ACADEMIC MOTIVATION AND CAREER CHOICE: PSYCHOLOGICAL PROFILES IN INTELLIGENT DECISION SUPPORT SYSTEMS

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Abstract

The present study analyzes academic motivation and its relationship with career choice among students in school and university settings within the framework of innovative STEM education. Based on an integral psychological concept, the research explores personal and situational factors influencing the motivational process, including emotional regulation, perceptions of the social environment, personality traits, and the need for competence and autonomy. By employing a combined diagnostic toolkit—methods for measuring academic motivation, personality profiles (Big Five), and indicators of life satisfaction—the authors develop a model capable of predicting behavioral attitudes and educational choices. The study proposes a conceptual framework for integrating psychological data into intelligent systems for supporting academic and career decisions. In line with interdisciplinary approaches discussed at conferences on innovative STEM education, the model combines technological solutions with psychological expertise to enable flexible searching and adaptive recommendation of educational and professional pathways according to individual motivational and personality profiles. This integration addresses the need for personalized support strategies in the rapidly changing educational and labor landscape and contributes to increased engagement.

Keywords: *Academic Motivation; Career Choice; STEM Education; Psychological Profiling; Intelligent Systems.*

INTRODUCTION

In a dynamically changing educational and labor environment, driven by global digitalization and the growing role of interdisciplinary knowledge, academic motivation has become crucial. The latest legal and regulatory reforms in Bulgaria only reinforce this trend by creating conditions for the effective implementation of innovative teaching approaches and support for STEM education. For example, the July 2024 amendments to the School Education Act expanded the possibility of retaking the state matriculation exam in order to improve university application results (Decision No. 507)[1], which highlights efforts to provide flexible educational opportunities. In addition, the inclusion of 521 schools in the list of "Innovative Schools" for the 2024/2025 school year is part of the Ministry of Education's strategy to stimulate creativity, project-based learning, and digital culture in the learning process. Legislative initiatives related to vocational education and training (Vocational Education and Training Act, amendment 2023–2024) introduced national standards for VET programs, digital competences, dual training, and adaptation to local labor market needs. These regulatory efforts clearly demonstrate the political will to adapt education to the needs

[1] Decision No. 507, Available at: https://pris.government.bg/document/4d0fafabb13021eea57251feea2970b2 (last view: 29-07-2025).

of the 21st century – competence-oriented, innovative and inclusive. In this context, understanding the psychological mechanisms that shape academic motivation and career choice becomes a necessity. This study responds to these regulatory requirements by proposing a framework for integrating personality, motivational, emotional, and environmental factors into intelligent systems that can support the implementation of education that meets the new standards and goals in the field of STEM and career guidance.

The subject of the study is academic motivation and career choice in the context of school and university environments. The subject of the study is the interaction between personality characteristics, motivational profiles, satisfaction, emotional well-being, and perception of the social and learning environment as interrelated factors influencing academic motivation and career guidance. The study focuses on the possibility of integrating these data into intelligent decision support systems in order to increase their effectiveness and accuracy.

The aim of the study is to examine the personal and situational factors that shape academic motivation and influence career choice, and to develop a psychological model for their integration into intelligent systems for supporting educational and professional choices. To achieve this goal, the following research tasks are set: (1) to analyze the concept of academic motivation and its contemporary interpretations; (2) to establish the relationship between personality characteristics (using the Big Five model) and academic motivation; (3) to identify the influences of environmental factors and emotional regulation on the motivational process; (4) to examine the relationship between academic motivation and career choice; and (5) to model an integral psychological framework for application in adaptive, intelligent decision support systems.

The study is based on three hypotheses:

1. There is a statistically significant relationship between personality traits and levels of academic motivation.
2. Perceptions of the social and learning environment have a direct influence on career choice.
3. Integrating data on personality, motivation, satisfaction, and emotional well-being increases the accuracy of recommendations in intelligent systems for academic and professional guidance.

The study is expected to identify reliable psychological profiles that predict educational and career choices. The developed model can be implemented in technological platforms, which will facilitate the application of personalized strategies to support learners and optimize the decision-making process in an educational and professional context. In this way, the research contributes to increasing the effectiveness and adaptability of educational policies and digital advisory tools.

