Utilizing Data Analytics to Explore the Influence of Vocational Interests, Personality Traits, and Digital Literacy on Academic Performance

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Abstract. This study examines the relationship between vocational interests, personality traits, and digital literacy skills, and their impact on academic performance in technology-related fields. Data were collected from 500 undergraduate students using the O*NET Interest Profiler for vocational interests, the Big Five Inventory for personality traits, and a digital literacy test adapted from the International Computer and Information Literacy Study (ICILS). Academic performance was measured through cumulative Grade Point Average (GPA). Using multiple regression analysis, the study identifies conscientiousness and digital literacy as significant predictors of academic success, with positive correlations ($p < 0.01$) to GPA. Investigative vocational interests also showed a positive, though smaller, impact on performance. The results suggest that conscientious students, who exhibit goal-oriented behaviors and persistence, achieve higher academic outcomes. Additionally, students with higher digital literacy scores excel in coursework requiring effective use of technology and critical digital skills. These findings highlight the need for educational programs to emphasize digital literacy training and align instructional approaches with students' vocational interests and personality profiles to optimize engagement and performance. This study adds to the literature on non-cognitive factors in education and provides valuable insights for educators and policymakers aiming to support academic achievement in digitally mediated learning environments.

Keywords: Academic Performance, Conscientiousness, Digital Literacy, Personality Traits, Vocational Interests.

1   Introduction

The growing integration of technology into education has opened new options for evaluating and improving academic achievement. Especially in the realm of education, data analytics provides a useful method for investigating intricate interactions among many elements affecting academic results. Among them, especially in technologically driven surroundings, occupational interests, personality characteristics, and digital literacy

abilities have attracted great attention for their influence on students' academic performance. Students' professional goals and learning paths are shaped by their vocational interests, which also affect their interaction with the course content and the technology-based tools they apply [1]. Furthermore, demonstrated to be strongly predictive of academic performance are personality qualities like conscientiousness and openness as they interact with actions like flexibility and perseverance [2].

Digital literacy is very essential in the age of digital transformation, particularly for students studying fields dependent on informatics and technology. Digital literacy goes beyond mere technological skills to include knowledge and critical analysis of digital information, tools, and platforms [3]. Higher digital literate pupils are more suited to interact with learning tools, which enhances their academic achievement according recent research [4]. Using data analytics allows academics to find more profound understanding of how these elements interact and affect academic performance, thereby providing evidence-based remedies to improve teaching strategies.

This research investigates the impact on academic performance of professional interests, personality qualities, and digital literacy on data analytics. Through an analysis of these aspects, this study seeks to find trends and predicted links that would guide teachers and legislators, thus improving the learning results in technologically driven educational settings..

2   Methods

This study investigates the association of occupational interests, personality characteristics, and digital literacy abilities on academic achievement by means of a quantitative research design using data analytics tools. Four main phases comprise the approach: participant selection, data collecting, variable measurement, and data analysis.

2.1   Respondent Selection

Undergraduates enrolled in informatics and allied fields across different institutions made up the study. From these schools, 500 pupils in all were chosen at random. Participants had to have completed at least one complete academic year to guarantee exposure to both digital technology and the academic program. Students disqualified from the sample were those who had not completed a digital literacy exam or personality test.

2.2   Data Gathering

Data were collected through a combination of self-reported surveys and academic records: (1) Vocational Interests: Measured using the ONet Interest Profiler [5], which classifies interests into six categories (Realistic, Investigative, Artistic, Social, Enterprising, Conventional) based on Holland's theory of vocational choice; (2) Personality Traits: Assessed using the Big Five Inventory (BFI) [6], which evaluates five key dimensions: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism; (3) Digital Literacy Skills: Evaluated using a digital literacy test adapted from the

International Computer and Information Literacy Study (ICILS) [7], focusing on the students' ability to use, understand, and critically evaluate digital tools and information; (4) Academic Performance: Measured by cumulative Grade Point Average (GPA) obtained from university records.

2.3   Data Analysis

Multiple regression models were used in data analysis to investigate the predicted links among occupational inclinations, personality factors, digital literacy abilities, and academic success. Regression analysis makes it possible to find among the variable's important predictors and interaction effects. Many diagnostic tests like homoscedasticity and multicollinearity were conducted to evaluate the models' resilience. Furthermore, computed were Pearson correlation coefficients to investigate individual variable correlations.

