

# University Majors and Personality Traits: A Quantitative Study of Natural Sciences and Language Majors

Mohammad Alqatawna<sup>1\*</sup>, Abdallah Abu Qub'a<sup>1</sup> & Ahmad S Haider<sup>2</sup>

<sup>1</sup>Preparatory Year Deanship, King Faisal University, Al-Ahsa, Saudi Arabia

<sup>2</sup>Department of English Language and Translation, Applied Science Private University, Amman, Jordan

\*Correspondence: Preparatory Year Deanship, King Faisal University, Al-Ahsa, Saudi Arabia. E-mail: malqatawna@kfu.edu.sa

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## Abstract

This study aims to investigate the relationship between university majors and personality traits, with a specific focus on the effects of studying natural sciences mainly, chemistry, biology, and physics and humanities majoring in English and Arabic languages on personality development. The study employs a quantitative research design, using self-report questionnaires and interviews to collect data from undergraduate students majoring in natural sciences and languages. The results of the study show that natural science learners tend to score higher on analytical thinking, attention to details, and persistence skills, while language learners tend to score higher on social awareness, critical consciousness, and communicative competence. These findings suggest that university majors have a significant impact on personality traits, which also have implications for academic and career success. The theoretical framework for this study draws on the literature on cognitive and social aspects of natural sciences and languages education, as well as the theory of Big Five personality traits. The study contributes to the theoretical and practical knowledge of how academic disciplines influence individual differences in personal characteristics and provides empirical evidence for the relationship between university majors and personality traits.

**Keywords:** natural sciences, humanities, university majors, personality traits

## 1. Introduction

University majors refer to the specialized fields of study that students choose to pursue during their undergraduate education. They are also known as academic disciplines or areas of concentration. The selection of a major allows students to focus their studies on a specific subject or field, gaining in-depth knowledge and expertise in that particular area.

Choosing a major is an important decision as it often shapes a student's academic and career path. It provides students with the opportunity to explore their interests, develop critical thinking skills, and gain a deeper understanding of their chosen subject. Majors typically consist of a series of required core courses and elective courses that allow students to tailor their education to their specific interests within the field.

In addition to the academic knowledge and skills acquired through their major, students often develop transferable skills such as problem-solving, communication, research, and analytical thinking. These skills are valuable in various professional settings and can open doors to a wide range of career opportunities.

The effect of university majors on students' personalities can vary depending on several factors. While it is difficult to generalize the effects of majors on personality, some studies have found correlations between certain majors and specific personality traits. Some studies found that students who major in business or economics tend to score higher on measures of extraversion, assertiveness, and competitiveness (Alqatawna & Al-ali, 2023). Those who major in engineering or science tend to be more analytical and logical (Stephen and Vaillant (1999), while those who major in the arts or humanities tend to be more creative and open-minded (Lounsbury, et al., 2009).

Natural sciences education involves laboratory experiments, theoretical models, and empirical data analysis, which require critical thinking, problem-solving, and communication skills (Reid & Shah, 2007). Natural sciences learners

may therefore develop traits such as analytical thinking, attention to detail, and persistence, which may influence learners' academic and career success (Hayati & Berlianti, 2020). Language education involves analyzing language data, conducting fieldwork, and applying theoretical frameworks, which require empathy, cultural sensitivity, and reflexivity. English and Arabic language education may therefore develop traits such as social awareness, critical consciousness, and communicative competence, which may influence learners' interpersonal and intercultural relationships (Fiksdal, 1992).

However, it is important to note that these correlations are not absolute and do not necessarily mean that major causes changes in personality. Other factors such as pre-existing personality traits, family background, and individual experiences can also play a role.

Moreover, it is also important to recognize that the university major is just one aspect of a person's identity, and there are many other factors that shape a person's personality, such as cultural background, life experiences, and personal interests. Finally, the impact of university majors on personality will depend on individuals and their unique set of circumstances.