THEORETICAL OVERVIEW

The study of academic motivation and its influence on career choice is based on a number of established psychological theories, among which the leading one is Self Determination Theory (SDT). According to this theory, the satisfaction of basic psychological needs for autonomy, competence, and relatedness is the basis of intrinsic motivation, which in turn is strongly linked to academic engagement and sustainable career orientation [1]. SDT offers a clear distinction between intrinsic and extrinsic motivation, emphasizing the conditions that support natural processes of self-motivation [2].

In the context of STEM education, academic motivation is particularly important. Factors such as self-efficacy, outcome expectations, perceived usefulness, and social support have been shown to have a direct influence on the choice of a STEM profession [3]. Positive

learning experiences and social encouragement further strengthen students' internal commitment and shape a sustainable educational and professional direction.

Contemporary models for explaining career choices are also based on social cognitive career theory (SCCT). According to this approach, cognitive factors such as academic self-esteem, motivation, and expected benefits play a key role in determining interest in specific fields, including STEM fields [4]. Data from systematic reviews indicate that these psychological components are among the strongest predictors of sustained career interest [5].

The contribution of personality psychology is no less significant. Studies based on the Big Five model show that traits such as conscientiousness, openness to new experiences, and emotional stability have positive predictive value in terms of academic achievement and professional adaptation [6]. Additional studies link decision-making styles (e.g., dependent, avoidant, or spontaneous styles) with increased difficulty in career orientation, especially in combination with high levels of neuroticism [7].

The social environment, gender stereotypes, and cultural attitudes also have a significant impact. Research shows that for women, participation in STEM disciplines is often limited by a perception of lower support and recognition, especially in the context of the academic environment in physics [8]. These social barriers reduce self-esteem and intrinsic motivation, which necessitates more sensitive and supportive educational strategies [9], [10].

Significant progress in the field has been achieved through the application of intelligent systems that combine psychological diagnostic data with technologies for recommending educational and career paths. Machine learning-based models (e.g., Random Forest, SVR, Fuzzy Logic) have shown high effectiveness in predicting career readiness among students using individual motivation profiles, personality traits, and self-assessment of satisfaction [11]. In addition, innovative approaches such as LLM-based interactions with the future "self" through letters or SDT-based chatbots demonstrate real potential to increase engagement in the career self-reflection process [12], [13]. Extended models of SCCT now include contextual factors such as social support and academic integration, leading to more accurate predictions and more effective interventions [14].

RESULTS OF THE STUDY

The sample in the study comprises 262 participants, divided into two main groups: 152 students aged between 15 and 19 (9th–12th grade), mainly from vocational high schools, and 110 students aged between 20 and 25, mainly from fields of study in the exact sciences. The gender distribution includes 61% women (about 160 participants) and 39% men (about 102 participants). The age groups are represented as follows: 15–16 years old – 36 participants, 17–18 years old – 84 participants, and 19 years old – 32 participants. All participants gave their informed consent, which in the case of students was ensured through permission from the school principals and notification of the parents. The data was collected anonymously. Descriptive statistics, t-tests, and correlation analysis were used to process the data using SPSS Statistics 26, which provides a reliable basis for comparison between groups, as well as for analyzing age and gender differences in academic motivation, emotional regulation, and career orientation.

In line with the hypothesis that integrating data on personality, motivation, satisfaction, and emotional well-being improves the accuracy of recommendations in intelligent systems for academic and career guidance, a comprehensive set of psychodiagnostics methods was applied. To measure academic motivation, the Academic Motivation Scale developed by Velichkov and Radoslavova [15] was used, which includes 11 statements assessing levels of internal and external motivation, as well as amotivation. To assess perceptions of the academic environment, the Academic Environment Scale developed by Velichkov, Petkov,

and Radoslavova [16], which includes nine subscales—regulatory framework, isolation, prestige, workload, security, and other aspects of the learning environment that may influence motivation and academic performance. The internal consistency coefficient (Cronbach's alpha) for the scales used is:

- For the academic motivation scale: $\alpha = 0.81$
- For the methodology of Gordeeva et al. (based on Self-Determination Theory): $\alpha = 0.85$
- For the Big Five questionnaire – adapted by Karabelova: values vary across subscales, but on average $\alpha \approx 0.78 – 0.83$
- For the academic environment perception scale: $\alpha = 0.88$

These values indicate high reliability of the instruments used, as Alpha values above 0.70 are considered good, and above 0.80 – very good in psychological research. This confirms the validity of the results obtained and the stability of the measured constructs.

