .01$  level. M = male students; F = female students; T = total; Aspiration = career aspiration; RGCT = Realistic General Confidence Theme; IGCT = Investigative General Confidence Theme; AGCT = Artistic General Confidence Theme; SGCT = Social General Confidence Theme; EGCT = Enterprising General Confidence Theme; CGCT = Conventional General Confidence Theme; ENG = engineering; DRU = drug/medical; TEA = teaching; GUI = guidance; ENT = entrepreneurial; FIN = finance/investing; ACC = accounting.

investigative confidence was helpful in separating pharmacy majors and mechanical and electrical engineering majors from guidance and business majors. Third, realistic confidence and investigative confidence were helpful in distinguishing engineering aspirations from the other aspirations. Ackerman and Beier did not include majors that were more conventional or more social in nature. However, in this Taiwanese sample, more conventional majors (finance) and more social majors (counseling and guidance) were represented. As a result, agreeableness and conventional confidence emerged as being helpful in separating students who aspired to be entrepreneurs or who aspired to work in financial institutions from students aspiring to be teachers and counselors.

This was the first SCI study translated into traditional Chinese and applied to a Taiwanese sample. For both educational major and career aspirations, the results are mostly consistent with research findings on Holland's theory and the SCI conducted in the United States (Betz et al., 1996, 2003; Rottinghaus, Betz, et al., 2003). For example, counseling majors had more social confidence than engineering majors; pharmacy and engineering majors had more investigative confidence than finance and counseling majors. Likewise, results for these Taiwanese students concerning career aspirations were similar to those for U.S. students in the way they mapped onto Holland's RIASEC model. For example, students aspiring to be engineers had more realistic confidence, as ex-

pected, than all other student groups; furthermore, students planning to be engineers or planning to enter the drug/medical professions had more investigative confidence than students in all other career aspiration clusters except the entrepreneurial group. Finally, students aspiring to pursue engineering careers, drug/medical careers, or finance/investing careers had more conventional confidence than students planning to be teachers. These results are consistent with Jin's (1986) findings, providing support for Holland's RIASEC model of interest in a Taiwanese context.

Although the NEO-FFI has been very popular in the United States, this was the first study in which the NEO-FFI was translated into traditional Chinese, following a rigorous translation process with the publisher's permission. We found that the female Taiwanese university students in the current study were less extraverted than Costa and McCrae's (1992) female sample. These results are partially consistent with previous studies that indicated that a Hong Kong Chinese student sample was less extraverted than two U.S. student samples (e.g., McCrae et al., 1996, 1998), and that Taiwanese students were less extraverted than Costa and McCrae's U.S. student sample, according to results obtained using the NEO PI-R (Chou & Chen, 2005). It seems the current study may reflect a cultural difference between Taiwanese women and American women: Both are socialized to attend to others' needs; but American women are also socialized to be gregarious, while Taiwanese women are socialized to be more compliant.

Table 8  
*Group Centroids and Discriminant Structure Matrix for  
 Discriminant Analyses of the NEO-FFI and SCI Among  
 Taiwanese College Students' Career Aspirations*

Group or variable	Discriminant function	
	1	2
Group centroids		
Engineering	-1.577	-0.410
Drug/medical	-0.318	0.294
Teaching	0.674	-0.817
Guidance	0.876	-0.539
Entrepreneurial	-0.286	0.841
Finance/investing	0.329	0.796
Accounting	0.758	0.317
Structure matrix		
Sex	.752	.131
NEO-FFI		
Neuroticism	.033	.115
Extraversion	.089	-.018
Openness	.035	-.331
Agreeableness	.266	-.449
Conscientiousness	.133	-.058
SCI		
Realistic GCT	-.536	-.227
Investigative GCT	-.512	.013
Artistic GCT	.154	-.277
Social GCT	.154	-.255
Enterprising GCT	.067	.193
Conventional GCT	-.284	.432

*Note.*  $N = 237$  (entrepreneurial  $n = 18$ ; teaching  $n = 35$ ; guidance  $n = 37$ ; engineering  $n = 44$ ; drug/medical  $n = 39$ ; accounting  $n = 23$ ; finance/investing  $n = 41$ ). NEO-FFI = NEO Personality Inventory Five-Factor Inventory; SCI = Skills Confidence Inventory; GCT = General Confidence Theme.

Recently, career researchers have provided evidence that there are some meaningful and stable relations between personality and self-efficacy across the six Holland themes in U.S. samples (Larson & Borgen, 2006; Rottinghaus et al., 2002). Our results, shown in Table 3, provide empirical data to support that evidence, and to expand it to include a Taiwanese sample. Extraversion was moderately related to social confidence and strongly related to enterprising confidence; Openness was moderately related to artistic confidence. These results are consistent with Larson and Borgen's findings, as well as those of Rottinghaus and colleagues (2002). Additional relations equal to or greater than  $|.20|$  emerged in this sample, some of which are consistent with Rottinghaus et al.'s (2002) findings and some of which are not. For example, there were more correlations equal to or greater than  $|.20|$  in this sample. More research is needed both in the United States and in Taiwan to determine the robustness of these findings. More Taiwanese studies are needed to determine whether these correlations are capturing something about the Taiwanese culture.