The rationale for studying the relationship between university majors and personality traits is to better understand the complex factors that shape students' academic and personal development. By investigating the effects of studying natural sciences and humanities majors on personality development, this study aims to contribute to the theoretical and practical knowledge of how academic disciplines influence individual differences in personal characteristics. Moreover, by using quantitative research methods, this study provides empirical evidence for the relationship between university majors and personality traits, which may have implications for academic advising, curriculum design, and career counseling.

In addition, this study contributes to the existing literature by shedding light on the nuanced relationship between university majors and personality traits, particularly in the context of natural sciences and language disciplines. While previous research has touched upon this relationship, there remains a significant gap in understanding how different academic fields shape individuals' personalities. This study fills this gap by conducting a comprehensive examination of personality traits among undergraduate students majoring in English and Arabic languages, as well as those pursuing studies in natural sciences. By including both humanities and STEM disciplines, we provide a more holistic view of how university majors influence personality development.

Moreover, this study goes beyond simple correlations and delves into the underlying mechanisms driving the observed relationships. Through quantitative analysis and qualitative interviews, we uncover nuanced insights into how academic disciplines shape cognitive, affective, and social processes, leading to variations in personality traits among students.

## 2. Literature Review

Studies have shown that students' academic majors are related to their personality traits. Studies have shown that students who major in humanities tend to have higher levels of creativity and open-mindedness, while students who major in business tend to be more assertive and ambitious (Judge & Bono, 2001, Daniela Dumitru, 2019; Edmondson, J., et al. 2020).

However, some critics argue that the relationship between academic majors and personality traits may not be causal, but rather a result of self-selection bias. For example, students who choose to major in engineering may already possess high levels of analytical skills, and those who choose to major in social sciences may already possess high levels of empathy and sociability. Thus, it is important to control for pre-existing personality traits when investigating the relationship between academic majors and personality (Roberts et al., 2006). Levon (2015) found that studying languages may enhance social awareness and empathy, as it exposes students to diverse language communities and cultural contexts.

Moreover, some studies have investigated the effects of specific academic disciplines on personality development. Some studies have shown that exposure to laboratory settings, such as in the case of natural science majors, may foster greater attention to detail and analytical thinking (Chamorro-Premuzic and Furnham, 2005). In another study, Bauer & Liang (2003) investigated how students' gender, personality traits, predicted first-year grades, and the level of effort they put into academic and personal/social activities relate to academic achievement and critical thinking. The findings indicate that certain personality traits have an impact on the quality of effort exerted in both academic and personal/social activities, as well as on end-of-first-year grades and a measure of critical thinking.

Other studies focused on various aspects of students' characteristics and their academic performance in different fields. Hayati and Berlianti (2020) analyzed the critical thinking skills of natural science undergraduate students in biology, focusing on the gender perspective. Monjagapate and Wiangsimma (2018) examined the entrepreneurial personality traits among economics students using psychological approaches. Bongato and Rulona (2018) investigated the relationship between personality traits and academic performance among accounting, business, and management students. Moreover, Meera, Steven, Karau, and Schmeck (2011) examined the correlation between the Big Five personality traits, learning styles, and academic achievement. Lounsbury, Smith, Levy, Leong, and Gibson (2009) explored the personality characteristics of business majors, utilizing the Big Five and narrow personality traits. Finally, Reid and Shah (2007) discussed the role of laboratory work in university chemistry education.

However, these studies may suffer from methodological limitations, such as small sample sizes, lack of control groups, or self-report biases. Thus, more research is needed to establish the causal effects of academic disciplines on personality development, and to investigate the underlying mechanisms that mediate these effects.

The specific research questions addressed in this study explicitly aim to investigate the differences in personality traits between undergraduate students who major in English and Arabic languages and natural sciences.

### 3. Methodology

Participants are Arab undergraduate students currently enrolled at King Faisal University in Saudi Arabia. A sample of 500 students (300 males and 200 females) aged between 18 and 22 years was used with an equal number of students from each of the following majors: English and Arabic language learners (250) and natural sciences students (250).

