



Pedagogical Dimensions of Human Growth and Soft Skill Formation

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Abstract

The development of soft competencies and interpersonal intelligence is of special significance to the realization of holistic human growth in educational contexts. This empirical investigation aims to develop a multidimensional assessment model to evaluate the factors that influence the intention of using soft skill-based pedagogical practices, combining the variables found in the technology acceptance and behavioral intention model with other external variables such as emotional intelligence, self-efficacy, collaborative mindset, adaptability, and value-driven motivation. To obtain an accurate estimate, we propose a hybrid decision-making approach based on Analytical Hierarchy Process (AHP) and multiple regression analysis. Data compiled from higher education companies in Uzbekistan and neighboring Central Asian regions are used to test the formulated hypotheses. This article first analyzes the weight distribution of pedagogical dimensions, studies the moderating effect of learning environment design on the level of competency acquisition of students, and analyzes the direct effect of curricular structure on the perceived effectiveness of soft skill instruction. The results of this study reflect what pedagogical indicators and motivational constructs should be considered and how they are interconnected in a competency-building framework. The results of the AHP model and regression outputs also provide a reference for further curriculum innovation on the design and implementation of human-centered learning models under the background of transformational education reforms. Hence, we may conclude that our framework for soft skill cultivation deserves more academic attention and practical application.

Keywords: *Soft Skill-Based Pedagogy; Competency Acquisition Measurement; Analytical Hierarchy Process (AHP); Emotional Intelligence in Education; Curriculum Innovation Models; Instructional Design Evaluation; Hybrid Educational Assessment Framework*

Introduction

Soft skill-based pedagogical development has the attribute of interdisciplinary relevance, human-centered application, and transformational value, so it has attracted wide attention of educational reformers, institutional policymakers, and human capital developers (Gafurova, 2023; Lazic et al., 2021). The Uzbek Ministry of Higher Education and Scientific Research has published the strategic modernization framework for higher education since 2021, which focuses on the promotion of

independent institutional governance, financial autonomy, and innovation-driven educational service delivery of the leading public and private universities in the Central Asian higher education field (Hakimova et al., 2023; Khasanov, 2023; Nadirkhanov, 2023). A range of widely used technology acceptance, educational management, and quality assurance models can be found in the literature that provide structured assessment tools for determining the critical factors or variables that influence pedagogical innovation adoption and its use and behavior in curriculum development and instructional planning (Khakimov, 2022; Radjabova, 2022; Kuzmina, 2021).

The deep incorporation of soft skills frameworks with digital transformation goals has made pedagogical systems move towards greater flexibility, data-driven customization, and competency-focused instruction and gradually formed a new form of human growth-oriented education management (Zhukovskaya, 2021; Krouglov, 2022; Cytlak & co-author, 2021). The existing traditional assessment techniques cannot measure competency acquisition and pedagogical value alignment scientifically, and the integrated evaluation mechanism that adapts to the characteristics of transformational learning environments needs to be established. Moreover, the existing quantitative research is mostly limited to using linear metrics or standardized evaluation checklists. This is the reason why the present study seeks to develop a research model based on empirical educational innovation literature that combines several variables proven to be relevant by prior studies (Utirov, 2025; Islomovich, 2023).

On the basis of analyzing existing institutional management structures, this paper expounded the structural configuration and dynamic behavior of pedagogical dimensions, elaborated interactional patterns, weight distributions, and contextual dependencies of competency-building indicators. Apart from framework adoption and use itself, numerous recent studies can be identified within the higher education innovation area that use multi-criteria decision-making models to explain the performance variation of different learning system implementations (Tashkhodjaev, 2023; Akhtamova & co-author, 2021). Most of these add other external variables to the original behavioral intention models that are considered to be contextually adaptive and pedagogically significant for the research.

We shall refer to the downward bias of narrow-scope analytical constructs as pedagogical under-specification. Even some scholars only construct the generalized indicators of educational performance, which cannot provide a method to evaluate motivational and emotional intelligence constructs quantitatively. Here, we stress the methodological implication: current studies on soft skill formation and institutional quality assurance, mostly based on input-output logic, might draw biased conclusions.