Additionally, a methodology developed by Gordeeva and colleagues [17] based on Self-Determination Theory [2], adapted to Bulgarian conditions, which allows for the study of subtypes of motivation such as cognitive, achievement-related, self-improvement-related, self-esteem-related, introjected, external, and amotivation.

Personality traits were examined using a questionnaire based on the Big Five model created by Parkinson [18] and adapted to Bulgarian conditions by Karabelova [19], which assesses the five basic personality dimensions: openness, conscientiousness, extraversion, agreeableness, and neuroticism. A four-point Likert scale was used, which showed high values of internal consistency and cultural validity.

Statistical processing was performed using descriptive analysis, t-tests, and correlation analysis using IBM SPSS Statistics 26 (IBM Corp., 2019), which allows for reliable verification of the relationships between personality, motivational, and environmental factors and assessment of their integral role in predicting academic and career decisions. This methodological framework, combining validated psychometric instruments and modern statistical methods, provides a reliable basis for building intelligent systems for personalized support in academic and professional orientation.

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On this basis, the following section presents the results of the analysis, which examines the significant interrelationships between emotional states, personality characteristics, and academic motivation, with a focus on their predictive value in the context of STEM education.

Analysis of the Results

The analysis of the relationship between emotional experiences and academic motivation reveals several key dependencies that are important in building effective educational models, especially in the STEM context. Among positive emotions, the strongest correlation is between academic motivation and intrinsic interest ($r = 0.389$, $p < .001$), confirming the importance of intrinsic engagement and personal meaningfulness in the learning process. Affiliation—the feeling of social connectedness—also shows a significant positive relationship ($r = 0.222$, $p = .001$), which speaks to the role of social support and relationships in the educational environment. Activation, understood as emotional energy and arousal, although less pronounced, also has a positive relationship with motivation ($r = 0.176$, $p = .006$).

Table 1: Correlations between emotions and academic motivation

Emotions	Correlation with academic motivation (r)	Significance (p)
Activation	0.17	0.006
Deactivation	-0.087	0.181
Internal interest	0.389	0.00
Depression – emotion	-0.122	0.05
Fear	0.035	0.585
Uncertainty	-0.221	0.
Depression	-0.139	0.032
Affiliation	0.222	0.001
Loneliness – emotion	-0.195	0.002
Hostility	0.041	0.530

On the other hand, several negative emotions show significant negative correlations with academic motivation. Insecurity, loneliness, and depression ($p < .05$) prove to be factors that significantly undermine the internal attitude toward learning. These states can lead to withdrawal from learning activities and difficulty coping with academic challenges. In contrast, emotions such as fear, hostility, and deactivation do not show statistically significant relationships with motivation ($p > .05$), suggesting that they do not directly influence engagement.

In innovative STEM education, where learning is often project-based, interactive, and requires high levels of autonomy and collaboration, positive emotions play an extremely important role. Interest in the content, the experience of progress, and the feeling of social belonging become the basis for building sustainable motivation. Conversely, negative emotions such as loneliness or insecurity can hinder learning, especially in situations of high cognitive load—for example, when solving complex mathematical problems or working in groups on engineering projects. This highlights the need for an educational environment that actively encourages emotional regulation, provides opportunities for support, and is capable of adapting to individual needs through intelligent guidance systems and personalized feedback.

Table 2. Correlations between personality traits (Big Five) and academic motivation

Personality trait	Correlation with academic motivation (r)	Significance (p)
Conscientiousness	0.489	< .001
Openness	0.176	0.004
Extraversion	0.085	0.181
Agreeableness	0.063	0.315
Neuroticism	-0.102	0.106

Table 3. Regression analysis – personality traits as predictors of academic motivation

Predictor	R	β (Beta)	t	p
Purposefulness	0.	.41	3.7	.000
Openness	—	n.s.	—	> .05
Other traits	—	n.s.	—	> .05

Analysis of the relationships between personality traits and academic motivation shows that conscientiousness is the strongest positive predictor. People with this trait tend to be

organized, diligent, and achievement-oriented—qualities that directly support academic effort and perseverance. The regression model confirms that this trait explains up to 50% of the variation in motivation, making it a key factor in personalized recommendations in academic guidance systems.

Openness to new experiences also shows a positive correlation, albeit weaker. It is associated with curiosity and flexibility in learning – particularly important in innovative and dynamic STEM disciplines. However, openness has no predictive value in the regression model, suggesting that it alone is not sufficient to maintain high motivation.