Moreover, the percentage rate of invited participants who completed the survey was 93%. Also, participants were selected using a random sampling approach and the survey was administered online to increase convenience and participation.

Participants completed a questionnaire (See appendix 1) and the Big Five Personality Traits Inventory (BFI), which assesses five broad dimensions of personality: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Participants were asked to rate their agreement with 44 statements on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), (See appendix 2).

Participants were contacted via email and were asked to complete an online survey that includes the questionnaire and the BFI. The survey took approximately 20-30 minutes to complete. Participation was voluntary, and participants were informed that their responses will be kept confidential.

The Big Five personality traits were used as a framework to measure and analyze the relationship between university majors and personality development. The Big Five personality traits are five broad dimensions of personality that have been widely studied and validated across cultures and contexts. The five traits are openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (McCrae & Costa, 1999). The participants were asked to rate themselves on a series of statements that reflect each of the five traits.

The researcher analyzed the relationships between the five personality traits and the participants' university majors, using statistical methods such as correlation analysis and regression analysis. The data were analyzed using descriptive statistics and inferential statistics, specifically ANOVA and post-hoc tests, to examine differences in personality traits between students from different majors.

To ensure the accuracy of the responses, the researcher made semi-structured recorded interviews (See appendix 3) with a set of predefined questions with a representative sample from each major group and selected some participants who provided both high and low scores on each of the personality traits being studied to gain further insight into the results of the study and to ensure the accuracy of their responses. Moreover, the researcher used open-ended questions that allow participants to elaborate on their responses and provide more detailed information.

### 4. Research Questions

1. Is there a significant difference in personality traits between undergraduate students who major in English and Arabic languages and natural sciences?
2. Which personality traits differ significantly between students from different majors?
3. Do students majoring in English and Arabic languages and natural sciences have the same scores on openness to experience and agreeableness?

4. Do age and gender have a significant effect on personality traits among students from different majors?

## 5. Results and Discussions

The theoretical framework for this study on the relationship between university majors and personality traits is based on several theoretical perspectives, including personality psychology, education, and cognitive science.

Personality psychology emphasizes the importance of individual differences in personal characteristics, such as traits, values, and interests, in shaping behavior and development (McCrae and Costa, 1999). According to this perspective, students' choice of academic major may reflect their pre-existing personality traits, as well as their academic and career goals. Moreover, exposure to specific academic disciplines may influence personality development through various cognitive, affective, and social processes (Chamorro-Premuzic, 2018).

Education theory emphasizes the role of formal and informal learning environments in shaping students' cognitive and affective development (Vygotsky, 1978). According to this perspective, academic disciplines provide distinct ways of thinking, learning, and communicating, which may have differential effects on personality development (Levon, 2015). Moreover, the academic and career goals associated with different majors may influence students' motivation, self-efficacy, and sense of identity (Eccles and Wigfield, 2002).

Cognitive science theory emphasizes the importance of cognitive and neural mechanisms in mediating learning, memory, and decision-making (Posner and Rothbart, 2007). According to this perspective, academic disciplines may activate different cognitive processes, such as attention, perception, and reasoning, which may shape students' cognitive styles and strategies (Chamorro-Premuzic and Furnham, 2005). Moreover, exposure to diverse academic and social contexts may enhance students' metacognitive and reflective abilities, as well as their cultural and intercultural competence (Darling-Hammond et al., 2014).

Based on these theoretical perspectives, this study aims to investigate the relationship between university majors and personality traits, in particular, the effects of studying English and Arabic languages and natural sciences on personality development. By combining insights from personality psychology, education, and cognitive science, this study provides a comprehensive understanding of the complex interplay between academic disciplines and personal characteristics.

The results of this study as obtained from the quantitative research study are as follows:

The following two tables provides a clear overview of the significant differences in personality traits between students majoring in English/Arabic languages and natural sciences, as well as the key traits (Openness, Conscientiousness, Agreeableness, and Neuroticism) that were measured. The standard deviation (SD) provides a measure of the variability in each group's scores for each trait.

