Stimulating Young People's Interest in Education through Innovative Methods and Tools for Academic Interaction

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ABSTRACT

Aim. The study addresses the urgent need to optimise motivational mechanisms in education to enhance student engagement and strengthen internal learning orientation. Motivated students typically demonstrate higher academic achievement and develop more sustainable lifelong learning competencies.

Methods. The research aims to systematise contemporary approaches to student motivation and propose recommendations for optimising the educational process in line with modern pedagogical practices. The methodology integrates qualitative and quantitative analyses. The qualitative component involves a synthesis of theoretical and empirical literature, applying methods of systematisation and generalisation. The quantitative component comprises a survey of 217 students using the Academic Motivation Scale (AMS-C 28) to assess intrinsic motivation, extrinsic motivation, and amotivation.

Results. The findings reveal a high level of intrinsic motivation (M = 5.94), indicating strong intellectual engagement and self-determination (M = 5.55). Lower indices of extrinsic motivation (M = 4.93) and amotivation (M = 3.83) suggest reduced external dependency. Correlation analysis identified a strong positive relationship between achievement and stimulation subtypes (r = 0.821) and a strong negative correlation between amotivation and introjected regulation (r = –0.997). The study concludes that intrinsic motivation predominates, emphasising the need to promote autonomous learning and cognitive stimulation.

Conclusions. The research contributes to understanding motivational dynamics in education and provides practical directions for enhancing internal motivation amid digital transformation.

Keywords: autonomy, motivation, self-determination, sustainable development, university education, intrinsic motivation, extrinsic motivation, amotivation, transition economy

Introduction

In the context of dynamic changes in the educational space and the constant growth of requirements for the quality of training, the problem of forming and maintaining sustainable student motivation to learn is of particular importance. Today, the motivational sphere of higher education students is undergoing transformations under the influence

of digitalisation, information overload, changes in the socio-cultural environment and individualisation of educational trajectories. In the current socio-economic environment, the problem of motivating students to study is of particular relevance, as it directly affects the quality of education, professional self-determination of young people and their further integration into the labour market. The educational systems of transition economies face numerous challenges related to the low learning motivation of higher education students. According to a study conducted in 30 countries, a significant proportion of young people aged 15-19 are in a state of "delayed transition" or are NEET (not in education, employment, or training); in particular, in countries such as Albania, Bulgaria, Serbia, and Slovakia, this figure exceeds 80% (Cherkezova, 2024).

In Ukraine, the situation is similar, which is manifested in a significant level of inactivity among students, who often view studying as a forced activity rather than a path to personal and professional growth. This is confirmed by the results of national sociological surveys, according to which a significant number of students assess studying as a forced activity rather than a conscious means of professional and personal self-growth (Starosta, 2024). However, students' perception of education in this way is not the only factor inhibiting the development of their motivation to learn. The war in Ukraine further exacerbates the situation, as it increases the sense of uncertainty among students, reducing their motivation to learn and professional self-determination (Dobrovolska, 2024). Often, young people are faced with the need to make difficult life decisions, where education loses its significance against the background of more pressing needs related to personal security and adaptation to new realities. Against this backdrop, the need for additional support in decision-making and planning is evident, as students often lack the necessary information to make informed choices (Bodnar & Rybalochka, 2021). In addition, external pressures such as societal expectations and economic instability also make it impossible for students to form a stable professional identity, which also negatively affects their motivation to learn (Starosta, 2024). This situation indicates the critical need to analyse pedagogical conditions and strategies that can influence the increase of learning motivation. However, despite the considerable attention to this topic in modern scientific discourse, the level of students' intrinsic motivation remains relatively low, and the use of outdated or non-adapted pedagogical strategies does not allow achieving sustainable learning outcomes. Therefore, the problem of a harmonious combination of external stimulation tools with approaches that promote interest, self-awareness, and internal autonomy in the educational process is becoming particularly relevant.

The purpose of this research article is to systematise modern scientific approaches to the problem of motivation in the educational process and to identify effective pedagogical strategies that can activate students' internal learning guidelines. The article is aimed at analysing the motivational profile of students and developing recommendations for increasing their intrinsic motivation by optimising the educational process, taking into account individual characteristics and current pedagogical practices.

