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CONCEPT
OF AN INTELLIGENT LEARNING SYSTEM
FOR SCHOOL CHILDREN

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1 General Provisions

This Concept of intelligent learning system for school children (hereinafter referred to as the "Concept") defines the strategic, pedagogical, legal, ethical, organizational, and technological foundations for the creation, pilot testing, implementation, maintenance, and monitoring of the intelligent learning system for a school children (hereinafter referred to as the "ILS").

The ILS is viewed as a unified digital educational and analytical platform designed to identify and develop schoolchildren's abilities, create individual development pathways, generate adaptive educational content, monitor achievements, and support pedagogical decision-making through the use of artificial intelligence (hereinafter referred to as "AI"), educational analytics, and expert review.

The Concept was developed within the framework of the program (IRN BR28712263) titled "Creation of a comprehensive scientific and innovation system for training pedagogical personnel to foster the development of gifted children in Kazakhstan" (hereinafter referred to as the "Program") and takes into account the provisions of the following Program documents: the Concept for the Development of ILS; the Standard "Artificial Intelligence in Education. ILS. General Requirements"; the Regulation on the ethical and legal regulation of the collection, processing, and use of schoolchildren's data within the ILS; and the Code of Ethics for the use of artificial intelligence and schoolchildren's data within the ILS.

The ILS does not replace the teacher, psychologist, methodologist, or researcher. The system serves as a tool to support instruction, diagnostics, the development of giftedness, the formulation of recommendations, and professional decision-making. Final, significant decisions are made by an authorized human agent.

2 Basis for Development

The development of this Concept is grounded in the need to create a holistic model of the ILS as a scientifically sound, ethically safe, and technologically manageable tool to support the development of gifted children in Kazakhstan:

— The IRN BR28712263 program, aimed at establishing a comprehensive scientific and innovation system for training educators to foster the development of gifted children in Kazakhstan;

— The need among schools and supplementary education centers for personalized student support;

— The need for digital assessment of students' educational, cognitive, creative, and research abilities;

— The need to create individual development pathways based on assessment data, portfolios, observations, and educational outcomes;

— The need to implement mechanisms for protecting student data, ensuring human oversight of AI-generated recommendations, and conducting ethical reviews of the ISS.

3 Relevance

Modern education in the Republic of Kazakhstan is evolving amidst digital transformation and the proliferation of AI, educational analytics, adaptive platforms, generative technologies, and personalized learning tools. These technologies create new opportunities to identify and nurture giftedness, enhance the quality of education, and support educators.

For the Program, the creation of an Integrated Educational System (IES)—capable of unifying diagnostics, instruction, analytics, expert support, the formulation of individual development pathways, and recommendations into a single, manageable cycle—is of particular importance. Such a system enables not only the recording of educational outcomes but also the analysis of a child's developmental trajectory, the identification of strengths, areas for growth, and learning challenges, as well as the determination of potential avenues for support.

At the same time, the implementation of an IES entails risks: the improper processing of student data, sensitive information leaks, erroneous AI recommendations, algorithmic discrimination, the stigmatization of students, and a decline in parental and educator trust in digital educational technologies. Therefore, the conceptual model of the IES must simultaneously address pedagogical, technological, legal, and ethical challenges.

4 Goal and Objectives

The goal of the Concept is to define a comprehensive model for the development, piloting, and implementation of the ILS as a safe, pedagogically sound, ethical, transparent, verifiable, and manageable digital platform for the personalized support of gifted students' development.

To achieve this goal, the following objectives are to be addressed:

1. Define the purpose, scope, and operating principles of the ILS.
2. Establish a functional model of the system, encompassing giftedness screening, diagnostics based on the EPTS model, creation of an initial student profile, generation of a comprehensive digital student profile, analysis of educational potential and outcomes, formulation of an individual development trajectory, implementation of educational support, monitoring of educational progress, and adjustment of the development trajectory.
3. Define the pedagogical model for using the ILS to develop students' divergent and convergent thinking, sub-skills, educational interests, and abilities.
4. Establish requirements regarding data, the digital student profile, and the protection of personal and sensitive educational data.
5. Set requirements for AI modules, generative AI, educational analytics, and the explainability of recommendations.

6. Define the procedure for human oversight of significant AI-generated recommendations.

7. Formulate an organizational model for implementing the ILS in partner schools and educational organizations.

8. Define the stages of the Concept's implementation, performance indicators, monitoring, auditing, and risk management.

5 Regulatory Framework

When developing the standard, it is advisable to take into account:

1. Law of the Republic of Kazakhstan No. 319-III dated July 27, 2007, "On Education." – Text: electronic // "Adilet" Information and Legal System. – URL: https://adilet.zan.kz/rus/docs/Z070000319

2. Law of the Republic of Kazakhstan No. 94-V dated May 21, 2013, "On Personal Data and Their Protection." – Text: electronic // "Adilet" Information and Legal System. – URL: https://adilet.zan.kz/rus/docs/Z1300000094

3. Law of the Republic of Kazakhstan No. 230-VIII dated November 17, 2025, "On Artificial Intelligence." – Text: electronic // "Adilet" Information and Legal System. – URL: https://adilet.zan.kz/rus/docs/Z2500000230

4. Code of the Republic of Kazakhstan No. 255-VIII dated January 9, 2026, "Digital Code of the Republic of Kazakhstan." – Text: electronic // "Adilet" Information and Legal System. – URL: https://adilet.zan.kz/rus/docs/K2600000255

5. Law of the Republic of Kazakhstan No. 418-V dated November 24, 2015, "On Informatization." – Text: electronic // "Adilet" Information and Legal System. – URL: https://adilet.zan.kz/rus/docs/Z1500000418

6. Law of the Republic of Kazakhstan No. 183-VI ZRK dated October 5, 2018, "On Standardization." – Text: electronic // "Adilet" Information and Legal System. – URL: https://adilet.zan.kz/rus/docs/Z1800000183

7. ST RK 1.2-2021 "National Standardization System of the Republic of Kazakhstan. Procedure for Developing Standardization Documents." – Text: official standard of the Republic of Kazakhstan.

8. ST RK ISO/IEC 42001 "Information Technology. Artificial Intelligence. Management System." – Text: national standard of the Republic of Kazakhstan.

9. ST RK ISO/IEC 5338 "Information Technology. Artificial Intelligence. AI System Life Cycle Processes." – Text: national standard of the Republic of Kazakhstan.

10. ST RK ISO/IEC 5339 "Information Technology. Artificial Intelligence. Guidance for AI Applications." – Text: national standard of the Republic of Kazakhstan.

11. ST RK ISO/IEC 23894 "Information Technology. Artificial Intelligence. Risk Management Guidance." – Text: national standard of the Republic of Kazakhstan.