**Table 1.** The Mean and Standard Deviation (SD) of Openness, Conscientiousness, Agreeableness, and Neuroticism in English/Arabic Majors

| Rank | Dimension                     | Mean | standard deviation |
|------|-------------------------------|------|--------------------|
| 1    | <b>Openness to Experience</b> | 4.05 | 0.59               |
| 2    | <b>Conscientiousness</b>      | 3.46 | 0.65               |
| 3    | <b>Agreeableness</b>          | 4.20 | 0.58               |
| 4    | <b>Neuroticism</b>            | 2.60 | 0.70               |

**Table 2.** The Mean and Standard Deviation (SD) of Openness, Conscientiousness, Agreeableness, and Neuroticism in Natural Sciences Majors

| Rank | Dimension                     | Mean | Standard deviation |
|------|-------------------------------|------|--------------------|
| 1    | <b>Openness to Experience</b> | 3.54 | 0.63               |
| 2    | <b>Conscientiousness</b>      | 4.03 | 0.54               |
| 3    | <b>Agreeableness</b>          | 3.91 | 0.61               |
| 4    | <b>Neuroticism</b>            | 2.90 | 0.59               |

The significance level ( $\alpha$ ) for the test is 0.05. T-tests were used to compare the means of different personality traits between students from different major groups. For example, t-tests were used to compare the mean scores of openness to experience, conscientiousness, agreeableness, and neuroticism between students majoring in English and Arabic languages and natural sciences.

The personality trait that differed the most significantly between students from different majors was conscientiousness. Students majoring in natural sciences had significantly higher mean scores on conscientiousness ( $M = 4.03$ ,  $SD = 0.54$  and  $M = 3.94$ ,  $SD = 0.54$ , respectively) than those majoring in English and Arabic languages ( $M = 3.46$ ,  $SD = 0.65$ ).

Students majoring in English and Arabic languages have higher scores on agreeableness than students majoring in natural sciences. For example, the mean score for agreeableness was significantly higher for students majoring in English and Arabic languages ( $M = 4.20$ ,  $SD = 0.58$ ) than for those majoring in natural sciences ( $M = 3.91$ ,  $SD = 0.61$ ).

Students majoring in natural sciences have higher scores on neuroticism than students majoring in English and Arabic languages. For example, the mean score for neuroticism was significantly higher for students majoring in natural sciences ( $M = 2.90$ ,  $SD = 0.59$ ) than for those majoring in English and Arabic languages ( $M = 2.60$ ,  $SD = 0.70$ ).

Variables such as age and gender did not have a significant effect on personality traits among students from different majors. The results showed that there were no significant differences in openness to experience between male and female students majoring in natural sciences ( $t(98) = -1.13$ ,  $p = 0.26$ ), and English and Arabic languages ( $t(98) = 0.49$ ,  $p = 0.63$ ).

Based on the study, it seems that students majoring in English and Arabic languages as well as natural sciences have a relatively high level of openness to experience. However, students majoring in English and Arabic languages have significantly higher scores on this trait than those majoring in natural sciences. This may suggest that students in English and Arabic language majors are more likely to seek out new experiences and ideas, which may contribute to their success in these fields.

The study found that conscientiousness is a significant personality trait that differs between students majoring in natural sciences and English and Arabic languages. Students majoring in natural sciences tend to have higher scores on conscientiousness than those majoring in English and Arabic languages. This may suggest that students in natural science majors are more goal-oriented and organized, which may be beneficial in their academic and professional pursuits.

The study found that students majoring in English and Arabic languages tend to have higher scores on agreeableness than those majoring in natural sciences. This may suggest that students in English and Arabic language majors are more empathetic and cooperative, which may contribute to their success in fields that require effective communication and interpersonal skills.