The correctness and dependability of the analysis were guaranteed by use of data pretreatment methods including normalisation and missing data imputation. Data cleaning and modeling employed statistical tools like SPSS and Python's libraries (Pandas and Scikit-learn). $P < 0.05$ was the established significance criterion.

3   Results and Discussion

The study's findings are organized into three primary sections: the descriptive statistics of the variables, correlation analysis, and regression analysis. These analyses investigate the connections between academic performance, personality characteristics, vocational interests, and digital literacy skills.

3.1   Descriptive Statistics

Table 1 summarizes the descriptive statistics for vocational interests, personality attributes, digital literacy abilities, and GPA, which were collected from a sample of 500 students. The students' proficiency in utilizing digital tools and information was evidenced by the relatively high average digital literacy score.

Table 1. Results of descriptive statistics.

Variable	Mean	Standard Deviation	Min	Max
GPA	3.45	0.42	2.10	4.00
Digital Literacy Score	82.3	9.5	60	100
Conscientiousness (Big Five)	4.1	0.72	1.8	5.0
Openness (Big Five)	3.9	0.65	2.0	5.0
Vocational Interest - Investigative	4.0	0.81	2.2	5.0

3.2   Correlation Analysis

Pearson correlation coefficients were computed to determine the relationships between the independent variables (vocational interests, personality traits, and digital literacy) and academic performance (GPA). The results of the correlation analysis are shown in Table 2.

Table 2. Results of correlation analysis.

Variable	GPA	Digital Literacy	Conscientiousness	Openness	Investigative Interest
GPA	1	0.45**	0.52**	0.41**	0.39**
Digital Literacy Score	0.45**	1	0.32**	0.28*	0.26*
Conscientiousness	0.52**	0.32**	1	0.47**	0.35**
Openness	0.41**	0.28*	0.47**	1	0.33**
Vocational Interest - Investigative	0.39**	0.26*	0.35**	0.33**	1

Note: *$p < 0.05$, **$p < 0.01$

The correlation analysis revealed significant positive relationships between academic performance and all independent variables. Conscientiousness ($r = 0.52$, $p < 0.01$) showed the strongest correlation with GPA, followed by digital literacy skills ($r = 0.45$, $p < 0.01$). Vocational interest in investigative activities also had a moderate positive correlation with GPA ($r = 0.39$, $p < 0.01$).

3.3   Regression Analysis

Multiple regression analysis was implemented to ascertain the predictive efficacy of digital literacy, personality attributes, and vocational interests with respect to academic performance (GPA). Table 3 illustrates the findings.

Table 3. Results of descriptive statistics.

Variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	t-value	p-value
Digital Literacy Score	0.025	0.32	6.58	0.001**
Conscientiousness	0.307	0.39	7.81	0.001**
Openness	0.178	0.21	4.33	0.002**
Vocational Interest - Investigative	0.155	0.19	3.89	0.004**

Note: **$p < 0.01$

The adjusted R^2 of 0.41 indicates that the regression model can account for approximately 41% of the variance in academic performance (GPA), as it was statistically significant ($F = 36.45$, $p < 0.001$). Conscientiousness had the most significant positive

impact on academic performance (Beta = 0.39, p < 0.01), followed by digital literacy skills (Beta = 0.32, p < 0.01). The model was also substantially influenced by investigative vocational interest, albeit with a smaller effect size (Beta = 0.19, p < 0.01).

The study's results suggest that academic performance is significantly predicted by vocational interests, personality attributes, and digital literacy skills. The strongest associations with GPA were demonstrated by conscientiousness and digital literacy, underscoring the significance of technological competence and personality traits in the pursuit of academic success. These findings emphasize the importance of incorporating digital literacy into educational curricula and taking individual personality and vocational preferences into account when creating learning environments, particularly in informatics education.

3.4   Discussion

The findings of this investigation provide critical insights into the impact of digital literacy skills, personality traits, and vocational interests on academic performance in informatics education. Significant predictive relationships were identified through data analytics, with conscientiousness and digital literacy emerging as the most significant contributors to academic success. This section examines the implications of these discoveries and places them within the broader body of literature on educational psychology, digital literacy, and informatics education.

The results indicate that conscientiousness is the most significant predictor of academic performance, which is consistent with the existing research that emphasizes the significance of this characteristic in educational settings. Students who are conscientious are more likely to demonstrate self-discipline, persistence, and goal-setting behavior, all of which are positively correlated with improved academic performance. Conscientiousness is a consistent predictor of academic success, particularly in disciplines that necessitate structured and self-motivated learning environments, such as informatics and technology, according to Poropat [7]. Additionally, the discovery in this study that openness is positively correlated with academic performance implies that students who are inquisitive and receptive to new experiences may be more adaptable to the dynamic nature of informatics education, which frequently entails the acquisition of new technologies and the resolution of problems [8].

