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Interest-Major Fit and Satisfaction: Extending Theories of Occupational Fit to Predict Academic Outcomes

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HONORS PROJECT

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Abstract

According to the National Center for Education Statistics (2008), only 58% of students enrolled in a four-year bachelor's degree program between 1995 and 1996 had successfully completed their degree by 2001 (Allen & Robbins, 2010). Some studies examining the frequency with which students change their major during their undergraduate education also offer insight into the potential reasons underlying the delayed graduation rates observed in Allen and Robbins' (2010) study; for instance, a study by the U.S. Department of Education (2017) found that within three years of enrollment, about 30% of students pursuing a bachelor's or associate's degree had changed their major. At first glance, these statistics documenting untimely graduation and low rates of major stability might seem mundane, or appear to be phenomena for which students alone can devise a solution; they may also seem to explain themselves to some extent, in the sense that a student's decision to change their major might be a factor in delayed graduation rates. However, research on student major selection suggests that these trends reflect certain deeper psychological constructs and external circumstances that may be related to academic outcomes among undergraduates in important ways. What follows is an original instance of scholarship that applies Holland's theory of vocational preferences (1997) to understand the relationship between major-interest fit, academic outcomes, and covariates of this relationship. Although the findings of the present study generally challenged Holland's theory (1997), these inconsistencies are parsed and their implications for future research/practitioners are discussed.

Introduction

Research has identified four broad categories of variables that are likely to influence a student's choice of major: personal, career, others, and institutional (Lee & Lee, 2006). One study by Liao and Ji (2015) was focused on assessing the relationships between major choice, academic commitment, career self-efficacy, and career readiness among a sample of Taiwanese college students. Liao and Ji (2015) found that academic commitment tended to increase when students in their sample had chosen majors based on personal and career preferences; alternative influences that can outweigh a student's own opinions about what they should major in include parenting/parental expectations (Shen, 2015) that encourage students to choose a particular major (Nerona, 2020), as well as gender-related beliefs and stereotypes or expectations set by peers. A study by Hackett (1985), for instance, found that gender-based socialization combined with extent of math preparation did influence math achievement and math-related self-efficacy; the pertinent finding from Hackett's (1985) study is that an understanding of how females/males are socialized did impact how well a student did in their major and how capable they perceived themselves to be in math.

Other studies similar to Hackett's (1985) have suggested that the influence of belief in certain stereotypes and identity expectations might extend beyond just the individual student who might adjust just their own decision about which major to pursue based on what they think is "appropriate" for someone of their identity; Dunlap and Barth (2019) for example found that men in STEM majors and women in female dominated majors expressed less strong STEM identities but strong STEM-gender stereotypes compared to women in STEM majors; further, women who were in a heterosexual relationship and majoring in a STEM subject shared more

similar levels of belief in STEM gender stereotypes compared to relationships lacking a female STEM major (Dunlap & Barth, 2019). The findings from Dunlap and Barth's (2019) study suggest that students might reinforce or challenge certain major-related/academic stereotypes, which could then influence the major another student believes is "fitting" for them. Such influence could take the form of direct statements about how "appropriate" a certain major seems for another student, or implicitly influence a student's decisions. For instance, if a student's friend group is convinced a particular identity does "best" in a certain major, a student who does not have characteristics of that preferred identity may feel unsupported in their academic pursuits and might thus feel obligated to choose a different major. In this sense, peer influence on students' choice of college major might closely resemble that of parents For students who do experience this reduced autonomy when choosing their major, either as a result of self-imposed expectations or those that come from others in the student's life (e..g parents, teachers, peers), such variables might present an obstacle to accessing certain academic outcome benefits, such as the increased academic commitment noted in Liao and Ji's (2015) study, and possibly a more timely graduation rate. Studies such as those performed by Nerona (2020) and Dunlap and Berth (2019) identify specific elements (expectations set by parents and peers, respectively) of a student's life that might influence major choice and determine which academic outcomes a student might be able to access. In doing so, these studies also powerfully challenge a misconception stated earlier in this paragraph, about how students are primarily responsible for their own graduation timing and major selection.

More accurately, students' choice of major is subject to multiple influences that are a part of their environments or relationships with others (such as parents or academic advisors); a refined understanding of these influences then becomes important for practitioners/academic

advisors to promote positive influences on students' major choice, and to ensure that students can reap academic benefits from their choice of major. According to Liao and Ji's (2015) study, such benefits may be most easily accessed by students who consider which majors serve their personal and professional interests.

However, a more nuanced understanding of the variables that relate to academic outcomes (such as performance in or persistence/commitment to a major) requires more careful examination of the intersection between industrial-organizational psychology and vocational counseling literature. The preceding sentence outlines a multidisciplinary approach to parsing the variables that correlate with the trends that Allen and Robbins (2018) observed in their data regarding low graduation rates and frequent changes in major; this is precisely the multidisciplinary lens in which the present study was set and applied when examining the research questions identified below.

In an attempt to track the relationships between these variables and students' academic outcomes in undergraduate programs, the present study centered on the following research questions: (1) how do major-interest fit and academic outcomes (such as performance and persistence) relate to each other?; (2) how are major-interest fit and students' satisfaction with their majors related?; (3) how does major satisfaction relate to performance and persistence?; (4) which, if any, variables moderate the relationship between major-interest fit and academic outcomes such as performance and persistence?; (5) how does self-efficacy relate to major-interest fit?; and (6) is there a relationship between outcome measures such as student performance and persistence in a major? The research questions appearing in the aforementioned list are justified in the subsequent literature review, which integrates findings from other studies

examining factors in a student's choice of major to predict the types of relationships that might emerge.

Literature Review

Factors in Student Major Choice

In a study that examined students' choices to major in a STEM subject, Moakler and Kim (2014) found that one important factor in whether a student selected a STEM major was their level of confidence in their math skills and related academic areas. Aside from confidence, another study by Chen (2015), which was also focused on STEM majors, found that certain personality profiles were more likely to enroll in college at STEM majors. Specifically, investigative personality characteristics were positively correlated with STEM major selection, while enterprising and artistic personalities were less likely to do so (Chen, 2015). Both of the aforementioned studies on STEM majors emphasize the role of internal perceptions and a student's characteristics in choosing a major (Chen, 2015; Moakler & Kim, 2014); however, contrary to this emphasis, a study by Trusty (2011) found that major selection might be subject to external influences such as past experience in a particular subject. According to Trusty's (2011) findings, for female students in particular, enrollment in high-school math classes was positively correlated with a later decision to major in math or science. The findings from Moaklet and Kim (2014) and Trusty's (2011) studies highlight the two main categories of influence that tend to be recognized in the literature on student major selection: personality/internal characteristics, and characteristics of the external environment. These two "types" of factors that might be related to a student's choice of major are usually wrapped into a single construct called "fit," or the extent that an individual's interests are supported by or appropriate for a particular environment in question.