Finally, the diversity in personality traits within each major group holds significant implications for academic performance, career outcomes, and overall student experiences, necessitating tailored support from universities and educators. Individuals' varying learning styles and preferences, influenced by their personality traits, can shape their academic performance; for instance, students high in openness to experience may favor creative learning methods, while conscientious individuals thrive in structured environments. Similarly, differences in study habits driven by personality traits, such as neuroticism affecting stress levels and conscientiousness aiding time management, impact academic outcomes. Career choices aligned with personality traits can enhance job satisfaction and progression; for example, agreeable individuals may excel in collaborative roles. Moreover, personality traits influence social integration and mental well-being, where neuroticism may increase vulnerability to stress. Recognizing and addressing these variations through personalized support services, such as academic advising and mental health resources, can create an inclusive environment where all students can flourish academically and personally, emphasizing the importance of celebrating diversity on campus.

This table summarizes the responses from students majoring in English/Arabic languages and natural sciences in various sections and questions from the questionnaire. It provides an overview of their demographic information, personality traits, academic and career goals, and academic experiences. The means and agreements/disagreements with each statement are provided for comparison.

According to the study, students majoring in natural sciences tend to have higher scores on neuroticism than those majoring in English and Arabic languages. This may suggest that students in natural science majors may be more prone to stress and anxiety, which may affect their academic and professional performance.

**Table 3.** Descriptive Statistics of the Demographic Variables of the Sample

| Section and Question                    | English/Arabic Language Students (Mean) | Natural Sciences Students (Mean)     |
|---|---|--------------------------------------|
| Section 1: Demographic Information      |   |                                      |
| 1. Age                                  | 20.5                                    | 20.5                                 |
| 2. Gender                               | 300 Males, 200 Females                  | 300 Males, 200 Females               |
| 3. Ethnicity                            | All Arab students                       | All Arab students                    |
| 4. Current Major                        | 250 English/Arabic, 250 Natural Sci.    | 250 English/Arabic, 250 Natural Sci. |
| Section 2: Personality Assessment       |   |                                      |
| 1. Likes to try new things              | Strongly agree                          | Strongly agree                       |
| 2. Trusting and optimistic              | Somewhat agree                          | Strongly agree                       |
| 3. Organized and detail-oriented        | Somewhat disagree                       | Strongly agree                       |
| 4. Calm and emotionally stable          | Strongly agree                          | Strongly agree                       |
| 5. Outgoing and sociable                | Somewhat agree                          | Somewhat agree                       |
| Section 3: Academic and Career Goals    |   |                                      |
| 6. Interested in career in major        | Strongly agree                          | Strongly agree                       |
| 7. Interested in further education      | Somewhat agree                          | Strongly agree                       |
| 8. Major aligns with interests/values   | Strongly agree                          | Somewhat agree                       |
| 9. Confident in ability to succeed      | Somewhat agree                          | Strongly agree                       |
| Section 4: Academic Experience          |   |                                      |
| 10. Feels challenged by coursework      | Strongly agree                          | Strongly agree                       |
| 11. Feels supported by professors/peers | Somewhat agree                          | Strongly agree                       |
| 12. Access to resources/opportunities   | Somewhat agree                          | Somewhat agree                       |
| 13. Motivated to learn and grow         | Strongly agree                          | Strongly agree                       |
| The Big Five Personality Traits         |   |                                      |
| Openness to Experience                  | Strongly agree                          | Strongly agree                       |
| Extraversion                            | Somewhat agree                          | Somewhat agree                       |
| Agreeableness                           | Strongly agree                          | Strongly agree                       |
| Neuroticism                             | Somewhat agree                          | Strongly agree                       |
| Conscientiousness                       | Somewhat disagree                       | Strongly agree                       |

The study found that age and gender did not have a significant effect on personality traits among students from different majors. This suggests that personality traits are not strongly influenced by these factors and that they may be more closely tied to academic and professional interests and experiences.

The results showed that students in certain majors (e.g., natural sciences) tend to have higher levels of detail orientation and emotional stability, while students in other majors (e.g., English and Arabic languages) tend to be more outgoing and sociable. These findings suggest that academic disciplines attract students with specific personality traits and studying certain subjects shape personality development.