12. ST RK ISO/IEC 19796-1 "Information Technology. Learning, Education, and Training. Quality Management, Quality Assurance, and Metrics." – Text: national standard of the Republic of Kazakhstan.

13. ST RK ISO/IEC 25040 "Systems and Software Engineering. Systems and Software Quality Requirements and Evaluation." – Text: National Standard of the Republic of Kazakhstan.

14. Recommendation on the Ethics of Artificial Intelligence. – Paris: UNESCO, 2021. – URL: https://www.unesco.org/en/articles/recommendation-ethics-artificial-intelligence

15. OECD Principles on Artificial Intelligence. – Paris: OECD, 2019. – URL: https://oecd.ai/en/ai-principles

6 Key concepts

Concept	Definitiom
ILS	An AI-powered ILS designed to provide personalized support for schoolchildren, assess abilities, create individual development pathways, generate adaptive content, and monitor achievements.
Individual development trajectory (hereinafter IDT)	a personalized learning and development pathway for the learner, formulated based on diagnostic results, an analysis of educational potential and achievements, digital profile data, and recommendations from the system and specialists.
Students digital profile	A comprehensive digital model integrating educational outcomes, diagnostic data, portfolios, observation checklists, behavioral metrics, and recommendations.
AI recomendation	A conclusion, forecast, proposal, or recommendation generated by the intelligent educational system based on an analysis of data regarding the learner, the group, the educational content, or the educational process.
Significant AI recommendation	A recommendation capable of influencing a student's educational trajectory, assessment, support, career guidance, participation in programs, self-esteem, or educational well-being.
EPTS model	A model for the diagnosis and development of learners that enables the assessment of the level of proficiency in analytical, creative, practical, and other skills and sub-skills; the identification of educational gaps, strengths, and educational potential; and the establishment of a basis for creating an individual development pathway.
Students educational gap	An insufficient level of development of a skill, sub-skill, competence, or educational outcome, identified through assessment and affecting the learner's achievement of educational goals.
The learners educational potential	The aggregate of a learner's abilities, interests, inclinations, and established or potentially developable skills and sub-skills that can be utilized to achieve educational outcomes and construct an individual development trajectory.

Human control	Review, interpretation, confirmation, adjustment, or rejection of significant AI recommendations by an educator, psychologist, expert, researcher, or authorized specialist.
Sensitive educational data	Data the improper processing of which could lead to a breach of confidentiality, discrimination, stigmatization, psychological harm, or a limitation of educational opportunities.

7 Vision

By 2027, the ILS is intended to serve as the scientific-methodological and technological foundation for the personalized support of gifted children's development in Kazakhstan and implement a continuous cycle of personalized support for gifted children (Figure 1)

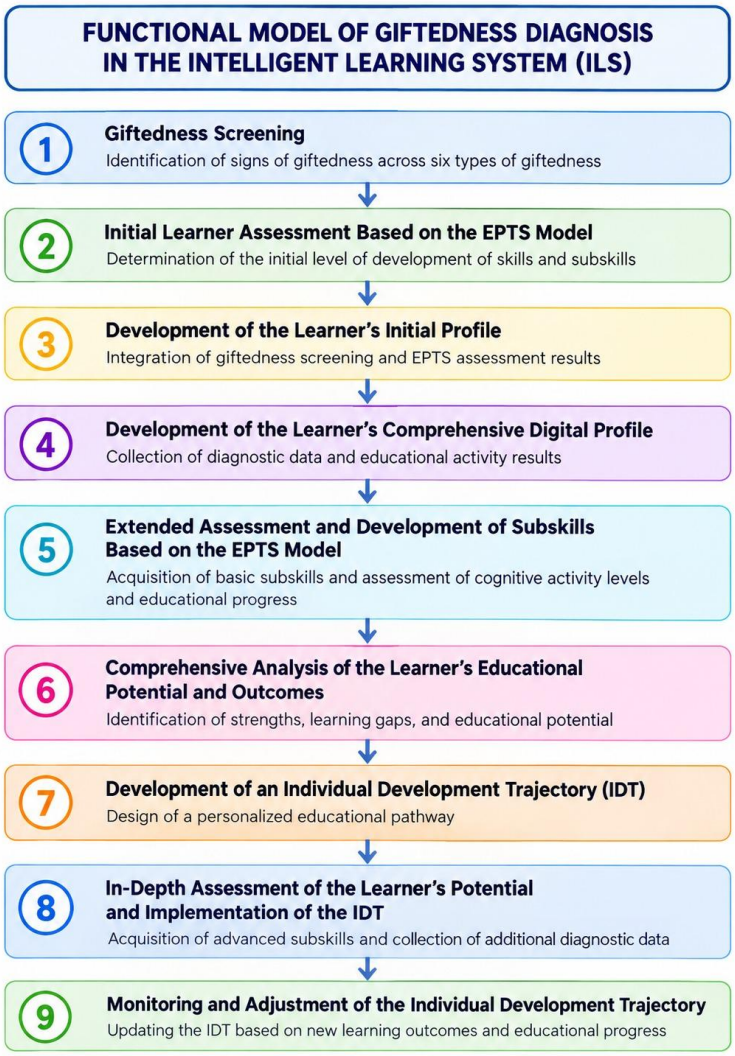

Figure 1 – Continuous cycle of personalized learning for gifted children

The ILS is not intended to be a tool for the automatic ranking of children, but rather a means to support their development, unlock their abilities, overcome educational challenges, and expand access to quality learning. Particular importance is placed on fostering trust among parents, educators, students, researchers, and educational organizations.

The vision for the ILS includes:

- unified intelligent system for diagnosis, learning, analytics, and support;
- personalized individual development trajectories;
- adaptive educational content in Kazakh, Russian, and English;
- a digital student profile incorporating diagnostic data, portfolios, observations, and learning progress;
- human review of significant AI-generated recommendations;
- protection of student data, transparency, explainability, and ethical review;
- training for educators, psychologists, methodologists, and administrators in the responsible use of the ILS.

8 Target groups and ecosystem participants

Participant	Role in ILS
Student	Undergoes screening, diagnostics, and training; receives assignments, feedback, and recommendations; and follows an individual development path.
Parent/legal representator	Receives information about the purposes of data processing, provides consent, views their child's data and recommendations, and can ask questions and withdraw consent.
Teacher	Assigns training, analyzes progress, reviews AI recommendations, provides pedagogical feedback, and supports the student.
Psychologist	Interprets psychological, pedagogical, and diagnostic data; participates in reviewing sensitive recommendations and preventing stigmatization.
Methodist	Develops and verifies instructional scenarios, assignments, courses, difficulty levels, criteria, and learning paths.
Expert	Conducts expert adjustments to the profile, technical specifications, recommendations, and analytical conclusions.
Researcher	It works primarily with anonymized or pseudonymized data for scientific analysis, reports, and publications.
Administrator / Super-administrator	Manages users, roles, access rights, logs, settings, integrations, and security.