### Sex Differences

Sex was also a salient factor in this Taiwanese university sample. First, in the discriminant analyses, stronger realistic confi-

dence and weaker social and enterprising confidence were more useful indicators for separating male engineering majors from men in the other majors; however, for women, greater investigative confidence was more useful in discriminating engineering and pharmacy majors from students in the other majors. Likewise, for men, stronger neuroticism and weaker agreeableness were useful indicators for separating finance majors from counseling and guidance majors; however, for women, weaker agreeableness and stronger conventional confidence were useful indicators for separating finance majors from counseling and guidance majors.

Second, main sex effects for personality and confidence were also apparent in this sample. Women were more agreeable than males. These results are consistent with Wan and colleagues (2000), who used the simplified Chinese version of the NEO-FFI; they found that Hong Kong university women were significantly more agreeable than their male counterparts. Moreover, the college sample in Costa and McCrae's (1992) study also showed women to be significantly more agreeable than men. It may be that women are encouraged to be agreeable in both Taiwan and the United States. Female Taiwanese university students in this sample also reported significantly less realistic and enterprising confidence than their male counterparts. These main effects for sex are consistent with the only other published study in Taiwan measuring traditional and nontraditional occupational self-efficacy, in which female Taiwanese students, compared with male students, reported less self-efficacy in traditionally male-dominated majors and occupations (Tien, 2003). Similar findings have been provided by two U.S. college student samples (Bailey et al., 2004; Betz et al., 1996), in which women, compared to men, reported less realistic, enterprising, and conventional confidence.

However, the current findings also provide evidence that women across majors differ with respect to how much confidence they possess in more traditionally male domains. Neither Betz et al. (2003) nor Bailey et al. (2004) examined sex differences within majors. In this Taiwanese university sample, women, compared to men, did not differ in their investigative confidence; rather, investigative confidence varied by major. Women and men who were pharmacy and engineering majors had more investigative confidence than did counseling and guidance majors and finance majors. Also, female and male engineering majors did not differ in their confidence across the RIASEC. Our findings suggest that U.S. researchers need to examine women's confidence within respective majors, as the women are not alike. It may be that women in both cultures have sufficient confidence within their identified interest domains, and that their confidence is less than that of men in traditional male domains outside their interest areas.

### Limitations and Future Research

This study has several limitations, and we suggest several future research directions. First, although we recruited a large sample from four campuses, resulting in an adequate sampling of four distinct majors, other majors need to be included in future studies. Second, future researchers need to replicate these findings with other Taiwanese college students from the same majors. Third, the Five Factor model of personality, although well accepted and validated in Hong Kong samples (Costa & McCrae, 1992; McCrae et al., 1996), includes only those five factors. Future researchers may want to consider other models of personality, both those that

have been developed in the United States and those that have been tailored specifically to the Chinese context. One intriguing culture-specific personality trait, Interpersonal Relatedness (including the facets Harmony, Relationship Orientation, Flexibility, and Face; Cheung et al., 2001), may be useful in future studies examining the role of personality in vocational and educational outcomes. Moreover, other models of personality, such as the MPQ, have been linked to vocational self-efficacy in the United States (e.g., Larson & Borgen, 2006). Researchers may want to examine the MPQ in the Taiwanese setting; they may especially want to study the MPQ primary scale, Control, which captures an individual's tendencies to be careful, to be cautious, and to plan. Fourth, future researchers need to replicate and expand these findings to Chinese American populations in the United States. Fifth, future researchers may want to give the two measures to students who are bilingual, to determine the extent to which differences are based on the culture. Finally, researchers may want to examine the equality of the covariance structures of Taiwanese compared to U.S. college samples in determining the psychometric equivalence of the NEO-FFI and SCI.

### Counseling Implications

Our results have some implications for career counseling. Our findings indicate that personality and vocational confidence played an important role in predicting Taiwanese students' choice of major and their career aspirations. If the results are replicated by other Taiwanese samples, this may lead to a greater recognition of the important roles of personality factors and vocational confidence across the RIASEC in the choice of college major and career aspiration. This perspective could be applied toward a better understanding of the uniqueness of particular Asian students (at least Taiwanese college students) in multi-cultural career counseling, training, and supervision. Counselors may want to encourage students who have strong realistic confidence to consider engineering as a major, and students with strong investigative confidence to consider medical/science majors. Likewise, counselors working with more agreeable female students who have less conventional confidence may want to recommend that they explore counseling as a career; by contrast, female students who have more conventional confidence and who are less agreeable may want to consider finance. Also, in this sample, Taiwanese students who were aspiring to be engineers were predominantly male, whereas students aspiring to be guidance counselors, teachers, or accountants were more likely to be female. This may suggest that counselors need to encourage both women and men to consider non-traditional careers. Our results also indicated that female Taiwanese students had less realistic and enterprising confidence. However, female students in engineering and pharmacy majors did not report less realistic and investigative confidence than their male cohorts in the same majors. Career counselors may need to consider the sex and majors of their clients to be able to tailor appropriate interventions aimed at increasing clients' confidence in their domains of interest. When working with Taiwanese university women who are interested in particular majors, career counselors need to ascertain if these individuals have sufficient confidence to pursue those majors. Interventions, such as modeling, and success experiences through externships and internships

may be quite useful in enhancing their confidence in those male-dominated areas that are of interest to them.

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