Theoretical Framework: Holland's Theory of Vocational Preferences

Past studies examining this construct of "fit" have used various, slightly distinct theories to examine the construct, such as Holland's theory of vocational preferences (1997); Super's developmental self-concept theory (Cook, 2013); and Roe's personality theory (Smart, 1998). Although the literature features studies that suggest each of these theories possesses its own merits, whether that has been suggested through findings that demonstrate a theory's high applicability to select demographic groups (Smart, 2013); that a particular theory affords a unique view of career development (Cook, 2013); or that the theory relates to important, non-career domains of an individual's social environment (Brown et al., 1997), the majority of research relevant to the "fit" construct has been premised on Holland's theory of vocational preferences (1997). The present study belongs to this category of studies that have used Holland's theory of vocational preferences (1997) as a framework for studying the relationship between the degree of fit between a student's interests and their major and various academic outcomes.

Applying Holland's Theory to Students and College Environments

As a result of how frequently Holland's theory (1997) has been used, several papers are available to provide a detailed explanation of the theory; according to Holland's (1997) theory, work environments and individual interests are characterized to varying extents by six different interest "types": realistic, investigative, artistic, social, enterprising, and conventional. Taken together, the degree of an individual's interests, or the interests supported by a particular work environment, across these six categories represents their Holland type; the similarity between the individual's and environment's Holland type then becomes a measure of person-environment fit.

While the original context of Holland's (1997) theory is work environments, recent

research has implemented an academic extension of the occupational fit construct, known as

major-interest fit, to better understand the predictors of academic outcomes (such as student

satisfaction, success, and persistence). Holland's theory has been considered an appropriate

theoretical framework for studies about major-interest fit (Porter & Umbach, 2006). Further

justification for the use of Holland's theory (1997) in the present study resides in the

interdisciplinary aims of this project; although the RIASEC types used to classify work

environments in Holland's theory (1997) are qualitative and characteristic of vocational

counseling, Prediger and Vansickle (1992) outline the steps for deriving a quantitative measure

of major-interest fit using the different RIASEC types. The process of calculating this

quantitative measure of fit is described in further detail in the methods section of this paper and

reflects the general preference for continuous, quantitative measures in the psychology

discipline.

Although bound by their similar theoretical framework, research implementing Holland's

(1997) theory has conceptualized fit in different ways, with some studies focusing on a student's

extent of fit in the broader university environment (Harms et al., 2006; Schmitt et al, 2008), and

others centering on a student's major-interest fit. Given that the present study belongs to the

latter category, those studies will comprise the majority of this literature review. Tracey and

Robbins's (2006) longitudinal study, for instance, examined the relationship between major-

interest fit and success in college, measured as GPA, enrollment status, and graduation. Their

findings suggested that higher levels of fit were positively correlated with GPA and third year

retention (Tracey & Robbins, 2006). The retention-related benefits of high major-interest fit also

translate to academic outcomes such as major satisfaction and timeframe of degree completion,

as Allen and Robbins (2006) found that students with greater major-interest fit reported higher satisfaction with their majors and were more likely to complete a Bachelor's degree within the predicted four years.

Other studies examining major-interest fit have also found that these benefits regarding degree completion or major stability might also continue into the future as students enter professional careers; that is, according to a study by Xu (2016), positive career outcomes such as higher salary and job satisfaction are associated with choosing a STEM profession that is congruent with their study of a STEM major in college. Although Xu's (2016) study has a slightly distinct from the present study in that it examined the correlates of job-major fit or congruence rather than the correlates of major-interest congruence when students transition from high school to college, the study nonetheless suggests that choosing a "fitting" major represents the start of experiencing enhanced occupational/academic outcomes. Further, Xu's (2016) findings also raise the important question of whether similar correlations exist between positive academic outcomes and choosing a "congruent" major.

Indirect Influences on Major-Interest Fit and Academic Outcomes

In addition to testing direct relationships between major-interest fit and academic outcomes, some studies have also examined variables that mediate/moderate this relationship, as well as some of the correlates of fit. For example, Schmitt et al. (2008), found that academic satisfaction mediates the relationship between high levels of fit and low rates of turnover intent, GPA, and absences from class—such findings suggest that even when a student's interests demonstrate a high degree of fit with their major, satisfaction remains distinct and is not guaranteed by high fit.

A separate study Moore and Cruce (2020) conducted sheds some light on additional correlates of fit, namely degree aspirations, which the researchers found as a predictor of major stability (an academic outcome related to persistence). If the definition of degree aspirations from Moore and Cruce's (2020) study is stretched slightly to reflect the extent that a student believes his/her major will present valuable career opportunities after exiting the university, this measure might be considered similar to meaningfulness. However, it should be noted here that other studies suggest meaningfulness might be derived from sources alternative to those related to employment prospects or future opportunities associated with a major. This was suggested by Lent et al. (2011), who measured Italian students' subject matter knowledge, interest, and outcome expectations before and after being exposed to a realistic preview of field work for a particular major. Lent et al.'s (2011) findings suggested that realistic job previews were associated with moderate increases in subject matter knowledge, but minimal changes in interest and outcome expectations (other than self-efficacy); because job previews did not correlate significantly with a shift in students' outcome perceptions, the link this study forms between Moore and Cruce's (2020) findings regarding degree aspirations and meaningfulness might need to be re-evaluated for the source of major meaningfulness.

Somewhat distinct from previous studies that have examined relationships between fit and outcome variables, or variables that indirectly influence these relationships, other areas of the literature on fit have studied the relationships between outcome variables themselves. In one such study, Allen & Robbins (2008) found that first-year GPA predicts major persistence.

While the studies presented in this literature review thus far have examined relationships between variables that primarily represent the "major" aspect of major-interest fit, or the various perceptions a student may have about their major, this does not sufficiently address the

remainder of the literature on fit that has investigated how aspects of the student's "self" (e.g. the student's personality), can also influence academic outcomes in important ways. Pritchard et al's (2018) study stands as one example of such research that has tracked this relationship between personality, major-interest fit, and measures of academic success; in Pritchard et al.'s (2018) study, the specific personality measure used was the Big 5 and the outcome variable was called "enjoyment of major." The researchers' findings revealed that enjoyment of major was most strongly associated with conscientiousness and openness to experience (Pritchard et al., 2018). In interpreting Pritchard and colleagues' (2018) findings, it may be important to consider how conscientiousness and openness experience might be related to attain a more nuanced understanding of the researchers' findings and why these two traits in particular demonstrated the strongest correlations: if conscientiousness is defined as a student's awareness of their responsibilities and openness to experience is considered a reflection of how capable aa student perceives themselves to be in fulfilling those potentially challenging responsibilities, these two personality measures might be combined to suggest that self-efficacy—a student's belief in their ability to accomplish pertinent tasks—could be a correlate of major satisfaction.