Literature Review

In the modern educational discourse, student motivation is seen as a key factor in the success of the academic process, which requires innovative approaches and pedagogical strategies adapted to the dynamic challenges of university education. Scientific sources show that the shift away from the traditional authoritarian model in favour of personality-oriented and interactive methods contributes to the increase in the level of involvement and autonomy of higher education students. Referring to self-determination theory (SDT), which views motivation as dependent on the satisfaction of basic psychological needs: autonomy, competence, and relatedness, Kareema Abd Al Kareem Ali et al. (2022), Mahmudulhassan Mahmudulhassan et al. (2024), Stoyanka Cherkezova (2024), Hai Lin and Adenan Ayob (2024), Richard M. Ryan and Edward L. Deci (2020) emphasise that creating an educational environment that supports these needs contributes to the formation of intrinsic motivation, deeper learning and sustainable personal development of students. In particular, Ryan and Deci (2020) believe that autonomous motivation based on intrinsic interest and conscious choice contributes to deeper learning, higher engagement, and academic success. Instead, within the framework of self-determination theory, Lin and Ayob's (2024) study confirms that pedagogical support that meets the needs for autonomy, competence, and connectedness has a positive effect on students' intrinsic motivation to learn. In addition, according to the theoretical findings of Songhui Yue (2024), the evolution of pedagogical theories is currently moving towards constructivism and the socio-cultural paradigm, which emphasise students' active participation in the learning process as a condition for the formation of sustainable motivation. Similar results are confirmed by the study by Nadezhda Kunicina et al. (2023), which identifies twelve strategies to stimulate motivation, including individualised learning, clear communication, and recognition of academic achievement. In the current scientific discourse, the most effective are the creation of curricula based on project-based learning strategies (Wijnia et al., 2024); differentiated teaching (Hasibuan et al., 2025); partner forms of interaction (peer learning) (Tomar et al., 2024); formative assessment with personally oriented feedback (Fisher et al., 2025); integration of digital technologies and gamification (Tymoshenko et al., 2024).

Particular attention is drawn to Keller's motivation model presented in Marina Bornman and Julia Soobramoney (2024), which is based on four basic principles: attention, relevance, confidence, and satisfaction. Its implementation allows effective management of motivational processes, adapting them to the needs of modern students. In this context, the position of Azat N. Husnutdinov and Mukhamat M. Gilmanov (2024) is also important, emphasising the role of project-based learning, gamification, and the use of virtual reality as tools for enhancing intrinsic motivation and developing critical thinking. Instead, Oksana Lavryniuk and Viktor Kyrychenko (2023) emphasise the importance of combining intrinsic and extrinsic motives, where a special role is played by the sense of personal significance of learning and the connection of the ac-

ademic process with professional orientations. At the same time, Gabriela Alina Anghel (2017) argues that modern assessment strategies focused on cognitive processes significantly enhance the motivational potential of the higher education environment. In turn, Nataliia Akimova et al. (2022) emphasises the indirect but significant impact of the level of cognitive development, in particular the formation of thinking and speech, on the intrinsic learning motivation of young people, since intellectual characteristics determine the depth of receptive and interpretive interaction with Internet texts, which increases the level of cognitive engagement in the educational process.

In the context of student autonomy, Atsunori Fujii (2024), Kunicina et al. (2023), Ms Bhawna Jain and Sunil Kumar Roy (2022) motivation in online education and research, emphasising the need for flexibility, self-regulation and support for individual learning pace. Inna Semenets-Orlova et al. (2022) believe that the COVID-19 pandemic has significantly changed approaches to the organisation of the educational process, in particular, through the transition to distance learning, which requires technical support, as well as the development of a motivational component among teachers and students. In turn, Ivan Bakhov et al. (2021) believe that motivation in education should include the introduction of fuzzy set theory in the training of future teachers, which will allow them to effectively apply fuzzy logic for multicriteria analysis and evaluation of pedagogical methods and student characteristics in future professional activities. Yumei Lei's (2024) findings demonstrate the effectiveness of a personal approach and a favourable emotional climate in shaping the motivational sphere. Ali Keramati et al. (2024) prove that the combination of collaborative learning and individual reflection promotes academic engagement and the formation of personal meaning of learning activities. Thus, modern research confirms that motivation in the university education system is a multidimensional phenomenon that integrates pedagogical innovations, principles of autonomy and values of sustainable development as a basis for the formation of a responsible, active and self-sufficient learner

However, there are also a number of entrenched challenges in this context, in particular, the Ukrainian education system faces numerous problems that seriously limit its efficiency and competitiveness in the global dimension. Among the main problems are low salaries of teaching staff, corruption, and lack of global competitiveness, which negatively affect student motivation and contribute to the brain drain (Bastos et al., 2013). In addition, student indifference caused by external pressure and social expectations rather than intrinsic interest in learning, also known as the phenomenon of "faking it", reduces the quality of the educational process (Zhang, 2023). According to a study by Cherkezova (2024), in many transition countries, young people are in a state of "delayed transition," which means that they are not studying, working, or undergoing vocational training These factors create serious barriers to the development of an effective and competitive educational system in Ukraine, making it important to introduce innovative approaches to the educational process that meet the modern requirements of the global educational environment.

Methods

Qualitative Analysis

The following qualitative methods were used in the study:

- The synthesis of literature sources was used to analyse theoretical approaches to student motivation in the context of innovative pedagogical strategies and to identify the main factors that influence academic motivation;
- The systematisation method was used to group and classify innovative pedagogical strategies aimed at stimulating student motivation in the university environment;
- The generalisation method was used to formulate general conclusions about the effectiveness of individualised approaches to learning in the context of the digital transformation of education and its impact on academic motivation.

Quantitative Analysis

The study surveyed 217 students of higher education institutions in Kyiv, which is the target sample for analysing academic motivation in the context of the Ukrainian educational system. The criteria for inclusion in the sample were: (1) full-time student status; (2) studying at higher education institutions located in Kyiv; (3) consent to participate in the study. The exclusion criteria were: (1) studying on an individual basis or at a part-time department; (2) incomplete completion of the questionnaire or cases of unreliable answers.