Developer	Implements and maintains the platform, AI modules, logging, security, integrations, and interfaces.
Ethics Commission / Working Group	Conducts ethical reviews, risk assessments, monitoring of principle compliance, and incident reviews.

9 Principles of Development and Implementation

Priority of the Child's Interests

The rights, dignity, safety, psychological well-being, and educational interests of the student take precedence over technological, research, administrative, or commercial goals.

Pedagogical Justification

Every function of the ILS must serve a clear pedagogical, methodological, diagnostic, or research purpose.

Legality and Purpose-Specific Data Use

Student data is used solely for predetermined, lawful, and pedagogically justified purposes.

Data Minimization

The system collects only the data necessary to perform its stated functions.

Transparency

Students, parents, educators, and project participants must understand what data is being collected, how AI is utilized, and who is responsible for decisions.

Explainability

Significant AI-generated recommendations must be accompanied by a clear explanation and the possibility of review.

Human Oversight

AI does not make final decisions affecting a student's educational trajectory, diagnosis, assessment, support, or access to opportunities.

Non-Discrimination

The IES must not create or exacerbate inequalities based on language, social status, geography, gender, culture, physical or psychological characteristics, or the digital divide.

Confidentiality and Security

Data must be protected through organizational, technical, and software measures, with access granted strictly within the scope of authorized roles.

Human Accountability

Responsibility for data usage and the application of AI recommendations lies with organizations, officials, and authorized specialists, not with algorithms.

10 Scientific and Theoretical Foundations of the Giftedness and Assessment Model in the ILS

Within this framework, giftedness is viewed not as a fixed trait of the child nor merely as a high level of intelligence, but as a dynamic combination of abilities, creativity, motivation, personality characteristics, and educational environment conditions. This approach enables a shift from a narrow understanding of giftedness based on IQ or academic achievement toward a comprehensive assessment of a learner's potential.

The model is grounded in contemporary concepts regarding the multifactorial nature of giftedness. According to J. Renzulli's Three-Ring Model, giftedness emerges from the interaction of three key components: high-level ability, creativity, and a high degree of task commitment. Crucially, for assessment within an ILS, it is important not only to identify the presence of these components but also to describe the specific actions, skills, and problem-solving methods through which they manifest in the child.

Accordingly, this framework supplements the giftedness model with the logic of the Educational Programs for Gifted Students (EPTS) model. This allows for a transition from a general description of giftedness to a more precise profile of the child's educational, cognitive, and self-regulatory skills. While Renzulli's model and the multifactorial approach explain the components that constitute giftedness, the EPTS model demonstrates the specific skills and actions through which these components can be identified during digital assessment.

In the proposed model, giftedness is examined across several interconnected levels.

The first level comprises the components of giftedness. At this level, the assessment covers intellectual abilities, creativity, motivation, cognitive interest, the capacity for independent problem-solving, and the readiness to engage in complex activities. This level makes it possible to determine the child's overall potential and identify which aspects of their development require further in-depth study.

The second level concerns the type of giftedness manifestation. Giftedness can manifest in various spheres: intellectual, academic, creative, technical, artistic-aesthetic, leadership, social, or a combination thereof. Therefore, assessment should not be limited solely to academic achievement or IQ test results. It is important to consider the activities in which the child demonstrates the greatest initiative, productivity, originality, and sustained interest.

The third level focuses on skills defined by the Educational Programs for Gifted Students (EPTS) model, viewed as observable manifestations of giftedness. At this level, the assessment covers not only the task outcome but also the child's process of action: how they understand instructions, analyze conditions, identify essential features, select a problem-solving strategy, transfer methods to new situations, explain their reasoning, detect and correct errors, maintain focus on the goal, and self-regulate their activity. This level is particularly significant for ILS, as it allows for capturing not just a final score but also the child's thinking process.

The fourth level is the individual diagnostic profile. By synthesizing data on giftedness components, the type of manifestation, and EPTS-based skills, a comprehensive picture emerges regarding the child's strengths, zones of proximal

development, and the necessary conditions for pedagogical support. Such a profile enables the creation of an individualized educational pathway rather than merely categorizing the child under a specific type of giftedness.

The proposed model is particularly relevant to inclusive education. For children with diverse educational needs, high potential may manifest not through standard academic success but through specific strengths: unconventional problem-solving, rapid transfer of methods, keen interest in a particular field, visuospatial reasoning, technical construction, pattern recognition, or deep engagement in specific activities. Therefore, the assessment process must be sensitive to the various ways in which abilities manifest and should not be reduced to a single test score.

Thus, the model of giftedness underpinning the assessment integrates three theoretical and practical foundations: a multifactorial understanding of giftedness, J. Renzulli's three-component framework, and the Educational Programs for Gifted Students (EPTS) model, which serves as a tool for describing a child's specific skills and actions. Such a model enables an ILS to move beyond a general assessment of abilities toward the creation of an individual learner profile; this profile reflects the student's potential, type of giftedness, established skills, areas for growth, and recommendations for ongoing support.

Appendix G outlines the theoretical approaches underlying the student giftedness assessment model, their significance for organizing assessment procedures, and the mechanisms for integrating them into the ILS. Based on these approaches, a structural model for assessing giftedness has been developed; it combines the evaluation of giftedness components, manifestation types, and skills and sub-skills (based on the EPTS model) with the creation of an individual diagnostic profile for the learner (Figure 1).