A study by Etzel and Nagy (2016) further clarifies the role of self-efficacy and personality in the relationship between major-interest fit and academic outcomes. That is, in Etzel and Nagy's (2016) study, the correlation between perceived person-environment fit and academic outcomes was not significantly improved by taking into account Big 5 personality traits; in other words, a student's perception of how well they fit into their academic environment accurately predicted academic outcomes beyond a calculated measure of fit based on personality traits (Etzel and Nagy, 2016). While these findings from Etzel and Nagy's (2016) study indicated

that self-efficacy may be correlated directly with academic outcomes, Pritchard et al. (2018) suggested that self-efficacy might be correlated with major satisfaction.

The Present Study

Hypotheses

Based on the literature review above, the present study tested the following hypotheses:

- **H1**: higher degrees of major-interest fit would be positively correlated with higher rates of performance and persistence.

- **H2:** higher interest-major fit would be positively correlated with higher levels of academic satisfaction.

- **H3:** satisfaction would mediate the relationship between fit and the outcomes of performance/persistence, such that higher levels of fit are correlated with higher rates of satisfaction, which in turn predict higher performance and greater likelihood of persistence.

- **H4:** meaningfulness would moderate the relationship between interest-major fit and academic outcomes, with lower rates of meaningfulness correlating with a stronger relationship between major-interest fit and academic outcomes (performance and persistence).

- **H5:** performance would be positively related to persistence.

- **H6:** self-efficacy would be positively correlated with fit.

The hypotheses developed listed in this section (and justified based on findings from the literature review) are also mapped visually in Figure 1 (below).
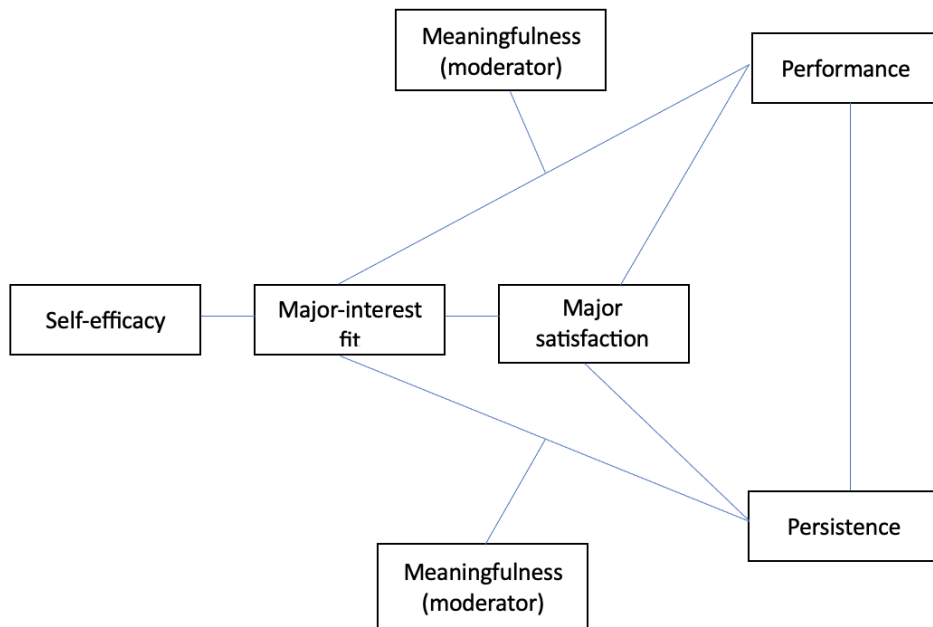
Participants

The hypotheses above were tested using data obtained through self-report methods. Participants (N = 214) were undergraduate students at Bowling Green State University who were (1) between the ages of 18 and 25; (2) not double-majors; (3) at least sophomores; and (4) full-time students. Participants were recruited through SONA (an online tool for finding students to participate in research), different courses (although students were recruited from various classes, psychology majors were overrepresented in the sample), and Campus Update emails. Justification for excluding double-major students included the possibility that these students may be different from single major students in terms of characteristics that could introduce a confound into the results; for example, double-major students may have importantly different interest profiles that map onto several hexagonal locations from Holland's typology, or might be

abnormally high in desire to achieve and motivation. The main reason freshmen were considered

ineligible to participate in the study was that one year of experience in a major might reflect low

levels of meaningfulness or other variables that may increase through exposure to coursework;

further, the high novelty of college student status may lead some freshmen to assign inflated

importance to their coursework or perceptions of their major. IRB approval was secured prior to

beginning the recruitment process, requiring submission of (1) an IRB application form; (2) the

study consent form; (3) the survey packet (included in Appendix 1); (4) all recruitment scripts;

(5) and the form used to award students compensation in the form of extra credit for a course or

Amazon e-gift card. The first 100 participants were provided with a guaranteed $5 Amazon gift

card as an incentive for participation, provided that they passed two attention checks

implemented in the study. Failure to respond correctly to the attention checks not only

disqualified participants from receiving compensation, but also was criteria for eliminating their

data from the sample.

Procedure

Eligible students were asked to respond to an online survey including questions about

demographics, academic status, individual interests (UNIACT Interest Inventory), self-efficacy

(General Self Efficacy scale), major satisfaction (Job in General Scale), and major

meaningfulness (Work and Meaning Inventory). Important scales from the academic status

section include those used to measure the two academic outcome variables in this study:

performance and persistence. Performance was measured through overall and major GPA (both

on a scale of 0.00 to 4.00). Persistence was measured through a question that asked students how

likely they were to graduate with their current major on a scale of 1 (very unlikely) to 4 (very

likely). The survey questions were structured to progress from demographics, to some of the

more "central" measures in the study; among these central measures, those more critical to

calculating fit were presented before other variables to minimize the chances of incomplete

survey responses and unusable data.

Measures

Along with the scales listed in the preceding section, a measure of major-interest fit was

derived by first calculating the hexagon location of each participant's interests and different

majors represented in the study. For individual participants, hexagon location was calculated

through a two step process: (1) converting participants' UNIACT scores to Data-Ideas/Things-

People scores; (2) using Data-Ideas/Things-People scores to calculate the hexagon location (in

degrees) of participants' interest profiles. This process was outlined by Prediger and Vansickle

(1992), who identified hexagon location as a more robust measure of fit compared to Holland's

interest profiles. According to Preidger and Vansickle (1992), measuring where an individual or

major can be placed in the hexagonal structure of Holland's RIASEC categories is a continuous

measure that allows for more nuanced distinctions between individuals with similar interest

profiles. Whereas subtle differences between two individuals' degrees of interest in a particular

interest type might yield identical letter profiles, hexagon location would more accurately reflect

these subtle differences (Prediger & Vansickle, 1992).

While the same two processes were used to calculate the hexagon location of major

profiles, the data for these profiles was not derived from the sample of the present study. The raw

data for major profiles was borrowed from Prediger and Vansickle's (1992) study, which

provided the RIASEC values for 51 occupational groups. The sample Prediger and Vansickle

(1992) used to calculate the RIASEC values for these occupational groups consisted of college

alumni who had completed a four year degree and were working in one of the occupational groups profiled in the study.