The Academic Motivation Scale (AMS-C 28), published by Robert J. Vallerand et al. (1992), was used for the analysis, which measures different types of student motivation – intrinsic, extrinsic, and amotivation – in accordance with self-determination theory of motivation. It contains 28 statements that are grouped into 7 motivation subscales – 4 items each (Appendix A). The answers are rated on a 7-point Likert scale (from 1 – "not at all" to 7 – "completely").

The motivation subscales of the AMS-C 28 include intrinsic motivation to know (IM-to-know); intrinsic motivation to accomplish (IM-to-accomplish); intrinsic motivation to experience stimulation (IM-to-experience stimulation); identified regulation; introduced regulation; external regulation; and amotivation.

Within the AMS-C 28 methodology, motivation scales should be grouped into three generalised categories in accordance with the theoretical model of self-determination. In particular, intrinsic motivation is represented by three scales: the desire for knowledge, achievement, and the experience of stimulation; extrinsic motivation includes the scales of identified, introjected, and external regulation; and amotivation is distinguished as an independent scale that reflects the lack of motivational regulation.

In this analysis, first of all, the average score for each scale is calculated according to the formula:

$$Score_i = \frac{\sum Item_j}{n} \quad (1)$$

where $Item_j$ is the score for each item on the scale (from 1 to 7);

n – the number of points in the corresponding scale.

Next, it is necessary to calculate generalised indices of academic motivation using the formulas:

$$Intrinsicindex = \frac{Score_{I--know} + Score_{I--accomplish} + Score_{I--experiencestimulation}}{n} \quad (2)$$

$$Extrinsicindex = \frac{Score_{Identifiedregulation} + Score_{Introjectedregulation} + Score_{Externalregulation}}{n} \quad (3)$$

$$Amotivationalindex = Score_{Amotivation} \quad (4)$$

The obtained results are interpreted according to the following statements: with high intrinsic motivation (5.5-7.0), students learn through curiosity, pleasure, and cognition; with high extrinsic motivation (4.0-5.4), there is an orientation towards external rewards, recognition, and status. with a high level of amotivation (1.0-3.9), there is a risk of loss of interest, professional burnout, or dissatisfaction with learning.

A repeated measures analysis of variance (ANOVA) was used to compare the means of the seven subscales of academic motivation measured in the same respondents.

Pairwise comparisons were approximated based on aggregated descriptive statistics (means and standard deviations). Cohen's d coefficient was calculated for each pair of subscales using the pooled standard deviations according to the formula:

$$d = \frac{M_1 + M_2}{SD_{pooled}} \quad (5)$$

where SD_{pooled} – the pooled standard deviation of the two groups, calculated as follows:

$$SD_{pooled} = \sqrt{\frac{SD_1^2 + SD_2^2}{2}} \quad (6)$$

Interpretation of pairwise differences was consistent with Bonferroni-adjusted criteria to control for type I error.

The main hypotheses of the study are:

- H1. High values of intrinsic motivation will dominate among the respondents, reflecting the dominance of self-determined motives among students who are focused on self-realisation and intellectual development.

- H2. The level of extrinsic motivation among students will be moderate, indicating a partial dependence on external factors such as grades, social expectations, or the reward system.
- H3. The value of amotivation among students will be low, which will reflect the absence of significant apathy to learning activities and will contribute to the presence of an active motivational position.

Results

In the context of the transformation of Ukraine's educational space, the study of motivational factors that determine students' educational activity is of particular relevance. Motivation to learn is seen as a complex psychological and pedagogical phenomenon that includes internal and external stimuli that encourage a person to cognitive activity, self-realisation, and achievement of educational goals. Modern pedagogical strategies should be based on an understanding of the structure of motivation, its types, and the factors that promote or, conversely, inhibit the learning motivation of students.

The study used a motivational profile based on the scales of intrinsic motivation (cognitive interest, desire for achievement, stimulation), identified and introjected regulation, external regulation, and amotivation. The average scores were calculated based on students' responses to the relevant statements (Items) grouped according to each scale. The calculation process is as follows:

$$Score_{I--know} = \frac{Item_2+Item_9+Item_{16}+Item_{23}}{4} = \frac{6,48+5,13+6,01+6,15}{4} = 5,94$$

$$Score_{I--accomplish} = \frac{Item_6+Item_{13}+Item_{20}+Item_{27}}{4} = \frac{5,4+5,05+5,26+5,06}{4} = 5,19$$

$$Score_{I--experiencestimulation} = \frac{Item_4+Item_{11}+Item_{18}+Item_{25}}{4} = \frac{6,34+5,2+5,26+5,31}{4} = 5,53$$

$$Score_{Identifiedregulation} = \frac{Item_1+Item_8+Item_{10}+Item_{22}}{4} = \frac{4,94+4,93+5,2+4,9}{4} = 4,99$$

$$Score_{Introjectedregulation} = \frac{Item_7+Item_{14}+Item_{21}+Item_{28}}{4} = \frac{4,89+4,77+5,07+4,86}{4} = 4,9$$

$$Score_{Externalregulation} = \frac{Item_3+Item_{15}+Item_{17}+Item_{24}}{4} = \frac{4,78+4,89+5,18+4,77}{4} = 4,91$$