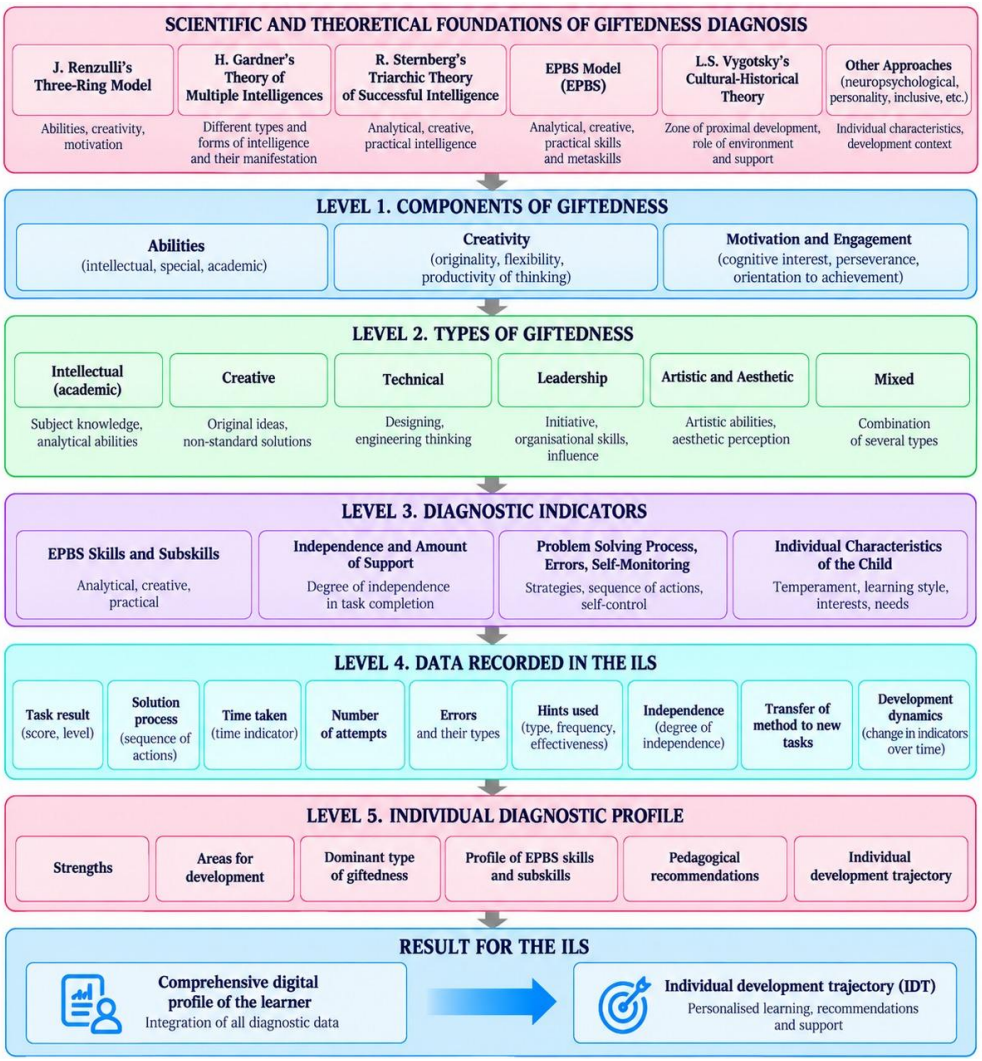

Figure 1 – Structural model for diagnosing student giftedness in an ILS

The presented structural model illustrates the interrelationship between the components of giftedness, its manifestations, the skills and sub-skills diagnosed via the EPTS model, and the creation of an individual diagnostic profile for the learner. The results of the comprehensive assessment are integrated into the learner's digital profile and used to design an individual development pathway, formulate pedagogical recommendations, and monitor educational progress.

11 Functional Model of an ILS

The functional model of an ILS represents a continuous cycle of identifying, diagnosing, developing, and supporting a learner's educational potential. The model is based on the principle of personalized learning, wherein the educational pathway is formulated and adjusted using objective data regarding the learner's abilities, educational outcomes, developmental progress, and individual needs.

The functional model of the ILS enables a flexible educational progression trajectory and comprises nine interconnected stages.

№	Stage	Purpose	Primary Result
1	Giftedness Screening	Initial identification of signs of various types of giftedness, educational interests, motivation, and potential areas of development	Preliminary Student Giftedness Profile
2	Initial EPTS Diagnostics	Assessment of the level of development of analytical, creative, practical, and other sub-skills	Map of sub-skills, strengths, and educational gaps
3	Forming the Initial Student Profile	Integration of giftedness screening results and initial diagnostics based on the EPTS model	Initial Student Profile
4	Forming the Comprehensive Student Digital Profile	Integration of giftedness screening results, EPTS diagnostics, educational achievements, observation data, digital portfolio data, and other data into a single digital student model	Comprehensive Student Digital Profile
5	Advanced EPTS Diagnostics & Sub-skill Development	Refinement of sub-skill development levels and implementation of programs for their formation	Sub-skill development dynamics and refined profile
6	Comprehensive Analysis of Educational Potential & Results	Analytical conclusion, system recommendations, and the basis for forming an individual development trajectory	Analytical conclusion and system recommendations
7	Forming the IDT	Forming a personalized learning and development path based on profile data and analysis results	Individual Development Trajectory (IDT)
8	In-depth Student Potential Diagnostics & IDT Implementation	Implementation of educational programs, developmental activities, projects, research work, and other forms of student support	Educational achievements, development results, and accumulated data
9	IDT Monitoring & Adjustment	Evaluation of educational progress, re-diagnostics, and adjustment of the development trajectory	Updated Digital Profile and actualized IDT

The Personalized Educational System (PES) operates on a cyclical basis. The results of each stage are used to refine the learner's digital profile and subsequently adjust their Individual Educational Trajectory (IET).

Personalized learning within the PES is facilitated by utilizing data from screenings, diagnostic assessments, educational achievements, digital portfolios, and specialist observations, as well as results from project-based work, research activities, and academic competitions.

A flexible educational progression path allows for adjustments to the learner's educational route based on the development of their abilities, the acquisition of specific sub-skills, the achievement of educational goals, and changes in educational needs.

Any significant modifications to the IET are subject to mandatory expert review by a teacher, psychologist, methodologist, or other authorized specialist.

The results of completing PES stages are stored in the learner's digital profile and used to generate recommendations, adjust the IET, document and digitally verify educational outcomes, assess developmental progress, and conduct expert evaluations and monitoring of the PES's effectiveness.

11.1 Personalized Learning and Flexible Educational Progress Trajectory

Personalized learning within the ILS framework entails organizing the educational process such that learning content, the sequence of mastering educational modules, task complexity, developmental recommendations, individual goals, and educational activities are determined based on the specific characteristics of the individual learner.

The foundation of personalization is a comprehensive digital learner profile, constructed from data including giftedness screening results, EPTS model diagnostics, educational achievements, project and research activity outcomes, observational checklists, specialist observations, digital portfolio data, interactions with the digital educational environment, and the dynamics of educational progress.

Personalization is implemented based on the following principles:

- consideration of the learner's individual abilities and educational potential;
- consideration of diagnostic results regarding sub-skills and educational gaps;
- consideration of strengths and manifestations of giftedness;
- consideration of the pace at which educational material is mastered;
- consideration of interests, motivation, and educational preferences;
- continuous updating of the educational pathway based on new data.

A flexible educational progress trajectory is a dynamically evolving learning and development path, shaped by the learner's digital profile data and subject to adjustment as new educational outcomes are accumulated.

The flexible educational trajectory is established based on giftedness screening results, EPTS model diagnostics, analysis of educational potential, identified educational gaps, educational achievements, specialist observations, and digital learner profile data.

Modifications to the educational trajectory may occur when the learner achieves set goals, when new educational needs are identified, when there are changes in the level of sub-skill development, upon the emergence of new achievements, or based on expert assessment results. All changes to the Individual Educational Trajectory (IET) are recorded in the system and saved in the student's educational development history.