The primary reason for basing major profiles on the data from Prediger and Vansickle's (1992) study is the need for independent data sets when assessing correlations between variables (i.e. if major profiles were calculated based on the UNIACT interest scores of participants in the present study, major-interest fit rates may appear especially high because the benchmark for major interests is the information provided by students in the sample). Additionally, using the interests of those who are working in a particular field as representations for the interests typical of a certain major might allow for more accurate major profiles than would the interests of current college students who may feel uncertain about their likelihood of continuing in their current major. After calculating the hexagon locations of student interests and the occupational groups they belong to (i.e. "major profiles"), a final estimate of fit was obtained by calculating the difference between the hexagon location of participants' individual interest profiles and major profiles. The value of this difference is a measure of the hexagonal congruence index, which was reverse coded in the present study to range on a scale of 0º (low fit) to 180º (high fit). The process for calculating fit and scoring participant responses on other measures in the study was executed on SPSS Statistics. This statistical software was also used to perform correlational, moderation, and mediation analyses to test the hypotheses in this study.

Analysis Plan

H1, H2, H5, and H6 were tested using correlational methods. H3 was tested using a mediation analysis (linear regression method) and H4 was tested using a moderation analysis. All analyses with the exception of the moderation and mediation analysis were performed using SPSS software and built in features. H3 (which predicted that satisfaction would mediate the

relationship between academic fit and outcomes) and H4 (which predicted meaningfulness would moderate the relationship between academic fit and outcomes) were tested using the SPSS PROCESS Macro (Hayes, 2022). Information about this SPSS analytical package is included in the references section.

Results

Key variables in this study included self-efficacy ($M = 31.41$, $SD = 4.18$), major satisfaction ($M = 43.06$, $SD = 10.22$), major meaningfulness (42.10, $SD = 7.15$), overall GPA ($M = 3.51$, $SD = 0.48$), major GPA ($M = 3.55$, $SD = 0.53$), and persistence ($M = 3.72$, $SD = 0.51$), and major-interest fit ($M = 127.46$, $SD = 40.29$). Correlational analyses were used to test the hypotheses justified in the literature review. The correlations between major-interest fit and outcome variables (performance and persistence) were not statistically significant, rejecting **H1**.

Additionally, the correlation between major-interest fit and satisfaction was not statistically significant; as a result, **H2** was not supported. A mediation analysis regressing performance onto academic satisfaction failed to support **H3**; while H3 predicted that academic satisfaction would mediate the relationship between major-interest fit and academic outcomes, the analysis revealed that aside from significant correlations between major satisfaction and outcome variables, a mediation effect was not present in the tested models. An analysis testing meaningfulness as a moderator of the relationship between fit and performance/persistence indicated statistically significant models when persistence or major GPA were the outcome variables ($p < .01$).

To further analyze meaningfulness as a moderator of the relationship between fit and major GPA and major GPA/persistence, the two moderation models were plotted. The plot of fit by major GPA with meaningfulness as a moderator (see Figure 2) indicated that at lower levels of fit, meaningfulness had a greater impact on major GPA. Additionally, the relationship

between fit and major GPA was strongest (the data forms the steepest line) at low levels of meaningfulness. Plotting fit by persistence with meaningfulness as a moderator (see Figure 3) indicated that meaningfulness influenced the relationship between fit and persistence most strongly when fit was low.

A second observation that could be drawn from the plot (see Figure 3) is that at higher levels of fit, persistence scores are more similar across different levels of meaningfulness—in other words, the moderating effect of meaningfulness is strongest when fit is low. Alternatively, at high levels of meaningfulness, the relationship between fit and persistence nearly assumes the shape of a horizontal line. Taken together, the plotted data supported **H4**, as they were consistent with the prediction that at high levels of meaningfulness, the relationship between fit and outcomes (performance and persistence) will be weaker. The prediction outlined in H4 was suggested especially clearly by a comparison between the following: the nearly horizontal relationship between fit and major GPA/persistence at high levels of meaningfulness, and the relatively stronger relationship between fit and the aforementioned outcome variables at low levels of meaningfulness.

Figure 2
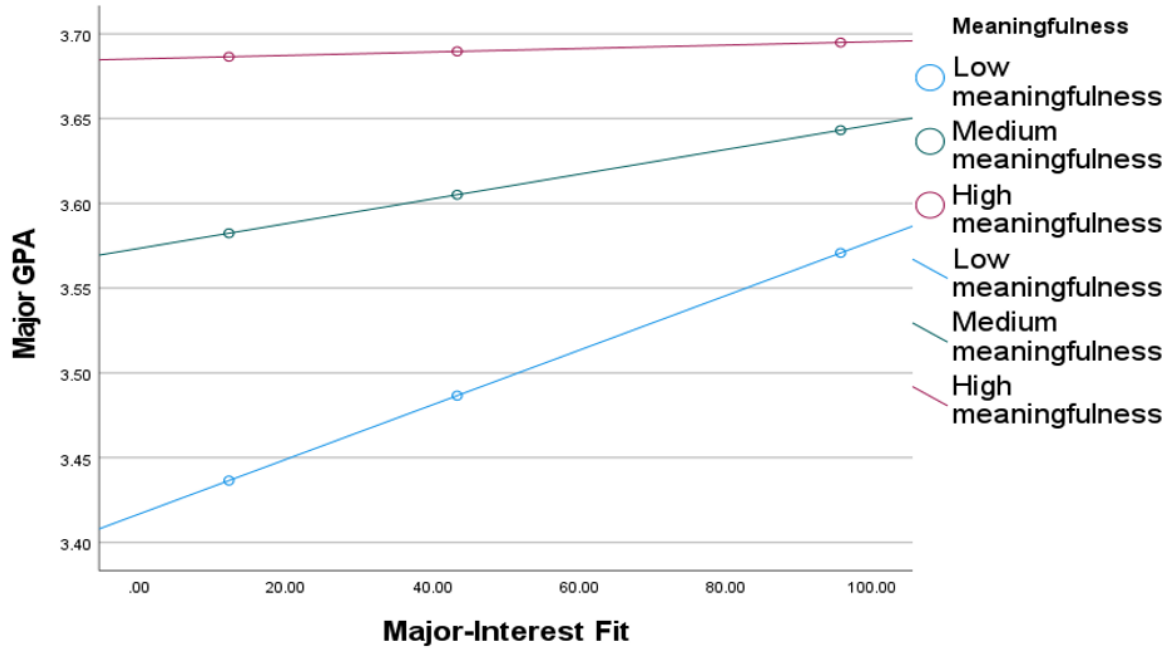
Figure 3
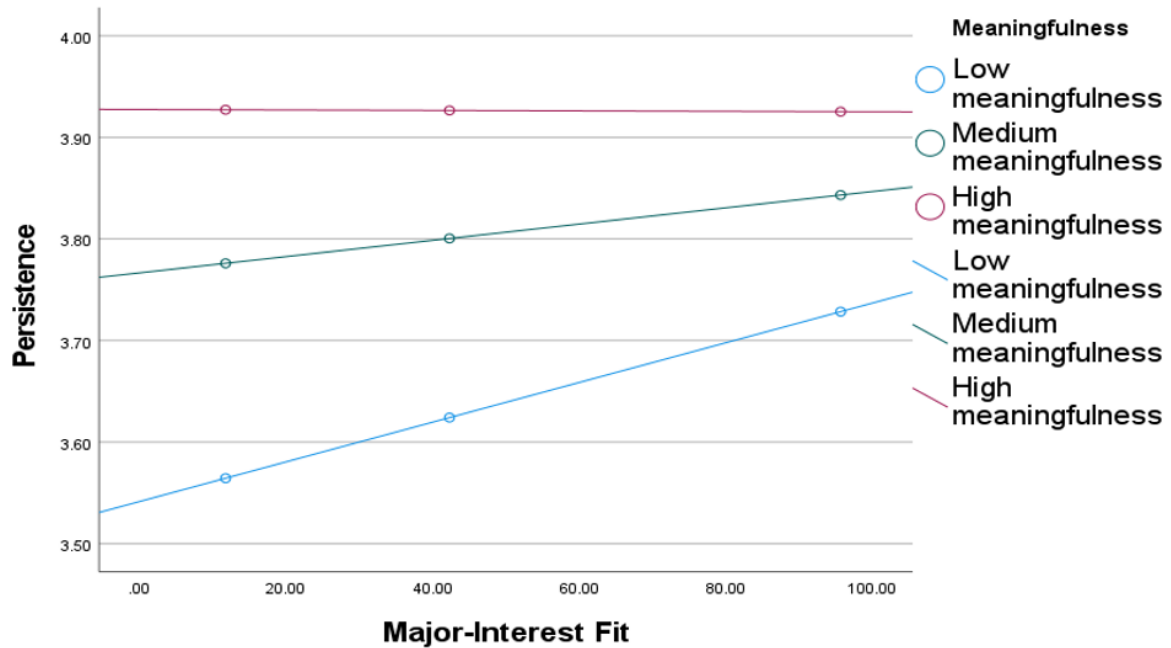
A correlation between the two measures of performance and persistence yielded similar