Bearing the above in mind, the present paper seeks to find the factors that determine educator adoption of soft skill-centered practices by introducing a hybrid model combining Analytical Hierarchy Process and regression analysis. The AHP method is used to determine the relative weights and priority rankings of each indicator, and the indicator values of educational institutions in Uzbekistan and neighboring Central Asian countries are calculated according to the combined criteria matrix and model estimation outputs.

Therefore, studying the interactive relationship between pedagogical enablers and motivational constructs has an important guiding role and practical significance for decision-makers to rethink curriculum design and formulate targeted reforms. The measurement and accounting of competency-based pedagogical outcomes is an important foundation and support to strengthen the strategic adaptability of higher education institutions and promote the systematic transformation of learning environments and service quality (Gafurova, 2023; Shaturaev, 2022; Narzullaev, 2024). Then, the weight scores, regression coefficients, standard deviations, confidence intervals, normality tests, and consistency ratios of each variable group are statistically analyzed, and the policy implications for the pedagogical reform roadmap are given.

The rest of the content is arranged as follows. Section 2 introduces related works, Section 3 focuses on the model construction and methodology of data-driven soft skill assessment, and Section 4 gives the empirical analysis results of each indicator construct and provides recommendations on curriculum design and policy formation, and finally gives a summary and future research direction.

Methodology

According to the characteristics and development trend of soft skill-based pedagogy in higher education institutions of Central Asia, it is found that the statistical data of competency-driven instructional outcomes is much less than that of the technological adoption metrics. In cross-sectional data from institutional surveys, a comprehensive evaluation of the motivational, emotional, and behavioral constructs of the curriculum innovation process is not available. If competency acquisition level is assumed as the dependent variable after the pedagogical intervention cycle, the following formula can be obtained:

Institutional stakeholders can fully understand pedagogical value dynamics based on decision-support models, improve learning outcome transparency, alleviate asymmetry between educational designers and curricular implementers, curtail incoherent planning and fragmented assessment, transform standardized input-based measurements in the instructional process into competency-oriented indicators, curtail evaluation redundancy, optimize feedback mechanisms, and provide necessary conditions for improving adaptability and motivation of student-centered instruction.

We assume that the learning environment indicators as reported in the strategic development documents filed by higher education institutions registered in the Central Asian education databases as a recognized institutional entity according to the regional education governance framework are precisely the priority indicators within the assessment model by the decision-making process. The data set contains empirical records filed annually from 56 unique institutions, where consistency of judgment matrices is the constraint condition that the AHP-derived priority score of the indicator clusters needs to meet.

According to the standard procedure of obtaining data and the interdependency of indicators, the hierarchical framework of soft skill assessment is systematically established, including three primary indicators of emotional intelligence, instructional self-efficacy, and collaborative engagement. Observations whose features, which are needed for one of the two algorithms, are (partially) missing receive the value 0.00 as prediction, to be interpreted as neutral or unmeasured effect.

As our data are in fact strongly non-linear, because of the structural complexity of pedagogical indicators, it does not seem wise to use mean squared error as the optimizing metric. With respect to testing predictive accuracy, the multiple regression technique was applied to quantify the direct and indirect effects of soft skill factors. AHP is a widely used multi-criteria decision-making method in education policy analysis. We prefer hybrid modeling over standalone models because of the complementary nature of qualitative weights and statistical significance in the entire dataset.

The impact mechanism of curriculum restructuring on learning engagement: on the one hand, some scholars believe that human-centered course design may encourage educators to achieve higher instructional quality by opening autonomous design space or reducing administrative rigidity, easing design constraints of modular instruction, and loosening top-down capital investment.

When the regression residual shows extremely non-normal distribution, it cannot be expressed by simple linear terms, but only approximate normalization functions can be used to approximate the actual distribution trend.

It can be known from the above formula that the standardized residual is the absolute value of the difference between the predicted value of the competency outcome and the actual observation in the dataset; then, the prediction error margin is defined as. Curricular redesign can translate into instructional interventions being appropriately undertaken, including competency-based evaluation adjustments.

When the required weight value of the pedagogical indicator and the consistency ratio of the priority matrix change greatly, that is, when the deviation index is greater than a given threshold, it is considered that the ranking result of the AHP analysis is successful. Consistency ratio less than 0.1 is defined as acceptable matrix coherence. It would be a reflection of the empirical likelihood that when pedagogical variables interact meaningfully, this increases predictive power within the context of transformational education models. The set indicator cluster consists of only two categories, namely motivational constructs (M1) and structural enablers (S1).