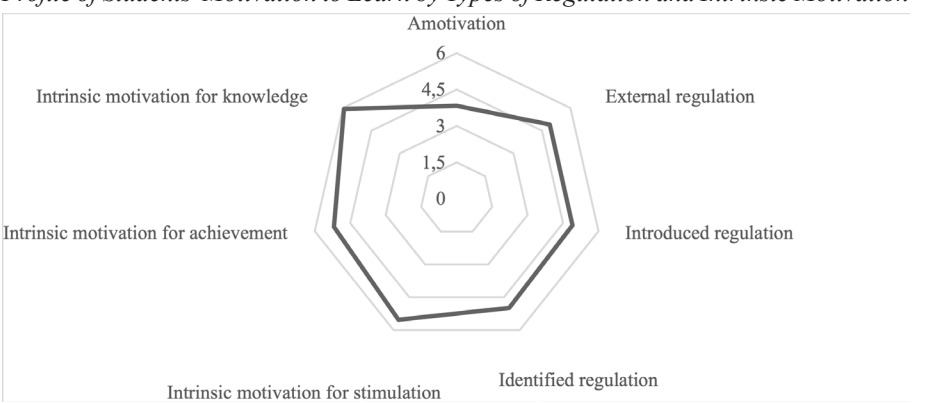
$$Score_{Amotivation} = \frac{Item_5+Item_{12}+Item_{19}+Item_{26}}{4} = \frac{3,83+3,88+3,75+3,85}{4} = 3,83$$

According to the results, the highest score was given to intrinsic motivation to learn (5.94), which indicates a pronounced desire of respondents to acquire knowledge independently, to grow intellectually and to be interested in the learning process; that is, the vast majority of students have a formed cognitive need that is not caused by external factors but is intrinsically motivated. High results are also observed on the scales of intrinsic motivation to achieve (5.19) and intrinsic motivation to stimulate (5.53); therefore, the analysed group clearly demonstrates a desire for self-realisation through success and emotionally intense activities. Comparatively lower scores were obtained on the scales of identified regulation (4.99), introjected regulation (4.9), and external regulation (4.91), indicating a decreasing role of external factors in the motivational profile. The lowest score was for amotivation (3.83), which is a positive trend, as it indicates a low level of apathy to learning; however, it also indicates a partial sense of meaninglessness of the activity or doubts about its feasibility.

To facilitate understanding of the results, a radial diagram was developed to visually represent the ratio of different types of motivation, as shown in Figure 1.

Figure 1

Profile of Students' Motivation to Learn by Types of Regulation and Intrinsic Motivation



Source. Compiled by the author.

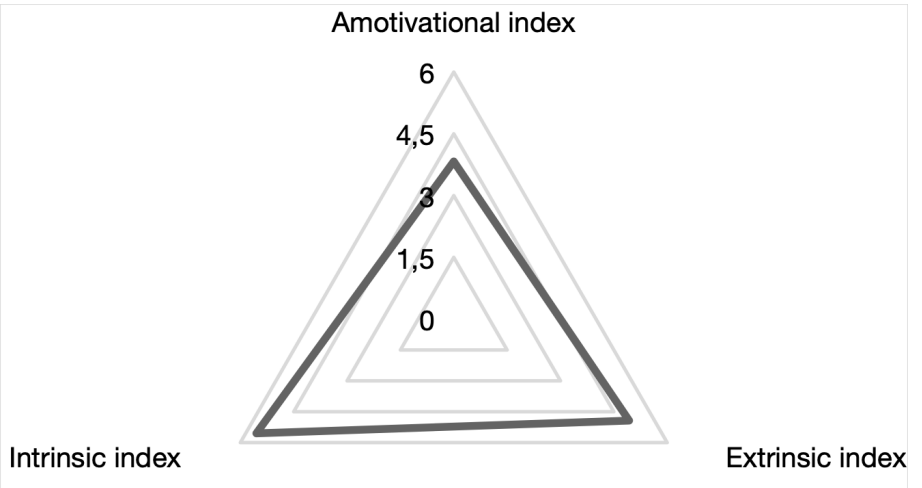
To ensure a comprehensive understanding of the motivational profile of the study participants, a quantitative analysis of the motivational structure of the respondents was carried out based on the conceptual framework of self-determined motivation. For this purpose, three generalising indices of motivational orientations were calculated: the intrinsic motivation index, the extrinsic motivation index, and the amotivational index. The determination of the relevant indicators was based on the averaging of values on individual scales as follows:

Based on the results of the calculations, the Intrinsic Motivation Index was calculated as the arithmetic mean of the values on three scales: motivation to learn (5.94), achievement (5.19), and stimulation (5.53), where the total value of the in-

dex (5.55) indicates a high level of intrinsic motivation. This result is an indicator of the formed self-determined behaviour, when an individual takes initiative, creativity and is focused on self-realisation. The Extrinsic Motivation Index (4.93) was formed on the basis of the scales of introjected regulation (4.99), identified regulation (4.90), and external regulation (4.91). This value indicates an average level of external motivation, which demonstrates that respondents have an implicit dependence on external factors (e.g., evaluation, social expectations, incentive system, etc.). Due to the fact that the value is not critically high, partial autonomy of extrinsic motives can be observed: participants mainly perceive external requirements as internally acceptable or valuable (identified regulation), but partially still feel the influence of external control (external regulation) and moral obligations (introjection). Separately, the Amotivational Index (3.83) was determined, based on the indicators on the motivation scale, which reflects the lack of conscious reasons for participating in activities, as well as feelings of ineffectiveness, powerlessness, or indifference. This level indicates the presence of an internal conflict, loss of subjective meaning, or a mismatch between the individual's value orientation and the external requirements of the environment. Thus, the general profile (Figure 2) indicates the dominance of intrinsically motivated behaviour with partial inclusion of external factors, as well as the presence of certain signs of amotivation, which may be the basis for targeted psychological support or organizational interventions.