results across both measures of performance: major GPA was significantly, positively correlated

with persistence ($r = 0.35$, $p < .01$), and overall GPA was also significantly, positively correlated

with persistence ($r = 0.25$, $p < .01$). These correlations supported **H5.** A correlation analysis

failed to support **H6**, as major-interest fit did not correlate significantly with any variables in the

study.

Variable	n	*M*	*SD*	1	2	3	4	5	6	7
1. Major-interest fit	225	127.46	40.29	-						
2. Performance (overall GPA)	256	3.51	0.48	-0.06	-					
3. Performance (major GPA)	255	3.55	0.53	-0.08	0.75**	-				
4. Persistence	254	3.72	0.51	-0.09	0.25**	0.35**	-			
5. Major meaningfulness	245	14.03	7.15	0.05	0.14*	0.20**	0.37**	-		
6. Major satisfaction	249	1.72	10.22	0.10	0.17**	0.24**	0.35**	0.60**	-	
7. Self-efficacy	248	3.14	4.18	-0.01	0.11	0.11	0.43**	0.41**		-

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

Discussion

Considering the frequency with which Holland's theory (1997) has been used as a

theoretical framework for past studies examining major-interest fit and its correlates (Pike,

2006), the finding that fit was not significantly correlated with any other variables in the study was unexpected and inconsistent with theory; therefore, this result will be considered first in this discussion. One possible (but unlikely) explanation for the discrepancy between the findings of the present study and what is predicted by theory speaks to the potential limitations of the fit construct itself; that is, due to the several professional or academic directions that a single major offers students, each student may perceive their major differently. For example, while one student majoring in psychology might see their studies as a stepping stone to later working as a practitioner, another student might consider majoring in psychology as a research-oriented subject that can provide similar employment opportunities in the future; in these cases, the extent that a student "matches" with the way their major is defined according to a general interest inventory might not provide the most accurate measure of fit that compares their interests to a specific path within a college major.

Another finding that merits analysis is that of meaningfulness; according to the test where meaningfulness was analyzed as a moderator of the relationship between fit and academic outcomes. The findings of this analysis supported the hypothesis that meaningfulness would moderate the relationship between fit and academic outcomes, such that low meaningfulness would be associated with a stronger relationship between fit and performance/persistence. Although this finding generally comports with that of Moore and Cruce's (2020) study, this finding is nonetheless important to dissect for its potential practical implications; one reason why fit might be more strongly correlated with academic outcomes at low levels of meaningfulness is that in such cases, a decent degree of fit between the student and their major's interests would be an important factor in the student's ability to perform and persist in the given major. By contrast, for students who find their major highly meaningful, the degree of "major-interest fit" they

possess might be less related to the types of academic outcomes/benefits they are able to glean from their elected major; in this case, meaningfulness alone might be most strongly associated with positive academic outcomes.

An alternative explanation of how meaningfulness might moderate the relationship between major-interest fit and academic outcomes would be if students experience an inherent meaningfulness in their role as a student, beyond any meaningfulness that might arise out of a particular major. If this is how meaningfulness is conceptualized by students and underlies how they perceive their academic work, then that meaningfulness would be separate from the level of major-interest fit between themselves and their coursework, thereby leading to a reduced correlation between fit and academic outcomes. Returning to Lent et al.'s (2011) previously discussed study, about how realistic job previews did not correlate strongly with changes in students' perceptions of their majors (apart from students' subject matter knowledge), this finding offers support for the explanation in this paragraph, namely the part of the explanation that re-defines meaningfulness as a reflection of value for the student role (rather than a particular major). Additional aspects of the data from this study that indicate meaningfulness might reflect the student role more than value for a particular major include the relatively high average score of meaningfulness in the sample. That is, while the maximum meaningfulness score on the Work and Meaning Inventory is 50, the mean score of meaningfulness in the sample was 42.10. This high mean might reflect a common source of meaningfulness across all majors, which could simply be student status.

The regression testing major satisfaction as a mediator of the relationship between major-interest fit and performance also yielded non-significant results; however, the correlation

between major satisfaction and performance was statistically significant. These results further suggest the potentially limited influence of major-interest fit

The finding that performance and persistence correlated strongly with each other is also informative and warrants further exploration. Future research might investigate this correlation further to determine the directionality of this relationship, due to its particularly unclear nature—that is, it is perhaps equally plausible that seeing higher rates of performance would cause students to feel more committed to their majors, or that commitment to a major would cause students to make a greater effort in their coursework and cause higher grades. If experimental studies are designed to clarify the relationship between the different academic outcome measures featured in this study, practitioners might have more data to use in determining whether one variable reliably causes the other and if any causal relationship between performance and persistence is direct/mediated by another variable.