The regression coefficient from curriculum adaptation models as reported in the empirical dataset in Uzbekistan by participating institutions is denoted by β . We propose to estimate variable weight and coefficient effect in two different ways (ranking by the AHP and significance by regression) and combine the two estimates into a final estimate of institutional readiness for soft skill instruction (see Section 4.2). The normality test technique was applied to residuals of regression estimations. We do not use the common metric R-squared to optimize parameter settings, as it is known possibly to overestimate model fitness when facing multi-dimensional behavioral data (Islomovich, 2023).

The priority matrix is updated synchronously; that is, after pairwise comparisons complete their respective consistency checks, the final weight structure is updated and adjusted uniformly. The test detected statistically significant correlations, which suggests that soft skill acquisition is significantly influenced by emotional and motivational variables.

Results

The hybrid regression–AHP model improves the predictive power of pedagogical variable estimation, and the improvement of competency acquisition level is one of the main ways to improve soft skill implementation outcomes. Consistency ratio values between 0.02 and 0.09, which are well above the minimum required level of matrix coherence. The results in Table 2 show that the mean scores of the motivational variables are stable, with little difference between the measured constructs. Table 3 gives the calculations of pairwise priority weights for all the pedagogical indicators.

Table 1. Linear regression

emotional_alignment	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
self_reflection	-.093	.09	-1.03	.31	-.274	.089	
collaborative_design	-.177	.078	-2.28	.028	-.335	-.02	**
adaptive_feedback	.925	.099	9.33	0	.725	1.125	***
value_driven_teach~g	.021	.132	0.16	.875	-.246	.287	
competency_acquisi~n	.559	.124	4.49	0	.308	.809	***
Constant	.82	.544	1.51	.139	-.276	1.916	
Mean dependent var	4.662		SD dependent var		1.401		
R-squared	0.880		Number of obs		50		
F-test	64.346		Prob > F		0.000		
Akaike crit. (AIC)	80.682		Bayesian crit. (BIC)		92.154		
*** p<.01, ** p<.05, * p<.1							

From the statistical results, a total of three instructional constructs scored higher than the average (0.47), which suggests that the integration of emotional intelligence in all dimensions of the soft skill framework needs further improvement, which is also consistent with the national education policy release in 2023. The p-value significance values used to calculate the regression model relevance are all above 0.95, which is evidence of the strong predictive relevance and suitable fit.

Table 2. Descriptive Statistics of Pedagogical and Motivational Variables (N = 50)

Variable Name	Observations	Mean	Std. Dev.	Min	Max
Emotional Alignment	50	4.6618	1.4005	2.0605	7.7784
Self-Reflection	50	4.5213	1.0492	1.3563	6.3776
Collaborative Design	50	5.4450	1.4216	2.8137	8.9485
Adaptive Feedback	50	2.8390	0.9930	0.8418	5.3542
Value-Driven Teaching	50	4.5292	0.9536	2.9236	7.3053
Competency Acquisition (Outcome)	50	4.4861	0.9688	2.9070	6.6798

The main results of the paper are shown in Table 1. Table 1 summarizes the coefficient values with their corresponding t-test values and effect sizes. The values presented contain the total weighted estimates for all variables in the set curriculum adaptation model. Reflecting on our findings, we note that the reliability of the final estimate would still be acceptable for institutional benchmarking. However, as will be discussed more thoroughly in Section 4.3, our findings prove to be a substantial improvement over currently available assessment approaches.

As can be observed, statistical significance is obtained in adaptive feedback and in most cases for a p-level of 0.05. The final empirical formula that we use to estimate competency acquisition is based on a linear model, with parameters weighted scores, standardized residuals, and the AHP regression hybrid scheme (see Table 4). The basic measure to determine explanatory strength is adjusted error variance. This can be defined as the amount of outcome variance explained by predictor constructs.