Significant changes to the educational trajectory are subject to mandatory expert review by an educator, psychologist, methodologist, or other authorized specialist.

When creating or adjusting the IET, the system must allow for the review of the rationale behind educational decisions, including diagnostic results, digital profile metrics, and the analytical findings and recommendations used to shape the trajectory.

During the pilot testing of the system, the following aspects are evaluated: the quality of the educational trajectory's design, the justification for any changes, alignment with the student's educational needs, the trajectory's impact on educational progress, the development dynamics of sub-skills, and the satisfaction of the educational process participants.

11.2 Accumulation, certification, and transfer of individual educational outcomes

One of the key mechanisms of the ILS is ensuring the continuous accumulation, validation, utilization, and transfer of a learner's individual educational outcomes throughout their participation in educational programs.

The educational outcome accumulation mechanism preserves the history of the learner's educational development and allows for the consideration of not only final achievements but also the dynamics of how abilities, competencies, and sub-skills are formed.

The following categories of educational outcomes are subject to accumulation within the ILS:

– giftedness screening results;
– diagnostic results based on the EPTS model;
– results regarding the formation and development of sub-skills;
– results of completing educational modules and programs;
– results of practical assignments;
– project activity results;
– research activity results;
– results of participation in Olympiads, contests, and competitions;
– results of Individual Development Trajectory (IDT) implementation;
– expert assessments and specialist recommendations;
– achievements reflected in the learner's digital portfolio.

All educational outcomes are stored in the learner's digital profile and used to analyze educational progress, formulate recommendations, adjust the IDT, and assess the dynamics of ability development.

The system must enable the viewing of the learner's educational outcome accumulation history, indicating the date the result was obtained, the data source, the basis for recording the result, and its connection to the individual development trajectory.

Certification of educational outcomes within the ILS is implemented through a mechanism for the digital validation of the learner's educational outcomes.

Digital verification of educational outcomes is the process of recording and validating the level of competency mastery, the development of skills and sub-skills, the completion of educational programs, and the achievement of individual educational goals.

The following may be subject to digital verification:

– individual competencies;

– groups of skills and sub-skills;

– results of sub-skill assessment and development based on the EPTS model;

– educational modules and programs;

– project and research achievements;

– achievements related to the development of giftedness;

– outcomes of Individual Educational Trajectories (IETs);

– other educational achievements supported by the functionality of the Integrated Educational System (IES).

Verification of educational outcomes is based on IES data, assessment results, educational analytics, and expert review.

For each verified educational outcome, the system must provide the ability to view the grounds for verification, including assessment results, educational achievements, expert evaluations, and other data used in the decision-making process.

Certification results are stored in the learner's digital profile and may be used to shape future educational pathways and IETs.

The transfer of educational outcomes is a mechanism for recognizing previously achieved learning and developmental results when transitioning between educational programs, levels of study, educational institutions, or individual educational trajectories.

Transfer may apply to:

– assessment results;

– verified competencies;

– developed sub-skills;

– completed educational modules;

– certified educational outcomes;

– project and research achievements;

– outcomes of IET implementation.

The transfer mechanism ensures continuity in the learner's educational development, eliminates the need to re-acquire competencies that have already been mastered, and facilitates the creation of a continuous, personalized trajectory of educational progress. When utilizing the transfer mechanism, the system must ensure the preservation of information regarding the source of the educational outcome, the date of

its attainment, the basis for its recognition, and the history of its use in the learner's subsequent educational pathways.

During the pilot implementation of the ILS, the following aspects are subject to evaluation: the comprehensiveness of educational outcome accumulation, the reliability of certification mechanisms, the validity of educational achievement recognition, the quality of outcome transfer between educational programs, and the impact of these mechanisms on the personalization of learning and the learners' educational progress.

12 Pedagogical Model

The ILS pedagogical model is based on the concept of personalized development of giftedness through assessment, adaptation, activity-based learning, support, and reflection. The system must support not only the tracking of achievements but also the development of thinking, independence, and research and creative skills.

The pedagogical model comprises the following components:

1. Diagnostic component: identification of the baseline level, strengths, areas for improvement, educational interests, and thinking patterns.
2. Adaptive component: selection of content, pace, complexity, task types, and learning sequence.
3. Developmental component: fostering of divergent and convergent thinking, as well as research, creative, analytical, and practical skills.
4. Advisory component: preparation of recommendations regarding instruction, support, Olympiads, projects, career guidance, and individual development.
5. Expert component: review and adjustment of the system’s findings by a teacher, psychologist, methodologist, or subject-matter expert.
6. Reflective-monitoring component: tracking progress, analyzing effectiveness, conducting follow-up assessments, and adjusting the Individual Development Trajectory (IDT).

The learning content within the ILS must be age-appropriate, methodologically sound, and aligned with educational curricula, the language of instruction, the student's proficiency level, and principles of psychological safety.

12.1 ILS Evidential Principles

The evidentiary nature of the ILS is ensured through the use of objective data recorded by the system at all stages of the educational process, as well as the ability for experts, educators, and other authorized specialists to verify the results.

Principle of Result Measurability

All significant results generated within the ILS must have quantitative or qualitative indicators that are available for analysis and verification.

Subject to verification are the results of giftedness screening, diagnostics based on the EPTS model, learner digital profile indicators, results regarding the creation and

implementation of the Individual Educational Trajectory (IET), and the learner's educational achievements and developmental progress.

Compliance with this principle is evidenced by diagnostic results, analytical reports, the learner's digital profile, the change log, and the history of educational results.

Principle of Data Traceability

Every indicator, recommendation, conclusion, or IET modification must have a source of origin and be linked to the specific data upon which it was based.

Compliance with this principle is evidenced by system action logs, the digital profile change history, the IET adjustment history, and references to the source data used to generate recommendations.

Principle of Result Reproducibility

When the same input data is used again, the system must generate comparable diagnostic results, analytics, and recommendations.

Compliance with this principle is evidenced by the results of data reprocessing, repeat assessments, and expert verification.

Principle of expert verifiability

All significant results generated by the ILS must be available for verification by educators, psychologists, methodologists, researchers, and other authorized specialists.

Compliance with this principle is evidenced by expert opinions, pilot testing results, expert evaluation materials, and the history of the system's recommendations.

Principle of accumulating evidence of educational development

The system must ensure the preservation of the learner's educational development history and the accumulation of results obtained at various stages of the ILS operation.

Compliance with this principle is evidenced by the learner's digital profile, digital portfolio, assessment history, history of Individual Educational Trajectory (IET) implementation, and history of educational achievements.

Principle of assessing educational dynamics

The evidentiary basis for ILS results must rely not only on one-off metrics but also on an analysis of changes in the learner's results over time.