Limitations and Implications

Prior to considering the implications of this study and the directions it may provide for future research, it is perhaps important to consider key limitations of the study, many of which arise from the finding that major-interest fit did not correlate significantly with any other variables in the study. This failure to detect a significant relationship between major-interest fit and other variables is inconsistent with Holland's (1997) theory—which was central to this study—and might reflect certain methodological shortcomings. More specifically, an error may have occurred during the three-step process of converting qualitative scores on the UNIACT Interest Inventory to scores on the Data/Ideas-People/Things measure, which was followed by another calculation of how students' and major interest profiles relate to each other according to the Hexagonal Congruence Index. Compared to other variables in the study that had a more

direct scoring process, calculating a composite measure of fit was far more challenging and complex, which subjects the measure to the possibility of miscalculations that may have disrupted results and in turn produced the findings that were in consistent with Holland's theory (1997). In the case that the process of calculating fit in the present study was too complicated, future research might focus specifically on the question of how to best measure fit—such research would seek to develop a measure of fit that is amenable to replication and relates more intuitively with variables that are associated with fit in the literature. Another measure-related issue that might have influenced the results is a lack of analyses testing the extent of overlap between different measures in the study; given the strong, significant correlations observed among different variables in the study with the exception of fit, there is perhaps a possibility that constructs appearing to be similar (such as major satisfaction or major meaningfulness) might have required testing to confirm that they are, indeed, separate variables that capture different components of a student's experience in college.

Another methodological limitation that should be considered is the actual data that was used to calculate major-interest fit; the raw data used to develop "major-interest profiles" that could be compared with those of students (based on survey responses) was collected by Prediger and Vansickle (1992) from a sample of college alumni who had completed a four year degree and were already working in the occupational group for which their data was being used to construct an interest profile. As Prediger and Vansckle's (1992) sample differs from that of the present study on the important account of student status (i.e. in college versus graduated), the interest profiles of individuals from their study might be altered through continued work in a particular field; more specifically, the interests of individuals from Prediger and Vansickle's (1992) study might be different from what they were when the sample was in college, and

through experience might have grown more similar to what is typically expected of someone in a particular field. This would present a fundamental issue with this study's method of measuring major-interest fit and might also contribute to the results that are disparate from what is predicted by Holland's (1997) theory.

Related to the question of how differences between the sample of the present study and that which was used in Prediger and Vansickle's (1992) study, discrepancies between Holland's theory (1997) and the findings from this study might be a product of important differences between students today and students who were sampled for research closer to the time these theories were first established. With greater access to online resources and opportunities to develop skills that may not come as "naturally," students may find it easier to select areas of study that do not correspond with what their personalities might predict, decreasing the extent that major-interest fit can influence major selection and academic outcomes.

Aside from sampling techniques, another methodological limitation of this study that should be noted is its correlational design. While correlations cannot clarify the directionality of relationships among variables in the study, particularly those between predictor variables, one past study by Balsamo et al. (2013) advanced the claim that certain work values might precede students' choices about a particular academic career. In this study, Balsamo et al. (2013) administered a questionnaire that assessed students' intentions to enroll in various college majors as well as the Work Importance Study (WIS; Supper & Nevill, 1989), which measured the types of goals that motivate people to work/they consider important to the purpose of their work. The researchers' findings revealed that "challenge" (i.e. the extent of risk, authority, variety, creativity, prestige, and physical activity in a job) and "self-orientation" (i.e. the extent that ability utilization, altruism, personal development, discipline, achievement, and creativity are

relevant in a job) represented pre-existing group differences that influenced the academic career choices that high school seniors made as they enrolled in a university program. Although the causal claims from Balsamo et al.'s (2013) study might be afforded by certain design decisions that do not apply to the present study, Balsamo et al.'s (2013) findings nonetheless offer some insight into the potential directionality of relationships between variables examined in this study.

In considering the implications of this study, the finding that meaningfulness was a significant moderator of the relationship between major-interest fit and academic outcomes may present important implications for practitioners. Specifically, academic counselors and other practitioners who guide students through their academic careers may use measures of meaningfulness as a tool to direct students towards majors in which they are likely to succeed. The importance of meaningfulness among a student population may arise from the greater optimism students have about their academic careers compared to adults in a particular profession. Additionally, the overlap between major coursework and a university student's more general role as a student may be great enough that if students associate high meaningfulness to their role as a student, the meaningfulness of their "student role" may also contribute to success. To build on the findings from this study and supply data for further refining academic counseling services provided to students, future studies may further explore how the moderating influence of meaningfulness changes as students progress through their undergraduate degrees. Future research might also examine how demographic variables—sex, gender, and socioeconomic status in particular, influence the relationship between fit and outcome variables.

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Appendix 1.

Interest-Major Fit and Academic Outcomes

IC   STATEMENT OF INFORMED CONSENT

TITLE: INFORMED CONSENT FOR Interest-Major Fit and Satisfaction: Extending Theories of Occupational Fit to Predict Academic Outcomes

KEY INFORMATION: You are invited to participate in a study about how individual interests might impact students' satisfaction with their major and other academic outcomes. This study is for undergraduate students who (1) are 18-25 years old, (2) are at least sophomores, (3) are full time students, and (4) are not double majors. Participation in this study will require approximately 10-15 minutes. Your responses will be kept confidential. Starting February 2, 2022, the first 100 participants to complete the entire survey and pass two attention checks will receive a $5 Amazon gift card. Failing to pass the two attention checks or complete the entire survey will disqualify you from receiving your incentive.

INTRODUCTION OF THE RESEARCHER: My name is Sneha Kamath. I am an undergraduate student in the Honors College at Bowling Green State University. I am researching how similarities and differences between a student's interests and the interest profile of their major might predict academic outcomes. This project is being advised by Dr. Dara Musher-Eizenman, an experienced psychology faculty member. To participate in this study, you must be an undergraduate student between the ages of 18 and 25; at least a sophomore; a full-time student; and not a double-major.

PURPOSE: This is a study about how a student's interests might impact academic outcomes (such as college major satisfaction and academic performance). There are no direct benefits to you for your participation. However, this research may help practitioners improve academic advising programs so that such programs may better estimate student interests and support student success. The first 100 participants to complete the entire survey and pass two attention checks will be awarded a $5 Amazon gift card. You cannot receive more than one gift card. Those eligible to receive a gift card will be asked to enter their name and email address in a survey that they will be redirected to immediately after completing the study survey.

PROCEDURE: This is an online study that will ask you questions about your academic status, different aspects of your experience with your major, and demographics. Participation in this study will require approximately 10-15 minutes. After completing the survey, you will automatically be redirected to a form where you can enter your information to receive a gift card.

To receive the gift card, you will need to enter your name and your email address in a survey that you will be redirected to immediately after completing the study survey.

VOLUNTARY NATURE: Your participation is completely voluntary. You are free to withdraw at any time. You may decide to skip questions or discontinue participation at any time without explanation or penalty. Your decision about whether to participate will not affect your relationship with Bowling Green State University.