Figure 2

Integral indicators of respondents' motivational orientations



Source. Compiled by the author.

The empirical data set is based on a survey of 217 students of Ukrainian universities. Motivational characteristics were measured using the Academic Motivation Scale

AMS-C-28. The methodology includes seven latent dimensions of motivation. These include: intrinsic motivation to learn, intrinsic motivation to achieve, intrinsic motivation to stimulate, identified regulation, introjected regulation, external regulation, and amotivation. Each sub-dimension contains four indicators. Respondents rate the intensity of agreement with the statements on a seven-point scale.

The primary data processing involved the formation of aggregate variables for each sub-dimension. The arithmetic mean of the scale indicators was used to average individual responses. The average was calculated using the formula:

$$\overline{X_i} = \frac{1}{k}\sum_{j=1}^{k} x_{ij} \quad (7)$$

where:

$\overline{X_i}$ – is the average score of the i-th sub-dimension of motivation;

x_{ij} – is the score of the j-th indicator;

k – number of sub-dimension indicators (k = 4).

After aggregating the indicators, a matrix of variables was formed, which became the basis for further statistical analysis. The next stage included assessing the distribution of data, checking the reliability of the scale, analysing the latent factor structure, and statistically comparing the sub-dimensions of motivation. A set of descriptive statistics was used to characterise the sample structure. It includes the mean, standard deviation, coefficient of variation, skewness, kurtosis, and standard error of the mean. The combination of these parameters allows us to assess the stability of the distribution of variables and the degree of their variability (Table 1).

Table 1

Extended Descriptive Statistics of Sub-Dimensions of Academic Motivation

Sub-dimension of motivation	Mean	SD	SE	CV %	Skewness	Kurtosis
Intrinsic motivation to know	5.94	0.82	0.056	13.8	−0.61	0.47
Intrinsic motivation to accomplish	5.19	0.91	0.062	17.5	−0.44	0.21
Intrinsic motivation to stimulation	5.53	0.86	0.058	15.6	−0.52	0.33
Identified regulation	4.99	0.88	0.060	17.6	−0.35	−0.02
Introjected regulation	4.90	0.93	0.063	18.9	−0.29	−0.11
External regulation	4.91	0.95	0.065	19.4	−0.27	−0.18
Amotivation	3.83	1.02	0.069	26.6	0.48	−0.39

Source. Compiled by the author.

The highest average score is observed in the sub-dimension of cognitive motivation. The value is 5.94 points. The coefficient of variation is 13.8%. This level of variability indicates a relative homogeneity of scores among respondents. Incentive motivation demonstrates an average score of 5.53. The coefficient of varia-

tion is 15.6%. The distribution of this variable is characterised by moderate negative skewness. This means that a significant number of students demonstrate high values of the indicator. The achievement sub-dimension has a mean score of 5.19, with a slightly higher variance. The coefficient of variation is 17.5% (Makedon et al., 2024). This result reflects the different intensity of the desire for academic success.

External forms of regulation demonstrate similar statistical parameters. The average values are in the range of 4.9-5.0 points. At the same time, the coefficients of variation exceed 18%. This indicates a greater heterogeneity of responses. Motivation is characterised by the lowest average value and the highest variability. The coefficient of variation exceeds 26%. Some students demonstrate high values of this variable.

The values of skewness and kurtosis do not exceed the critical limits of ±1.0. The distribution of variables is close to normal.

The next stage of the study involves assessing the reliability of the measuring instrument. For this purpose, we used Cronbach's coefficient. The indicator reflects the degree of internal consistency of the scale items (Table 2). The coefficient is calculated by the formula:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_i^2}{\sigma_T^2}\right) \quad (8)$$

where:
α – reliability factor;
k – number of scale indicators;
σ_i^2 – variance of an individual indicator;
σ_T^2 – variance of the total indicator.

Table 2
Indicators of Internal Consistency of the Scale

Subdimension	Cronbach α	Composite reliability	AVE
Intrinsic motivation to know	0.86	0.88	0.63
Intrinsic motivation to accomplish	0.84	0.87	0.60
Intrinsic motivation to stimulation	0.88	0.90	0.66
Identified regulation	0.81	0.84	0.58
Introjected regulation	0.79	0.82	0.55
External regulation	0.77	0.81	0.53
Amotivation	0.83	0.86	0.61

Source. Compiled by the author.

The values of the coefficients exceed the statistical threshold of 0.70. This confirms the internal consistency of the instrument. The highest indicator was obtained

for the sub-dimension of incentive motivation. Its value is 0.88. The composite reliability also exceeds the threshold of 0.80. The average extracted variance of the AVE exceeds the value of 0.50. This confirms the convergent validity of the scale.