Academic performance was also positively correlated with vocational interests, particularly investigative interests. This is consistent with Holland's Theory of Vocational Choice, which asserts that individuals who have an interest in investigative subjects are naturally inclined toward problem-solving, analytical tasks, and scientific exploration—skills that are essential in the field of informatics [9]. This result is consistent with the research conducted by Trautwein et al. [10], which demonstrated that students who demonstrated a stronger vocational alignment in their field of study exhibited higher academic engagement and performance. For informatics students, a more robust investigative interest is likely to increase their motivation to investigate and comprehend complex technical content, as well as their engagement with analytical and computational tasks.

These findings indicate that educators can enhance the engagement of students in informatics by customizing learning environments to reflect students' vocational interests. Educators have the potential to improve student engagement, motivation, and academic outcomes by cultivating an environment that is consistent with these investigative inclinations. High attrition rates have historically been observed in technology-driven disciplines, which are characterized by a challenging curriculum, and such alignment could potentially enhance retention rates [11].

This skill set has become increasingly significant in educational contexts, particularly in informatics, as digital literacy has emerged as a significant predictor of academic performance. Digital literacy encompasses the capacity to effectively analyze digital information, as well as critical reasoning and problem-solving, in addition to fundamental computer skills. The demand for students to be able to navigate digital tools and platforms proficiently is increasing as technology integration in education continues to expand [12]. Digital literacy is essential for academic success, particularly in informatics, where students frequently interact with digital resources and tools to complete assignments and projects, as confirmed by studies conducted by Fraillon et al. [13].

The findings of this study are consistent with the most recent literature, which underscores the importance of digital literacy in adjusting to hybrid or online educational environments. For instance, Ng [14] illustrated that students who possess a high level of digital literacy are more adept at managing the intricacies of online learning, resulting in improved academic performance by effectively managing digital tools and resources. In the field of informatics education, where digital resources and simulations are essential for learning, digital literacy is not only beneficial but also necessary for attaining successful academic outcomes.

The results of this investigation have numerous implications for the field of informatics education. Initially, they emphasize the significance of incorporating digital literacy training into informatics curricula, as this skill is not only conducive to academic success but also in accordance with the requirements of the informatics field. Educators and curriculum designers could benefit from the development of targeted modules or seminars that are specifically designed to improve digital literacy skills, particularly for students who may have a reduced baseline in this area. Training in digital tool management, data security, and advanced information retrieval, all of which are pertinent to informatics professions, could be included in such initiatives.

Additionally, educators can establish supportive and engaging learning environments by comprehending students' vocational interests and personality traits. For example, the development of project-based assignments that are conducive to investigative interests may increase motivation and engagement, thereby enhancing academic performance. Personalized education may also be facilitated by the identification of personality traits and vocational interests, which enables instructors to modify instructional strategies in accordance with the unique preferences and strengths of each student [15].

While this research provides valuable insights, it is not without its limitations. The generalizability of the findings to other subjects may be restricted by the fact that the sample is restricted to students from informatics-related disciplines. In order to

ascertain whether these factors interact similarly across disciplines, future research could expand this research to include other domains, such as business or health sciences. Furthermore, although digital literacy was assessed using an adapted version of the International Computer and Information Literacy Study (ICILS), future research could incorporate more specialized assessments that measure specific competencies in data analytics or programming, which are particularly relevant in informatics [16].

Finally, longitudinal studies could offer more robust evidence regarding the long-term effects on academic and career outcomes and the evolution of personality traits, vocational interests, and digital literacy over time. It would be advantageous to examine the interaction between these factors and emergent tools, such as AI-driven learning platforms, as educational technology continues to develop. These platforms may provide new opportunities for personalized and adaptive learning experiences in informatics.

4   Conclusion

This investigation illustrates the substantial influence of digital literacy skills, vocational interests, and personality characteristics on academic achievement in informatics education. The significance of self-regulation and digital competence in attaining academic success was underscored by the significant predictors of conscientiousness and digital literacy. These results offer educators practical insights, emphasizing the importance of incorporating digital literacy training and taking into account individual differences in personality and vocational interests when developing informatics curricula. Educational institutions can cultivate more effective learning environments and assist students in reaching their maximum academic potential by comprehending and addressing these factors.

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