CONFIDENTIALITY/ANONYMITY PROTECTION: All of your data will be kept confidential. Data will be stored on password protected computers belonging to the researcher and the project advisor; that the data will be stored on personal laptops as opposed to computers on campus does not increase your risks of participating in this study. No one other than the researcher and project advisor will have access to the data. Data will be kept for three years. The identifying information you provide in the incentive forms will be kept separately from your responses to the survey. Additionally, the identifying information you provide will be destroyed as soon as you have been contacted with your gift card. Information in the final report will be group level results; in the final report, the information you provide will never be presented in an individually identifiable manner. Please be informed that some employers may use tracking software, so you may take the following steps to protect the confidentiality of your responses: (1) complete the survey on a personal device, and (2) clear your browser cache and page history after completing the survey.

RISKS: The risk of participation is no greater than that expected in daily life. If you have questions about your major or need academic counseling, you may consider scheduling an appointment with your academic advisor, whose contact information can be found in the Student Center page of your MyBGSU account.

CONTACT INFORMATION: If you have questions about this study, you may contact Sneha Kamath at snehak@bgsu.edu or 419-392-6330, or Dr. Dara Musher-Eizenman at mushere@bgsu.edu or 419-372-294. You may also contact the Chair of the Bowling Green State University Institutional Review Board, at 419-372-7716 or irb@bgsu.edu, if you have any questions about your rights as a participant in this research.

Thank you for your time,
Sneha Kamath and Dara Musher-Eizenman, Ph.D.

Q44 Please select one of the following:

○ I have been informed of the purposes, procedures, risks, and benefits of this study. I

have had the opportunity to have all my questions answered and I have been informed that my participation is completely voluntary. I agree to participate in this research. (1)

○ I do not consent to participate in this study. (2)

End of Block: Statement of Informed Consent

Start of Block: Academic Status

AS The following questions will ask you about your current academic status.

AS1 What year student are you?

○ Second year (sophomore) (1)

○ Third year (junior) (2)

○ Fourth year (senior) (3)

○ Fifth year or more (4)

○ Other (please describe) (5)

_____

AS2 What is your major?

_____

Q34 How satisfied are you with your overall academic performance in college so far?

○ Very dissatisfied (1)

○ Dissatisfied (2)

○ Neither satisfied nor dissatisfied (3)

○ Satisfied (4)

○ Very satisfied (5)

Q35 How satisfied are you with your academic performance in classes related specifically to your major?

○ Very dissatisfied (1)

○ Dissatisfied (2)

○ Neither satisfied nor dissatisfied (3)

○ Satisfied (4)

○ Very satisfied (5)

Q36 How likely are you to graduate with your current major?

○ Very unlikely (1)

○ Unlikely (2)

○ Likely (3)

○ Very likely (4)

Q32 What is your overall GPA on a 4.0 scale?

	0	1	1	2	2	3	3	4
Overall GPA ()								

Q33 What is your major GPA on a 4.0 scale?

	0	1	1	2	2	3	3	4
Major GPA ()								

P1 Have you ever changed your major?

○ Yes (1)

○ No (2)

Q25 Not including your current major, how many other majors have you had in the past?

○ 1 major (1)

○ 2 majors (2)

○ 3 majors (3)

○ 4 majors (4)

○ 5 majors (5)

○ More than 5 majors (7)

Display This Question:

If Have you ever changed your major? = Yes

And Not including your current major, how many other majors have you had in the past? = 1 major

---

P2 Please list your previous major

○ Major #1 (4) _____

Display This Question:

If Have you ever changed your major? = Yes

And Not including your current major, how many other majors have you had in the past? = 2 majors

---

Q26 Please list your previous majors from oldest to most recent. Major #1 should be the oldest of all your majors. Do not list your current major.

○ Major #1 (2) _____

○ Major #2 (4) _____

Q27 Please list your previous majors from oldest to most recent. Major #1 should be the oldest of all your majors. Do not list your current major.

○ Major #1 (1) _____

○ Major #2 (2) _____

○ Major #3 (3) _____

Q28 Please list your previous majors from oldest to most recent. Major #1 should be the oldest of all your majors. Do not list your current major.

○ Major #1 (1) _____

○ Major #2 (2) _____

○ Major #3 (3) _____

○ Major #4 (4) _____

Q29 Please list your previous majors from oldest to most recent. Major #1 should be the oldest of all your majors. Do not list your current major.

○ Major #1 (1) _____

○ Major #2 (2) _____

○ Major #3 (3) _____

○ Major #4 (4) _____

○ Major #5 (5) _____

Q30 Please list your previous majors from oldest to most recent. Major #1 should be the oldest of all your majors. Do not list your current major.

○ Major #1 (1) _____

○ Major #2 (2) _____

○ Major #3 (3) _____

○ Major #4 (4) _____

○ Major #5 (5) _____

○ Major #6 (6) _____

○ Major #7 (7) _____

○ Major #8 (8) _____

○ Major #9 (9) _____

○ Major #10 (10) _____

AS4 Are you a transfer student? (i.e. Did you ever transfer to Bowling Green State University from another institution?)

○ Yes (1)

○ No (2)

End of Block: Academic Status

Start of Block: Job in General (JIG)

Q8 Think of the coursework required for your major. All in all, what is it like most of the time? For each word, select "Yes" if it describes coursework for your major, "No" if it does not describe coursework for your major, and "?" if you cannot decide.

	Yes (1)	? (2)	No (3)

Pleasant (1)   ○   ○   ○

Bad (2)   ○   ○   ○

Great (3)   ○   ○   ○

Waste of time (4)   ○   ○   ○

Good (5)   ○   ○   ○

Undesirable (6)   ○   ○   ○

Worthwhile (7)   ○   ○   ○

Worse than most (8)   ○   ○   ○

Acceptable (9)   ○   ○   ○

Superior (10)   ○   ○   ○

Better than most (11) ○   ○   ○

Disagreeable (12)   ○   ○   ○

Makes me content (13)	○	○	○
Inadequate (14)	○	○	○
Excellent (15)	○	○	○
Rotten (16)	○	○	○
Enjoyable (17)	○	○	○
Poor (18)	○	○	○

Q9 The following items ask about how you see the role of your major in your own life. Please honestly indicate how true each statement is for you and your major.

	Absolutely untrue (1)	Mostly untrue (2)	Neither true nor untrue (3)	Mostly true (4)	Absolutely true (5)
I have found a meaningful major (1)	○	○	○	○	○

I view the work for my major as contributing to my personal growth (2)	○	○	○	○	○
The work for my major really makes no difference in the world (3)	○	○	○	○	○
I understand how the work for my major contributes to my life's meaning (6)	○	○	○	○	○
I have a good sense of what makes the work for my major meaningful (7)	○	○	○	○	○
I know the work for my major makes a positive difference in the world (8)	○	○	○	○	○
The work for my major helps me better understand myself (9)	○	○	○	○	○

I have discovered a major that requires work with a satisfying purpose (10)	○	○	○	○	○
The work I do for my major helps me make sense of the world around me (11)	○	○	○	○	○
The work I do for my major serves a greater purpose (12)	○	○	○	○	○

End of Block: Work and Meaning Inventory (WAMI)

Start of Block: General Self Efficacy Scale (GSE)

Q10 Please rate your level of agreement with the following statements on a scale from "Not at all true" to "Exactly true."