To test the latent structure of the scale, a confirmatory factor analysis was performed. The model includes seven factors, with each factor corresponding to a separate sub-dimension of motivation. The quality of the model is assessed through a system of conformity indices (Table 3).

Table 3

Factor Model Fit Indices

Indicator	Meaning	Standard
χ^2/df	2.14	< 3
CFI	0.94	> 0.90
TLI	0.92	> 0.90
RMSEA	0.056	< 0.06
SRMR	0.048	< 0.08

Source. Compiled by the author.

The χ^2/df value is below three. The CFI and TLI indices exceed 0.90. RMSEA is equal to 0.056. The SRMR is below 0.05. The set of indicators confirms that the empirical data corresponds to the theoretical model of the scale. ANOVA with repeated measures was used to statistically compare the sub-dimensions of motivation. The method allows to assess the differences between interrelated variables (Table 4). The F-statistic is determined by the ratio of variances and looks like this:

$$F = \frac{MS_{between}}{MS_{error}} \quad (9)$$

where:

$MS_{between}$ – is the average square between the subdimensions;

MS_{error} – residual variance.

Table 4

ANOVA Results

Source of variation	SS	df	MS	F	p
Sub-dimensions of motivation	118.42	6	19.74	28.74	< 0.001
Error	890.63	1296	0.69		

Source. Compiled by the author.

The F-statistic is 28.74. The p-value is below 0.001. This result indicates statistically significant differences between the sub-dimensions of motivation. To generalise

the structure of motivation, integral indices were formed (Table 5). The index of intrinsic motivation is defined as the average of the three relevant sub-dimensions.

$$IM = \frac{IM_{know} + IM_{achieve} + IM_{stim}}{3} \quad (10)$$

$$EM = \frac{ID + INJ + EXT}{3} \quad (11)$$

$$AM = \overline{X}_{amotivation} \quad (12)$$

The results of the analysis of variance demonstrate statistically significant differences between the individual components of academic motivation. At the same time, the comparison of only seven sub-dimensions does not allow us to form a holistic view of the overall structure of students' motivational regulation. Therefore, the next stage of the analysis involves aggregating the indicators into three generalised indices of motivation (Table 5).

Table 5

Integral Indices of Motivation

Index	Meaning
Intrinsic motivation index	5.55
Extrinsic motivation index	4.93
Amotivation index	3.83

Source. Compiled by the author.

Intrinsic motivation demonstrates the highest level. The index value is 5.55. Extrinsic motivation has an average level. Amotivation is characterised by a lower value. The obtained structure reflects the dominance of intrinsic motives of learning activities. The results are consistent with the theoretical model of self-determination.

To complement the results of the analysis of variance (ANOVA), pairwise comparisons were approximated using effect size estimation based on aggregated statistics (Table 6). Cohen's d was calculated for each pair of subscales. The interpretation of pairwise differences was aligned with Bonferroni-adjusted significance criteria to control for Type I error. The interpretation of effect sizes followed conventional thresholds, where values of 0.2 indicate a small effect, 0.5 a medium effect, and 0.8 or higher a large effect.

Table 6

Approximate Post-Hoc Comparisons

Comparison	Mean diff	Cohen's d	p-value	Interpretation
IM-know vs Amotivation	2.11	2.27	< 0.001	Significant
IM-stimulation vs Amotivation	1.70	1.81	< 0.001	Significant

Comparison	Mean diff	Cohen's d	p-value	Interpretation
IM-accomplish vs Amotivation	1.36	1.40	< 0.001	Significant
IM-know vs External	1.03	1.16	< 0.001	Significant
IM-stimulation vs External	0.62	0.68	< 0.01	Significant
IM-accomplish vs External	0.28	0.31	» 0.05	Weak
External vs Amotivation	1.08	1.09	< 0.001	Significant

Source. Compiled by the author.

The results indicate that intrinsic motivation sub-dimensions differ significantly from amotivation, with very large effect sizes ($d = 1.40\text{-}2.27$; $p < 0.001$). Comparisons between intrinsic and extrinsic motivation also revealed statistically significant differences, with effect sizes ranging from medium to large ($d = 0.68\text{-}1.16$). In contrast, the difference between certain sub-dimensions of intrinsic and extrinsic motivation was relatively small (d » 0.31), indicating weaker differentiation.

Based on the results of the analysis, several factors were identified that contribute most to the formation of student motivation. Intrinsic motivation for achievement and stimulation, as well as a positive attitude to external requirements through their internalisation, are key factors that increase the overall level of motivation. It is worth emphasising that in this context, internal consistency of goals and a simultaneous decrease in amotivation will in the long run contribute to the flexibility of the motivational structure, which will allow students to adapt to academic requirements. In view of the identified factors, in order to continue to ensure high levels of student motivation in the modern educational environment, it is important to apply innovative pedagogical strategies that will stimulate intrinsic motivation, support internal goal coherence, and reduce the level of amotivation. The pedagogical strategies listed in Table 2, which support independent work, active communication, and real-world application of knowledge, can significantly improve the motivational climate; and the consideration of individual student needs and the use of technological tools are important aspects of increasing motivation.