Compliance with this principle is evidenced by repeat assessment results, educational dynamics metrics, the history of sub-skill development, and monitoring results regarding IET implementation.

Principle of independent result verification

Results generated by the ILS must allow for independent verification without requiring changes to the system's source data.

Compliance with this principle is evidenced by system reports, data exports, expert evaluation results, and ILS pilot testing materials.

Principle of result explainability

All significant conclusions, recommendations, IET modifications, and analytical results must allow for the identification of the data and factors upon which they were based.

Compliance with this principle is evidenced by system analytical reports, data source information, the history of recommendation generation, and expert verification results.

12.2 Levels of the learner cognitive activity

In the ILS, the assessment of skill and sub-skill proficiency takes into account the learner's level of cognitive activity.

Levels of cognitive activity are used during EPTS-model diagnostics, the analysis of educational potential, the interpretation of diagnostic results, and the formulation of Individual Educational Trajectories (IETs).

Level 1. Recognition and reproduction

The learner recognizes objects, attributes, facts, and methods of action; reproduces learned information; selects correct answers from provided options; and performs actions based on a model.

Level 2. Understanding and application

The learner explains learned material, compares objects and phenomena, classifies information, establishes connections between objects, and applies mastered methods of action in standard situations.

Level 3. Analysis and independent use of knowledge

The learner analyzes information, identifies patterns, selects problem-solving methods, justifies their decisions, and independently applies knowledge and skills in new educational and practical situations.

For each skill and sub-skill in the EPTS model, the system determines the learner's level of cognitive activity based on diagnostic results and educational performance.

The results of cognitive activity level assessments are used to identify the learner's strengths and educational gaps, determine educational potential, formulate recommendations, and develop IETs.

Changes in cognitive activity levels over time are monitored and recorded in the learner's digital profile.

During the ILS pilot phase, the following are evaluated: the accuracy of determining cognitive activity levels; the alignment of levels with diagnostic results; the consistency of results; the dynamics of level changes; and the feasibility of using level-based interpretation to formulate IETs.

13 ILS Technological Architecture

The ILS technological architecture must ensure the reliable operation of the digital educational and analytical platform, secure data storage, scalability, the integration of AI modules, the configuration of workflows without modifying program code, and the management of access rights.

Subsystem	Purpose

Registration & Authentication Subsystem	Unified user identification, login/password, SSO, two-factor authentication, access recovery, parental confirmation of child registration.
Role & Access Control Subsystem	RBAC, access matrix, temporary permissions, access restrictions by role, organization, group, status, and learning stage.
Screening & Diagnostics Subsystem	Execution of screening and diagnostic tasks, logging of responses, attempts, duration, errors, and calculated indices.
Educational Content Subsystem	Theoretical lessons, practical tasks, micro-tasks, interactive activities, multimedia, assessment, and adaptation.
AI & Analytics Subsystem	Index calculation, progress analysis, learning difficulty identification, recommendation generation, forecasting, and personalization.
IDT Subsystem	Creation, storage, adjustment, and monitoring of Individual Development Trajectories (IDT).
Expert Review & Adjustment Subsystem	Verification, adjustment, or rejection of student profiles, IDTs, recommendations, and learning paths by authorized specialists.
Reporting & Dashboards Subsystem	Reports on students, groups, educators, courses, diagnostics, progress dynamics, indices, recommendations, and risk factors.
Security & Logging Subsystem	Logs of logins, actions, data modifications, roles, permissions, data exports, expert adjustments, and security incidents.
Integration Subsystem	API and integration with LMS, educational platforms, analytical services, and state educational systems.

14 Learner Data Model and Digital Profile

The learner's digital profile is a central element of the ILS. It consolidates the data required for diagnostics, learning personalization, the creation of Individual Educational Trajectories, progress monitoring, and the generation of recommendations. At the same

time, the data included must be limited to the minimum necessary and align with the stated objectives.

Code	Data Category	Examples	Risk Level
D1	Personal Identification Data	Full name, age, school, grade/class	High
D2	Legal Representative Contact Data	Phone number, email address	High
D3	Educational Data	Grades, task results, tests, projects, Olympiads/competitions	Medium / High
D4	Diagnostic Data	Giftedness diagnostic results, cognitive indicators, attention, memory, thinking	High
D5	Behavioral Data	Activity logs, task duration, error frequency, interaction history	Medium / High
D6	Psycho-pedagogical Data	Motivation, emotional state, stress levels, psychologist recommendations	High
D7	AI Recommendation Data	Individual trajectory, progress forecast, development recommendations	High
D8	Technical Data	Login logs, IP address, device info, date and time of actions	Medium
D9	Anonymized Research Data	Datasets without direct identification of the student	Low / Medium
D10	AI-Generated Content	Tasks, explanations, hints, feedback	Medium

Diagnostic, psycho-pedagogical, and prognostic data, as well as high-impact AI recommendations, are classified as sensitive information; they require an enhanced level of protection, restricted access, a justified purpose, and human oversight.

A comprehensive digital learner profile integrates results from giftedness screening, EPTS-model diagnostics, educational potential analysis, the implementation of an individual development pathway, educational achievements, and specialist observations. The accumulated data are used to analyze the learner's developmental trajectory, formulate and adjust pedagogical recommendations, update the individual development pathway, monitor educational progress, and conduct expert assessments.

14.1 Verification of the Learner Digital Profile

Verification of the learner digital profile is a procedure for checking the completeness, currency, accuracy, and consistency of the data used to construct the profile.

The purpose of verification is to confirm that the learner digital profile accurately reflects diagnostic results, educational achievements, developmental progress, and the learner's individual characteristics all of which inform the formulation of recommendations and the ITR.

The following data within the digital profile are subject to verification:

– giftedness screening results;
– EPTS-model diagnostic results;
– results of follow-up diagnostics;
– levels of skill and sub-skill development;
– identified strengths and educational gaps;
– educational progress indicators;
– results of ITR implementation;
– achievements recorded in the digital portfolio;
– results of project, research, competition, and Olympiad activities;
– indicators of the learner's educational potential;
– data from observation checklists and expert observations by specialists.

Verification of the digital profile involves checking for:

– the presence of results from ILS stages completed by the learner at the time of the check; – consistency of digital profile data with initial diagnostic and observational data;
– accuracy of the display of EPTS screening and diagnostic results;
– accuracy of educational progress metric calculations;
– alignment of identified strengths and educational gaps with the learner's actual performance;
– alignment of recommendations with digital profile data;
– ability to identify the rationale behind recommendations and Individual Educational Trajectories (IETs);
– alignment of IETs with digital profile data;
– absence of contradictions between different data sources;

– preservation of the digital profile's change history.

Digital profile verification may be performed by educators, psychologists, methodologists, researchers, and other authorized specialists.