The other traits (extraversion, agreeableness, and neuroticism) show no significant correlation with academic motivation. This suggests that social activity or emotional sensitivity do not directly influence internal academic drive.

In the context of STEM education, which often requires long-term commitment and autonomous coping with difficulties, traits such as purposefulness and openness could be used as indicators in modeling academic potential and applying intelligent career guidance systems. Such systems can personalize support according to stable personality profiles and thus improve engagement and the selection of appropriate academic paths.

The study confirms the hypothesis that integrating data on personality, motivation, satisfaction, and emotional well-being increases the accuracy of recommendations in intelligent systems for academic and professional guidance. This is achieved through the use of a comprehensive psychodiagnostics toolkit, including a Big Five questionnaire, scales for academic motivation and subjective well-being, as well as indicators of perceived social and academic environment.

The results of the correlation analysis show that personality traits such as conscientiousness and openness are positively related to intrinsic academic motivation. For example, conscientiousness demonstrates the strongest correlation with motivation ($r = 0.489$, $p < .001$), and in multiple regression, it remains a significant predictor ($\beta = .41$, $t = 3.74$, $p < .001$). In addition, participants with high levels of life satisfaction and emotional stability demonstrate higher levels of motivation and more clearly defined career orientations.

Perceptions of the academic environment, including feelings of support, autonomy, security, and recognition, make a significant contribution to predicting academic motivation ($R^2 = 0.46$; $p < .05$). This means that when data from different psychological sources—personality traits, motivational profiles, satisfaction, and perceptions of the environment—are combined, a more accurate model for predicting academic and career behavior can be constructed.

Evidence for the predictive power of the integral model can be found in the results of analyses by career type (according to John Holland's model), where academic motivation correlates significantly with career types such as "research" ($r = .433$, $p < .001$). This suggests that individual psychological profiles have not only explanatory but also predictive value when integrated into intelligent recommendation systems.

In the context of innovative STEM education, such a multifactorial approach is particularly important. STEM disciplines often require sustained engagement, resilience to difficulties, and self-regulation skills—qualities that can be identified through comprehensive psychological assessment. Intelligent systems that use such an integrated profile could not only tailor their recommendations to individual needs, but also offer psychological support to overcome internal and environmental barriers when choosing an academic and professional direction.

INSIGHTS FROM THE STUDY

The results of the study confirm all three hypotheses and exceed expectations for the development of a reliable integrated model for academic and professional orientation based on psychological profiles.

First, a statistically significant relationship between personality traits and levels of academic motivation was established, confirming Hypothesis 1. In particular, conscientiousness and openness show positive correlations with intrinsic motivation, with conscientiousness also standing out as a significant predictor in the regression model. This demonstrates that stable personality characteristics play a role in resilience and engagement in the learning process – a key factor in designing support systems in STEM education.

Second, the analysis shows that perceptions of the social and academic environment – such as prestige, accessibility, support and security – have a significant impact on participants' career orientation. This confirms Hypothesis 2, showing that not only internal but also situational factors are critical in making decisions about future education and career.

Most importantly, Hypothesis 3 is confirmed by regression and correlation analyses, which demonstrate that the integration of personality traits, academic motivation, satisfaction, and emotional well-being provides high predictive value in terms of career choice. The complex model that combines these dimensions shows that intelligent systems based on such an approach can significantly improve the accuracy and applicability of the recommendations they provide to users.

Accordingly, the expected result of identifying reliable psychological profiles that predict educational and career choices has been achieved. The developed model has the potential to be implemented in technological platforms and intelligent systems for academic and professional guidance. It provides a basis for personalized support strategies that can increase the engagement, motivation, and adaptation of learners in a dynamic and complex STEM environment.

Based on the results of this study and contemporary STEM models such as SCCT (Social Cognitive Career Theory), SDT (Self-Determination Theory), and integrated AI-assisted advisory tools, a comprehensive psychological model can be proposed that is suitable for implementation in intelligent systems for supporting academic and career decisions. This model reflects the empirically established links between personality characteristics, motivation, emotional well-being, and perceptions of the learning and social environment, turning them into a basis for personalized guidance and recommendations.