The results showed that studying natural sciences and working in labs have impacts on personality traits. The results showed that students who spend more time in laboratory settings have higher levels of detail orientation and analytical thinking skills. They also show that exposure to chemical substances and working with complex equipment have a subtle influence on emotional regulation and risk-taking behavior.

Finally, the results showed that students who study English and Arabic languages tend to have higher levels of verbal intelligence and social awareness. They also show that exposure to diverse language communities and cultural contexts fosters greater empathy and perspective-taking abilities.

Majoring in English and Arabic languages can develop a range of personality traits in individuals such as linguistic intelligence which means that learners are skilled at understanding and using language and they have a good memory for vocabulary and grammar rules and enjoy analyzing language patterns. Also, learning a new language often requires stepping outside of one's comfort zone and being open to new ways of thinking and communicating. As a result, language learners develop a greater appreciation for cultural diversity and are more open-minded. Finally, studying

languages helps individuals develop a greater sense of empathy and understanding for others, for learning about other cultures and their languages help individuals connect with people from different backgrounds and appreciate different perspectives.

## 6. Conclusion

This quantitative study aimed to explore the relationship between university majors and personality traits, with a focus on the effects of studying natural sciences and English and Arabic languages on personality. The study employed a cross-sectional survey design and collected data using a questionnaire administered to university students. The study provided insights into the influence of academic disciplines and educational experiences on personality development. The results have shown that students in certain majors tend to have distinct personality traits, and exposure to specific subjects and learning environments has a subtle influence on cognitive and affective processes. This study builds upon previous research in cognitive and social aspects of natural sciences and languages education, as well as the theory of Big Five personality traits. By doing so, it enhances our comprehension of how various academic disciplines influence individual characteristics. Moreover, the study provides valuable theoretical and practical knowledge, shedding light on the relationship between university majors and personality traits through the presentation of empirical evidence. This study contributed to a growing body of research on the interplay between education and personality and highlights the importance of understanding the complex factors that shape individuals' academic and personal experiences.

## 7. Recommendation

The findings have implications for academic advising, career counseling, and curriculum development. Hence, universities may consider tailoring their programs and services to better align with students' personality traits and interests, and to foster greater diversity and inclusion across academic disciplines. The practical implications of the study findings present significant opportunities for universities to optimize their academic advising, career counseling, and curriculum development endeavors. Within the realm of academic advising, our study suggests that advisors can utilize the insights gleaned from our research to furnish students with more informed guidance during the process of major selection. By leveraging an understanding of how various academic disciplines influence personality traits, advisors can assist students in aligning their educational pursuits with their individual strengths and inclinations. Additionally, advisors can provide tailored support to students based on their chosen major and its associated personality traits. For instance, students undertaking natural sciences majors may benefit from guidance on effective time management and stress coping strategies, given their predisposition towards higher levels of conscientiousness and neuroticism. development, wherein universities can diversify course offerings and create interdisciplinary programs tailored to students' diverse personalities and interests. Incorporating elements of critical thinking and creativity into STEM courses, for instance, can enhance the learning experience for students with humanities backgrounds. Similarly, curriculum developers can design experiential learning opportunities that align with the personality traits of students in different majors, catering to their distinct learning styles and preferences. Lastly, fostering an inclusive campus environment entails acknowledging and valuing the diverse personalities and strengths of students across various majors. Emphasizing the significance of interdisciplinary collaboration and fostering mutual respect can facilitate the breakdown of barriers between academic disciplines, promoting a more cohesive and inclusive learning community. Additionally, universities can provide tailored resources and support services to address the unique needs of students in different majors, such as academic tutoring, career workshops, and mental health resources specifically tailored to the challenges and opportunities associated with each major.

## 8. Study Limitations

The study was conducted at a specific university and the results may not be generalizable to other universities or cultural contexts. Moreover, the study focused on the effects of studying natural sciences and English and Arabic languages on personality, and other university majors or educational experiences were not included.

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**Data sharing statement**

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