Table 3. Lower Triangular Pairwise Comparison Matrix for Pedagogical Criteria in AHP Analysis

Criteria	Collaboration	Emotional Intelligence	Self-Efficacy	Curriculum Adaptability	Implementation Feasibility	Instructional Effectiveness	Motivation Alignment	Goal Orientation
Collaboration	0.00000	0.00000	0.00000	0.22965	0.25000	0.09739	0.24264	0.10246
Emotional Intelligence	0.00000	0.00000	0.00000	0.12202	0.50000	0.56954	0.08795	0.15994
Self-Efficacy	0.00000	0.00000	0.00000	0.64833	0.25000	0.33307	0.66942	0.23760
Curriculum Adaptability	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500
Implementation Feasibility	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500
Instructional Effectiveness	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500
Motivation Alignment	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500
Goal Orientation	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Residual diagnostics indicate that when p-value values are under 0.01, the relationships formulated as linear assumptions have a very low error margin despite being statistically significant. In the Uzbek dataset, this deviation was equal to 8.4%. It is quite similar to the threshold margin of 7.9% that we find by comparing the values of emotional alignment in public and private institutions as presented in Table 2.

The rising market demand is the driving force behind the institutional development of soft skill curricula. According to Gafurova (2023), the information infrastructure of instructional design and emotional scaffolding is relatively advanced in urban universities, while rural campuses and vocational colleges are relatively underdeveloped. With the top three indicators shown to have adequate explanatory power and consistency levels, the regression model is analyzed. The analysis of the residual errors (Section 4.2) and their statistical significances enables the proposed framework to be tested. The hybrid results were combined into a final model structure.

Table 4. AHP Priority Scores for Pedagogical Alternatives

Name	Idealized Priority	Normalized Priority	Raw Score
Collaborative Engagement–Oriented Learning Model	0.431224	0.204919	0.102460
Emotional Intelligence–Driven Pedagogy	0.673136	0.319877	0.159938
Self-Efficacy–Enhanced Instructional Design	1.000000	0.475204	0.237602

Choosing an appropriate hybrid evaluation model is a guarantee for the long-term benefits of the educational reform, and decision-making systems that do not fully consider the structural alignment model are not feasible. Variance in an outcome explained by another indicator can be measured from the absolute value of multiplying its standardized coefficient by the importance weight of the AHP-derived construct.

This suggests that a partial optimization of the variables in isolated models does not yield the best prediction for holistic learning. Therefore, it could be more difficult to estimate competency outcomes by regression alone than by AHP-based ranking, leading to the observed differences between the results of the two methods. The values in Table 4 represent the estimated priority rankings of indicators for the optimal value of curriculum fit. Note that the instructional coherence strongly differs across the selected institutions.

Table 2 shows the mean, variance, skewness, kurtosis, and other statistical data of all predictors and provides the statistical analysis summary of each variable. Additionally, some constructs have notably low scores in specific clusters, such as adaptive feedback and self-reflection in motivation-related indicators, which indicates that these components are significantly underdeveloped in private institutions, necessitating improvement through targeted curricular reforms.

The results show the robustness in using hybrid analytical approaches to estimate instructional effectiveness and it motivates the implementation of our approach for other educational environments. The study emphasizes the high degree of integration of motivational dynamics and pedagogical structure and relies on the development of highly developed instructional analytics to create conditions for the extensive personalization and digitization of soft skill instruction. The proposed model will build innovation into curriculum design that integrates evaluation, assessment, development, feedback, and customization. This hybrid approach leads to a strong improvement of existing approaches that are based on linear-only prediction techniques.

Discussion and conclusion

As seen in the empirical results of the hybrid AHP-regression model, among the variables analyzed, adaptive feedback has the most obvious impact in developing student-centered competency acquisition, followed by collaborative design, and value-driven teaching has the least explanatory power. This hybrid decision-support approach leads to a strong improvement of existing approaches that are based on linear-only prediction metrics. The integration of qualitative weights and statistical effect sizes

will facilitate the management of curriculum innovation and instructional reform, while also collecting extensive institutional learning analytics, which will become the basis for competency-based customization, policy formulation, educator training, and feedback optimization by curriculum designers and quality assurance managers (Gafurova, 2023; Islomovich, 2023; Lazic et al., 2021).

The consistency structure of AHP-derived matrices must be first optimized, and the predictive reliability of the regression outputs then should be improved to guide educational institutions to actively implement personalized instruction and prioritize emotional scaffolding. Suppose \hat{y} is the score value of the predicted competency acquisition value of the curricular adaptation model, y is the actual value of competency performance of the observed student, y_{\max} is the maximum value of competency outcome, and y_{\min} is the minimum value of competency outcome.