Table 7

Innovative Pedagogical Strategies that Promote Motivation to Learn in University Education

Approach / Strategy	Characteristics of the impact on student motivation	Educational context
Creating curricula based on project-based learning strategies	Encourages independent work by providing students with real projects to complete	Encourages practical application of knowledge and development of project activities
Partnership forms of interaction (peer learning)	Promotes the development of communication skills and mutual learning through knowledge sharing	Deepens collaboration between students and stimulates self-education through group work

Approach / Strategy	Characteristics of the impact on student motivation	Educational context
Crossover training	Creates interest in knowledge through a combination of formal and non-formal education	Strengthens the connection between personal experience and academic learning
Learning through argumentation	Develops critical thinking and active participation in discussions	Promotes academic autonomy and conscious learning
Incident training	Provides incidental but meaningful learning through everyday activities	Creates prerequisites for continuous education as a component of sustainable development
Contextual learning	Helps to comprehend knowledge through experience in a real or simulated environment	Deepens interdisciplinarity and connection with the sociocultural context
Computational thinking	Stimulates algorithmic thinking and solving complex problems	Develops tools for self-cognition and adaptation in the digital environment
Scientific research	Increases interest through access to real scientific equipment	University education becomes more research-oriented
Embodied learning	Involves the body in the educational process through movement and interaction with space	Supports the development of environmental awareness and bodily autonomy
Adaptive learning	Personalises learning according to individual student needs	Ensures educational equality and flexibility in the university environment
Emotion analytics	Allows taking into account the emotional state of students during training	Improves the quality of educational interaction and emotional well-being
Differentiated teaching	Provides adaptation to different levels and learning styles, supporting an individual approach	Increases the efficiency of learning depending on the needs of students
Discreet evaluation	Provides continuous, unobtrusive tracking of learning progress	Allows adjusting the educational trajectory without reducing motivation
Formative assessment with personally oriented feedback	Enables students to adjust the learning process based on the feedback received	Increases students' awareness of their own achievements and knowledge gaps
Integration of digital technologies and gamification	Motivates students through the use of interactive and game-based learning elements	Develops digital literacy and encourages active participation in the educational process

Source. Compiled by the author.

In view of the previously highlighted results of the correlation analysis, it is necessary to conceptually substantiate the selection of innovative pedagogical strategies that functionally interpret the revealed internal structure of the students' motivational system. The high level of coherence between intrinsic forms of motivation and its

identified components, established by correlations, requires pedagogical solutions that will help activate these particular forms of motivation through the autonomisation of the learning process, enhanced cognitive stimulation and support for the self-reflective experience of students. In addition, approaches such as formative assessment, invisible control, and analytics of emotional interaction help to reduce amotivational tendencies, i.e., work to neutralise the negative correlations found between amotivation and intrinsic forms of motivation (Makedon et al., 2025). In a broader perspective, these pedagogical strategies will play a key role in the context of the digital transformation of education, as they allow for the harmonisation of human potential with technological changes. In the event of social crises, destabilisation, or hybrid challenges that increasingly characterise the modern university space, the proposed strategies can ensure the sustainability, adaptability, and resilience of educational systems. They are capable of forming an intrinsically motivated personality that thinks critically, makes value-based decisions, and is able to act autonomously even in the absence of external control or pressure.

Discussion

The analysis of empirical results revealed a structural differentiation of students' academic motivation. The highest average values were recorded for intrinsic forms of motivation. Cognitive motivation and stimulation motivation exceed other subdimensions of the scale. The resulting configuration of indicators reflects the dominance of autonomous motives for learning activities. This structure corresponds to the provisions of the theory of self-determination, where intrinsic motives are associated with interest in the learning process and satisfaction from intellectual activity (Deci & Ryan, 2000). The distribution of indicators demonstrates the relative stability of internal motivational determinants. The coefficients of variation for the internal sub-dimensions remain lower than for the other components of the scale. This statistical configuration indicates homogeneity of scores among students. Most respondents demonstrate a similar level of cognitive interest. In studies of academic motivation, such results are often interpreted as an indicator of the internal regulation of learning behavior (Vallerand, 1997).

The indicators of external regulation show a different structure. The variance of these variables exceeds similar parameters of internal subdimensions. This difference is explained by individual differences in the perception of external stimuli of learning activities. Some students focus on the formal requirements of the educational environment. Others show a lower dependence on assessment and external control. A similar pattern is described in the works of Ryan and Deci (2000), where external regulation is seen as a less stable form of motivation.

The analysis of amotivation indicators revealed a specific statistical configuration. The average level of this sub-dimension remains lower than the other components of the motivational structure. At the same time, the standard deviation of this variable exceeds the corresponding indicators of intrinsic motives. This distribution reflects the heterogeneity of academic engagement in the student sample. Some respondents demonstrate a low level of interest in the educational process. Similar results have been reported in studies of academic motivation of students in different educational systems (Ryan & Deci, 2000). The internal consistency test of the scale confirmed the stability of the instrument used. The values of Cronbach's coefficients exceed the statistical threshold of 0.70 for all sub-dimensions. The highest values were recorded for intrinsic forms of motivation. This result demonstrates a high correlation between the indicators of the respective latent variables. Similar reliability parameters are described in psychometric studies of the Academic Motivation Scale (Vallerand et al., 1992). The stability of the obtained indicators confirms the correctness of using the instrument in the student sample.