During the pilot testing of the ILS, the following are subject to evaluation:

– completeness of the digital profile;

– reliability of the data contained in the profile;

– accuracy of data integration from various sources;

– traceability of the origin of profile metrics;

– accuracy of profile data usage in generating recommendations and IETs;

– feasibility of independent expert verification of results.

Confirmation of the digital profile's accuracy is provided by diagnostic results, digital portfolio data, specialist observation records, monitoring results, the history of IET implementation, system change logs, and expert verification results.

14.2 Presentation of the Learner's Digital Profile Data

The learner's digital profile must enable the viewing, analysis, and expert review of data accumulated at various stages of the ISL's (Integrated System for Learning) operation.

The digital profile must present information covering at least the following areas:

– the learner's giftedness profile;

– diagnostic results based on the EPTS model;

– levels of skill and sub-skill development;

– identified strengths and educational gaps;

– indicators of educational potential;

– indicators of educational progress (dynamics);

– results of the implementation of the Individual Development Trajectory (IDT);

– the learner's educational achievements;

– digital portfolio materials;

– results of specialist observations;

– the digital profile's modification history;

– the history of the learner's educational development;

– the rationale behind recommendations and the individual development trajectory.

Data presentation must enable:

– viewing the learner's current results;

– analyzing performance trends over various time periods;

– comparing results from different diagnostic stages;

– viewing data sources used to generate profile indicators;

– analyzing the rationale behind recommendations and the individual development trajectory;

– conducting an independent expert review of the results.

During the ISL pilot phase, the following aspects are subject to evaluation: the completeness of the digital profile data presentation, the ease of analyzing results, the ability to trace the origin of indicators, and the feasibility of using the digital profile for making educational decisions and conducting expert assessments.

15 Requirements for AI and Generative AI

AI modules within the Educational Information System (EIS) must have a strictly defined purpose and specifications regarding inputs, outputs, limitations, the level of impact on the learner, risk level, human oversight requirements, and procedures for deactivating the module upon the detection of risks.

The use of AI within the EIS is permitted for the following tasks:

analyzing educational progress and identifying learning difficulties;

calculating indices, levels of sub-skill acquisition, and developmental trends;

generating learning tasks, explanations, hints, feedback options, and practice materials;

selecting the difficulty level, pace, sequence, and type of tasks;

formulating preliminary recommendations for the teacher, psychologist, parent, and student;

supporting the creation of an individual development pathway;

preparing anonymized analytics and reports.

Content generated by AI may not be used in official educational materials, reports, recommendations, or diagnostic findings without verification by a teacher, methodologist, expert, or other authorized specialist.

It is prohibited to input a student's full name, contact details, individual diagnostic results, psychological information, health data, individual AI recommendations, photographs, audio, video, or other information that could identify the child into open or external AI services.

16 Human oversight of AI recommendations

All significant AI recommendations within the ILS are subject to mandatory human review. AI recommendations are advisory in nature and do not constitute a final pedagogical, psychological, administrative, or legal decision.

Recommendation Type	Reviewer / Verified By	Decision After Review
Recommendation on Individual Development Trajectory (IDT)	Teacher, methodologist, expert	Approve, adjust, postpone, or reject the IDT.

Conclusions on signs of giftedness	Expert, psychologist, research team	Use as a preliminary conclusion requiring comprehensive interpretation.
Recommendations on psychological and pedagogical support	Psychologist, teacher, expert team (if needed)	Apply only after professional interpretation.
Career guidance recommendations	Teacher, psychologist, parent, student	Treat as a guidance benchmark, not as a restriction of choice.
Recommendations for Olympiads, competitions, and projects	Teacher, methodologist, expert	Approve taking into account the student's interests, readiness, and workload.
Risk of overload, stress, or decline in motivation	Psychologist, teacher, parent	Conduct an additional check and adjust the workload accordingly.

If a recommendation is unclear, inexplicable, contradictory, potentially harmful, or based on incomplete data, it is not implemented pending further review.

17 Legal and ethical framework for data use

The ILS must operate within the framework of the legislation of the Republic of Kazakhstan, the Program's internal documents, and approved ethical principles. The legal and ethical framework must ensure legality, voluntary participation, informed consent, data minimization, confidentiality, security, transparency, explainability, verifiability, non-discrimination, and human accountability.

Implementation of the ILS requires the following set of internal documents:

- Regulation on the ethical and legal regulation of the collection, processing, and use of student data within the ILS;
- Code of ethics for the use of AI and student data within the ILS;
- Procedure for obtaining informed consent;
- Consent form for parents or legal guardians;
- Plain-language explanation form for students;
- Student data access matrix;
- Procedure for data anonymization and pseudonymization;
- Procedure for human review of AI recommendations;
- Ethical review checklist;
- Incident log;
- Methodology for monitoring compliance with ethical principles.

18 Informed Consent and Participant Rights

Before the processing of a student's personal data begins, the legal representative must receive clear information regarding the Program, the purposes of data processing, data categories, the use of AI, potential AI-generated recommendations, data retention periods, parties with access, the rights of the student and parent, the procedure for withdrawing consent, and data protection mechanisms.

The student is provided with an explanation in simple language regarding why the system is used, what data may be collected, who will see the results, how AI assists, why important decisions are reviewed by a human, and whom to contact in case of questions or discomfort.

The parent or legal representative has the right to grant consent, decline participation, withdraw consent (fully or partially), request information about the child's data, demand the correction of inaccurate data, obtain an explanation of a significant AI recommendation, and file a complaint.

Refusal to participate or withdrawal of consent must not result in lower grades, unfair treatment of the student, restricted access to compulsory education, or other negative consequences.

19 Security, anonymization, and pseudonymization

The IS must be designed with data protection by design and default and security principles integrated into all stages of the lifecycle. Data access is granted based on roles and limited to the minimum necessary scope.

— user authentication, two-factor authentication, and concurrent session control;

— access control at the level of roles, organizations, groups, modules, tables, fields, and data types;

— logging of logins, views, modifications, deletions, exports, expert adjustments, and administrative actions;

— backup and disaster recovery;

— data export control and prevention of unauthorized copying;

— data anonymization or pseudonymization for scientific analysis, publications, and external expert review;

— separate storage of matching keys and research datasets;

— recording and investigation of security incidents.

20 Prohibited practices

The following are prohibited within the IS:

1. Collecting data on schoolchildren without a legal basis and informed consent, where such consent is required.

2. Using data for purposes other than those stated or collecting data "just in case."

3. Transferring data to third parties without a legal basis and compliance with confidentiality requirements.

4. Uploading personal and sensitive data of schoolchildren to public AI services.

5. Using AI recommendations as the sole basis for a significant decision.

6. Automatically assigning labels such as "ungifted", "weak," "unpromising," or "underachieving" to a schoolchild.

7. Limiting a schoolchild's educational opportunities based on an automated conclusion. 8. Publish individual diagnostic results, photos, videos, or identifiable information without specific grounds.