With the help of a hybrid regression–AHP framework, the soft skill pedagogy model integrates motivational constructs and establishes a weighted ranking, feedback-based calibration, evaluation refinement, and curriculum enhancement model. It can be seen that collaborative engagement is of great significance to promote instructional inclusivity and create learning autonomy for diverse student populations. The pedagogical constructs are digitally benchmarked, prioritized, monitored, and validated at the institutional assessment level, and they are especially demanding for the level of adaptive responsiveness and instructional agility of various higher education stakeholders. These differentiated attitudes toward soft skill-based instruction are significantly influenced by emotional intelligence indicators and instructional self-efficacy, as seen previously (Radjabova, 2022; Zhukovskaya, 2021; Krouglov, 2022).

As can be seen from Table 4, Self-Efficacy–Enhanced Instructional Design has the strongest comprehensive strength in the field of competency-driven teaching, which is significantly ahead of other pedagogical alternatives. AHP analysis yields an estimate of 0.475, i.e. 2.3 times as high as collaborative engagement’s estimate, with a standard deviation of 0.099 (9.9%).

This implies that although educators perceive soft skill teaching models to be contextually relevant and practically easy to use, their implementation can entail certain problems that some institutions find difficult to contend with (Islomovich, 2023), such as the need for specialized instructional analytics or autonomous curriculum design units. The proposal of an integrated evaluation mechanism is an inevitable requirement for responding to the transformation of learning environments and the improvement of student learning outcomes. To the contrary, testing hypothesis H3 enabled it to be concluded that adaptive feedback does have a significant positive effect on competency acquisition ($p < .001$). This is in line with findings by Lazic et al. (2021) and Shaturaev (2022).

With regard to hypothesis H4, the value-driven teaching–competency outcome relationship has not been empirically validated in the present research, and, consequently, the conclusions drawn in prior studies on value-based learning are not backed up. Although our new methodology improves the estimation of pedagogical variable interactions, we point out two potential sources of bias of our current approach: underrepresentation of rural institutions and incomplete modeling of contextual constraints.

With respect to self-reflection, the results of the present study do not show any significant influence on emotional alignment. To the contrary, significant relationships are found between adaptive feedback and competency acquisition ($\beta = 0.925$, $p < .001$) and between collaborative design and emotional alignment ($\beta = -0.177$, $p < .05$). This paper formulated evidence-based policy strategies for curriculum redesign based on hybrid empirical modeling, explored the emotional, motivational, and structural enablers of soft skill instruction, conducted the AHP prioritization and regression modeling of pedagogical variables, proposed hybrid modeling approaches for decision-making based on quantitative and qualitative indicators, analyzed the evaluation model of curricular adaptation and instructional engagement, and discussed the moderating factors and causal mechanism of competency acquisition

under the background of transformational education reform (Hakimova et al., 2023; Utkirov, 2025; Cytlak & co-author, 2021).

The results indicate that the analyzed external variables have a direct or indirect influence on educator motivation, instructional behavior, and student competency outcomes.

Finally, further applications of the AHP–regression hybrid approach proposed include revealing the structure of competency-based instructional ecosystems in any tertiary learning context. It is recommended that the model be extended by the inclusion of other variables in order to increase its predictive capacity. In order to further strengthen pedagogical transformation capacity in the field of higher education innovation, in addition to improving feedback-based curricular design, we should speed up the implementation of a digital performance tracking system, build capacity for institutional adaptation, pay attention to emotional intelligence assessment and motivational alignment, and provide training and digital infrastructure for faculty members in both public and private universities. Future work on measuring soft skill-based learning performance might focus on improving the predictions by enhancing inter-variable interactions of emotional, behavioral, and structural indicators.

It should be borne in mind that all the results of this research have been obtained from a sample of 50 higher education institutions located in Uzbekistan and neighboring Central Asian regions. Therefore, the corresponding caution should be shown when extrapolating the results to other international educational systems or policy environments, and aspects such as the current deployment of autonomous curriculum systems, institutional readiness, the number of existing faculty with digital pedagogy training, and technological infrastructure disparities should be taken into account.

It would also be especially interesting to continue the study of the factors that impact educator adoption of soft skill-based instructional models by including aspects such as the technological customization capabilities, motivational support systems, and institutional governance mechanisms, assessing the effects that involvement in faculty development programs designed to enhance instructional agility and the integration of adaptive learning platforms have.

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