	Not at all true (1)	Hardly true (2)	Moderately true (3)	Exactly true (4)
I can always manage to solve difficult problems if I try hard enough (1)	○	○	○	○

If someone opposes me, I can find the means and ways to get what I want (2)	○	○	○	○
It is easy for me to stick to my aims and accomplish my goals (3)	○	○	○	○
I am confident that I could deal efficiently with unexpected events (4)	○	○	○	○
I know how to handle unforeseen situations (5)	○	○	○	○
I can solve most problems if I invest the necessary effort (6)	○	○	○	○
I can remain calm when facing difficulties because I can rely on my coping abilities (7)	○	○	○	○
When I am confronted with a problem, I can usually find several solutions (8)	○	○	○	○

If I am in trouble, I can usually think of a solution (9)	○	○	○	○
I can usually handle what comes my way (10)	○	○	○	○

Q14 The things you like to do now can give you clues about jobs you might like in the future. Show how much you would like doing each of the activities listed below. Mark an answer to an activity even if you are uncertain how you feel about it. Consider whether you would like or dislike the activity, not your ability to do it.

	Dislike (1)	Indifferent (2)	Like (3)
1. Use a microscope or other lab equipment (1)	○	○	○
2. Prepare drawings to illustrate a magazine story (4)	○	○	○
3. Help a newcomer meet people (5)	○	○	○
4. Conduct a meeting (6)	○	○	○
5. Calculate the interest on a loan (7)	○	○	○

6. Inspect products for defects (8)	○	○	○
7. Read books or magazines about new scientific findings (9)	○	○	○
8. Write short stories (11)	○	○	○
9. Find out how others believe a problem can be solved (12)	○	○	○
10. Manage a small business (14)	○	○	○
11. Set up a bookkeeping system (15)	○	○	○
12. Assemble a cabinet from written instructions (16)	○	○	○
13. Measure chemicals in a test tube (17)	○	○	○
14. Read about the writing style of modern authors (18)	○	○	○
15. Help someone make an important decision (19)	○	○	○
16. Present information before a group (20)	○	○	○

17. Find errors in a financial account (21)   ○   ○   ○

18. Pack things into boxes (22)   ○   ○   ○

19. Read about a new surgical procedure (23)   ○   ○   ○

20. Design an ad for an event (24)   ○   ○   ○

21. Take part in a small group discussion (25)   ○   ○   ○

22. Interview workers about company complaints (26)   ○   ○   ○

23. Figure shipping costs for catalog orders (27)   ○   ○   ○

24. Build a picture frame (28)   ○   ○   ○

25. Attend the lecture of a well-known scientist (29)   ○   ○   ○

26. Compose or arrange music (30)   ○   ○   ○

27. Help friends with their problems (31)   ○   ○   ○

28. Develop new rules or policies (32)   ○   ○   ○

29. Take inventory in a store (33)   ○   ○   ○

30. Engrave lettering or designs on a plaque (34)   ○   ○   ○

31. Read about the earth, sun, and stars (35)   ○   ○   ○

32. Write a movie script (36)   ○   ○   ○

33. Teach people a new hobby (37)   ○   ○   ○

34. Hire a person for a job (38)   ○   ○   ○

35. Make charts or graphs (39)   ○   ○   ○

36. Shelve books in a library (40)   ○   ○   ○

37. Study the effects of vitamins on animals (41)   ○   ○   ○

38. Play jazz in a combo (42)   ○   ○   ○

39. Help rescue someone in danger (43)   ○   ○   ○

40. Plan work for other people (44)   ○   ○   ○

41. Keep expense account records (45) ○ ○ ○

42. Build furniture (46) ○ ○ ○

43. Learn how birds migrate (47) ○ ○ ○

44. Write reviews of Broadway plays (48) ○ ○ ○

45. Give directions to visitors (49) ○ ○ ○

46. Conduct business by phone (50) ○ ○ ○

47. Operate office machines (51) ○ ○ ○

48. Cut and polish gemstones (52) ○ ○ ○

49. Explore a science museum (53) ○ ○ ○

50. Make creative photographs (54) ○ ○ ○

51. Help settle an argument between friends (55) ○ ○ ○

52. Explain legal rights to people (56) ○ ○ ○

53. Plan a monthly budget (57)	○	○	○
54. Design a bird feeder (58)	○	○	○
55. Study plant diseases (59)	○	○	○
Please select "dislike" (77)	○	○	○
56. Play in a band (60)	○	○	○
57. Work on a community improvement project (61)	○	○	○
58. Discuss a misleading ad with a salesperson (62)	○	○	○
59. Sort, count, and store supplies (63)	○	○	○
60. Trim hedges and shrubs (64)	○	○	○
61. Observe and classify butterflies (65)	○	○	○
62. Entertain others by telling jokes or stories (66)	○	○	○
63. Help people during emergencies (67)	○	○	○

64. Look for errors in the draft of a report (68)	○	○	○
65. Prepare a budget (69)	○	○	○
66. Help repair a television (70)	○	○	○
67. Learn how the brain works (71)	○	○	○
68. Sketch and draw pictures (72)	○	○	○
69. Give a tour of an exhibit (73)	○	○	○
70. Demonstrate a new product (74)	○	○	○
71. Handle money transactions (75)	○	○	○
72. Operate a lawn mower (76)	○	○	○

End of Block: UNIACT Interest Inventory

Start of Block: Demographics

Q31 What is your age?

_____

Q15 How would you best describe yourself?

○ American Indian or Alaska Native (1)

○ Asian (2)

○ Black or African American (3)

○ White (4)

○ Native Hawaiian or Other Pacific Islander (5)

○ Other (please describe) (6)

_____

Q19 Gender: how do you identify?

○ Male (1)

○ Non-binary (2)

○ Female (3)

○ Prefer to self-describe (please describe below) (4)

_____

Q24 What is your major?

_____

Q16 Are you a first-generation college student?

○ Yes (1)

○ No (2)

Q18 What is the highest level of education completed by one of your parents or guardians? If your parents/guardians have received different degrees, please indicate the highest degree.

○ Less than high school degree (1)

○ High school degree or equivalent (GED) (2)

○ Some college but no degree (3)

○ Trade/technical/vocational training (5)

○ Associate degree (4)

○ Bachelor's degree (6)

○ Master's degree (7)

○ Professional degree (8)

○ Doctorate (9)

Q17 What was your annual household income while growing up?

○ Less than $20,000 (1)

○ $20,000-$34,999 (2)

○ $35,000-$49,999 (3)

○ $50,000-$74,999 (4)

○ $75,000-$99,999 (5)

○ $100,000 or more (6)

○ I'm not sure (7)

Q23 While growing up, what social class did your family belong to?

○ Poor (1)

○ Working class (2)

○ Lower middle class (3)

○ Upper middle class (4)

○ Upper class (5)

○ I'm not sure (6)

End of Block: Demographics