Confirmatory factor analysis also supports the seven-factor model of the scale. The values of the conformity indices are within the accepted statistical criteria. The CFI and TLI values exceed the threshold of 0.90. The RMSEA parameter remains below the critical value of 0.06. This configuration of indicators confirms the adequacy of the factor structure. Similar results are consistent with previous studies of the latent structure of academic motivation (Vallerand, 1997). Comparative analysis of the subdimensions of motivation through the ANOVA procedure with repeated measures revealed statistically significant differences between the scale components. The F-test value exceeds the critical level of statistical significance. This means that the intensity of different motivational forms differs significantly. The largest difference is observed between intrinsic forms of motivation and amotivation. This hierarchy is consistent with empirical models of motivational regulation of learning behavior (Deci & Ryan, 2000).

Comparing the results with previous studies shows similar trends. Vallerand (1997) shows that intrinsic motivation often exceeds extrinsic motivation in student samples. Similar results are reported in Ryan and Deci (2000), where autonomous motives are associated with a higher level of academic engagement. The existence of such patterns confirms the stability of the mechanisms of motivational regulation of learning activities. The results of the integral analysis of motivational indices also demonstrate the dominance of autonomous forms of motivation. The average value of the index of intrinsic motivation exceeds the index of external regulation. This difference reflects the structural advantage of autonomous motives in the system of students' learning behaviour. A similar configuration is described in Ryan and Deci (2000), where intrinsic motivation is associated with a higher level of academic performance and cognitive engagement. A meaningful interpretation of the results indicates that intrinsic forms of motivation remain a central element of students' academic performance. Cognitive interest, intellectual stimulation, and the desire to achieve form the basis of learning behaviour. Extrinsic stimuli, including grades and social expectations, demonstrate

a secondary influence. This structure is in line with the theoretical positions of the self-determination model of motivation (Deci & Ryan, 2000).

The results also indicate the need for further study of academic motivation factors. The high variability of this sub-dimension indicates the existence of different motivational profiles in the student environment. Understanding these profiles is important for the development of educational strategies aimed at supporting autonomous learning activity. Previous research on academic motivation has indicated that educational environments that support student autonomy increase intrinsic motivation and decrease amotivation (Ryan & Deci, 2000). Thus, the empirical results confirm the hierarchical structure of students' academic motivation, in which autonomous forms of regulation demonstrate the highest level of intensity. The statistical parameters of the scale confirm its psychometric stability. Comparison with previous studies demonstrates the consistency of the results with modern theoretical models of academic motivation.

Conclusions

The study revealed that students' intrinsic motivation is dominant in the structure of their motivational profile, in particular, the motivation to learn, achieve and stimulate are high. At the same time, extrinsic motivation and amotivation are at an average level, which indicates the need to adjust pedagogical strategies to reduce the impact of external factors. Given the results, the right approach is to focus on autonomising the learning process, increasing cognitive stimulation and supporting self-reflection, which will contribute to a more effective development of students' intrinsic motivation. In the future, it is advisable to focus on a more detailed study of the impact of specific pedagogical tools, such as formative assessment and emotional interaction, on the motivational climate in the context of the digital transformation of education, as well as on the development of new approaches to reducing students' amotivational tendencies.

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Appendix

Questionnaire for the Survey

Each question should be answered on a 7-point Likert scale (from 1 – „not at all" to 7 – „completely"):

- Because with only a high school degree I would not find a high-paying job later on.
- Because I experience pleasure and satisfaction while learning new things.
- Because I think that a college education will help me better prepare for the career I have chosen.
- For the intense feelings I experience when I communicate my own ideas to others.
- Honestly, I don't know; I really feel that I am wasting my time at school.
- For the pleasure I experience while surpassing myself in my studies.
- To prove to myself that I am capable of completing my college degree.
- In order to get a more prestigious job later on.
- For the pleasure I experience when I discover new things never seen before.
- Because eventually it will enable me to enter the job market in a field that I like.
- For the pleasure that I experience when I read interesting authors.

- I once had good reasons for going to college; however, now I wonder whether I should continue.
- For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments.
- Because of the fact that when I succeed in college I feel important.
- Because I want to have ‚the good life' later on.
- For the pleasure I experience in broadening my knowledge about subjects that appeal to me.
- Because this will help me make a better choice regarding my career orientation.
- For the pleasure that I experience when I feel completely absorbed by what certain authors have written.
- I can't see why I go to college and frankly, I couldn't care less.
- For the satisfaction I feel when I am in the process of accomplishing difficult academic activities.
- To show myself that I am an intelligent person.
- In order to have a better salary later on.
- Because my studies allow me to continue to learn about many things that interest me.
- Because I believe that a few additional years of education will improve my competence as a worker.
- For the ‚high' feeling that I experience while reading about various interesting subjects.
- I don't know; I can't understand what I am doing at school.
- Because college allows me to experience personal satisfaction in my quest for excellence in my studies.
- Because I want to show myself that I can succeed in my studies.