First, the model includes integrated psychodiagnostics profiling based on validated instruments for measuring personality (Big Five), motivational types (intrinsic, extrinsic, amotivation – according to SDT), as well as emotional well-being, satisfaction, and social perceptions. This builds an individualized motivational and emotional profile, which is an input parameter in the system.

The next stage is evaluative – the system uses modern algorithms such as Random Forest, Support Vector Regression (SVR), and Fuzzy Logic to calculate the degree of academic and career readiness. Cluster analysis is used to classify participants according to motivational and personality dimensions and to identify potential risk areas, such as high demotivation, low conscientiousness, or emotional instability.

The interpretive layer of the model combines the data obtained to generate a synthesized psychological profile. On this basis, the system predicts the degree of commitment to STEM education, identifies barriers or supporting factors, and links them to appropriate academic or professional directions. For example, for participants with high conscientiousness and intrinsic achievement motivation but low affiliation, the system recommends self-directed learning with mentoring support.

The model's output functionality includes adaptive recommendations for specific STEM fields (e.g., engineering, technology, bioinformatics) tailored to the personality-motivation profile. In addition, interventions such as reflective exercises (e.g., letters to the future self – Jeon et al., 2025), coaching strategies, or the use of AI-based career chatbots are offered, in line with SDT principles.

The model is fully compatible with existing SCCT concepts, which include self-efficacy and outcome expectations as mediators of career choice, as well as with intelligent decision support systems (DSS) embedded in university portals, career centers, or mobile applications. The proposed framework allows for tracking engagement, dynamically adapting guidance, and providing individualized support in real time.

This model is applicable in educational institutions, career counseling services, and digital guidance platforms. By linking psychological dimensions with modern technological solutions, it facilitates informed choices about academic and professional trajectories, tailored to the individual needs and potential of each learner.

Table 4: Integral model for intelligent support in academic and career choices in the STEM context

Component	Description	Scientific basis (APA style)
1. Psychological profile (input data)	Personality traits (Big Five), motivation type (intrinsic/extrinsic/amotivation), emotional well-being, satisfaction with the environment	Deci & Ryan (2020); Niessen et al. (2020); Gordeeva et al. (2019); Karabelova (2011)
2. Diagnostic layer	Profile analysis algorithms – cluster analysis, regression models, fuzzy logic, SVR	Assylzhan et al. (2023); Study on Career Decision-Making (2024)
3. Psycho-semantic interpretation	Derivation of behavioral profiles through a combination of motivational, personality, and emotional indicators	Vansteenkiste, Ryan & Soenens (2020); Li & Singh (2023)
4. Generation of recommendations	Adaptive guidance towards learning paths, professions, and counseling strategies according to the profile	Jeon et al. (2025); Career Counseling Chatbot Study (2025)
5. Applicability and integration	Implementation in academic and career guidance systems – mobile applications, university DSS platforms	SCCT Model Extension (2024); El Hout et al. (2021)

CONCLUSION

In the context of digitalization and the rapidly changing educational and labor environment, intelligent decision support systems (DSS) are emerging as a key tool for personalized support in academic and career choices. This study demonstrates that the integration of complex psychological data—including personality traits, academic motivation, life satisfaction, and emotional well-being—significantly increases the predictive accuracy of such systems. The importance of academic motivation on satisfaction has been examined in detail in other studies [20].

Intelligent systems based on machine learning, adaptive algorithms, and diagnostic models can process multidimensional input data and create individualized profiles that serve as the basis for automatically generating recommendations. For example, based on the established positive links between purposefulness and intrinsic academic motivation, the system can recommend educational and professional paths that require high self-discipline and resilience—typical of engineering and scientific STEM fields.

The assessment of emotional well-being and satisfaction with the environment also plays a significant role in the adaptability of the system. Participants with lower emotional well-being may receive recommendations that include not only suitable academic paths, but also access to psychological support or referral to learning environments that offer high social engagement and a supportive culture.

In this sense, intelligent academic and career guidance systems not only recommend but also interpret—translating complex psychological data into concrete actions aimed at improving academic performance, emotional resilience, and confidence in career choices. This is particularly valuable in STEM fields, where the workload is high and individual adaptation is critically important.

Thus, the study confirms the need to implement interdisciplinary, psychologically informed DSS systems that build on standard guidance platforms through in-depth diagnostics and personalized support. In the long term, such solutions can contribute not only to more informed choices, but also to increased satisfaction, academic achievement, and more sustainable professional realization.

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