9. Create public rankings of students based on sensitive data.

10. Ignore complaints, errors, incidents, signs of discrimination, or harmful recommendations.

21 Ethical Review and Risk Management

An ethical review is conducted prior to the pilot implementation of the ILS, as well as whenever there are changes to high-risk functions, data composition, or AI modules. The review assesses pedagogical rationale, data categories, the presence of consents, data minimization, access, the protection of sensitive data, transparency, explainability, human oversight, the risk of discrimination, the risk of stigmatization, and incident response procedures.

Risk	Potential Consequences	Mitigation Measures
Data Leakage	Breach of confidentiality and trust	RBAC, encryption, logging, export restrictions, incident investigation.
Erroneous AI Recommendation	Incorrect trajectory, overload, or harmful recommendation	Human verification, expert review, explainability, quality monitoring.
Discrimination / Bias	Unjustified variation in recommendations between groups	Bias analysis, audit of results, module suspension until verified.
Stigmatization	Lower self-esteem and restricted opportunities	Prohibition of labeling, careful communication, psychologist involvement.
Excessive Data Collection	Increase in legal and ethical risks	Data mapping, data minimization, review of processing purposes.
Low-Quality AI Content	Errors in tasks and explanations	Pedagogical and methodological verification prior to usage.

22 Organizational implementation model

ILS implementation should be carried out in stages, with the appointment of responsible persons, approval of local documents, training of users, setting up access, testing, ethical review, pilot testing and regular monitoring.

Level	**Content / Description**
Regulatory / Normative	Approval of standards, concepts, regulations, codes, procedures, consent forms, access matrices, and recommendation verification protocols.
Organizational	Establishment of working groups, appointment of responsible personnel, ethics committees, administrators, and partner school coordinators.
Pedagogical	Development of application scenarios, courses, diagnostics, methodological materials, assessment criteria, and guidelines for educators.
Technological	Development of the platform, AI modules, databases, user interfaces, logging systems, APIs, backup systems, and security infrastructure.
Ethical	Informing participants, obtaining consent, assessing risks, addressing appeals, and monitoring adherence to ethical principles.
Research	Collection of anonymized data, evaluation of effectiveness, preparation of reports, academic publications, and recommendations.

23 Implementation stages

Stage	Timeline	Key Actions	Deliverable / Result
1. Preparatory	2025–2026	Clarification of requirements, approval of the concept and local regulations, formation of the working group.	Approved regulatory and organizational framework.
2. Design & Architecture	2026	System architecture, data model, user roles, interfaces, AI modules, access matrix, learning scenarios.	Design documentation and prototype model.
3. Developmen t	2026–2027	Implementation of modules for screening, diagnostics, learning, IDT,	Working version of the ILS.

		recommendations, analytics, security, and administration.	
4. Internal Testing	2026	Functional, technical, pedagogical, ethical, and security testing.	Testing report and list of revisions.
5. Ethical Review	2026	Evaluation of data, risks, consents, human oversight, and non-discrimination compliance.	Expert opinion approving pilot implementation.
6. Pilot Implementation	2026	Testing in partner schools, collecting feedback from teachers, parents, and students, analyzing KPIs and incidents, conducting expert evaluation of digital profiles, IDTs, system recommendations, and personalization mechanisms.	Pilot testing report.
7. Refinement & Scaling	2027	Resolving deficiencies, expanding content, integrations, reporting features, and methodological materials.	Expanded deployment release version.
8. Monitoring & Sustainable Development	2026–2027	Regular audit, user training, updating AI modules, reviewing normative documents.	Sustainable IES ecosystem.

24 Monitoring, Audit, and Effectiveness Assessment

Monitoring of the ILS is conducted regularly and encompasses technical, pedagogical, ethical, legal, and user-related metrics. Monitoring results are compiled into reports and used to refine the system, update documentation, train users, and mitigate risks.

Monitoring Area	**Metrics / Indicators**
Pedagogical Effectiveness	Dynamics of educational outcomes, sub-skill mastery level, IDT quality, course progress, engagement level.
Quality of AI Recommendations	Accuracy, explainability, rate of expert verification/adjustment, number of disputed recommendations.
Data Security	Security incidents, unauthorized access attempts, completeness of logging, compliance with the access matrix.

Ethical Compliance	Absence of discrimination, stigmatization, harmful language, complaints, and consent violations.
User Experience (UX)	Satisfaction levels of students, parents, teachers, psychologists, methodologists, and administrators.
Technical Reliability	System availability, response time, fault recovery, scalability.

24.1 Criteria for the Pilot Testing and Expert Evaluation of the ILS

The pilot testing and expert evaluation of the ILS are conducted to confirm the implemented system's compliance with the provisions of this Concept and to assess the correct functioning of key system mechanisms, the quality of learning personalization, the effectiveness of IET formation, and the achievement of stated educational outcomes.

Expert evaluation is carried out based on an analysis of ILS data, pilot testing results, digital profiles of learners and IETs, educational outcomes, analytical reports, system logs, expert assessments, and other documentation generated during the ILS operation.

The primary objects of the pilot testing and expert evaluation are the following ILS components.

Assessment Object	**What is Assessed**	**Key Criteria**	**Sources of Verification**
Giftedness Screening	Accuracy in identifying signs of giftedness and forming the preliminary student profile	Completeness of the profile, consistency with expert assessments, stability of results	Screening results, giftedness profile, expert conclusions
EPTS Diagnostics	Accuracy of assessing analytical, creative, and practical sub-skills	Correctness of calculations, stability of results, sensitivity to changes, reproducibility of results	Diagnostic results, sub-skill map, analytical reports
Initial Student Profile	Correctness of integrating screening and diagnostic data	Completeness of data, absence of contradictions, profile validity	Initial student profile, diagnostic and screening results
Comprehensive Student Digital Profile	Quality of formation and updating of the digital profile	Data completeness, data relevance, traceability of data	Student digital profile, audit log, digital portfolio

		origin, correctness of profile updates, feasibility of independent verification	
Comprehensive Analysis of Educational Potential & Results	Validity of analytical conclusions and system recommendations	Explainability of analytics, alignment with source data, soundness of conclusions, utility of recommendations	Analytical reports, evaluations, expert feedback
AI Recommendations & System Guidance	Accuracy of recommendations based on student digital profile data	Alignment with digital profile data, validity, explainability, compliance with student educational needs	System recommendations, student digital profile, analytical reports, expert conclusions
IDT Formation	Correctness of forming the IDT based on diagnostics and analysis results	Personalization, validity, feasibility, alignment with student profile	IDT, student digital profile, expert conclusions
IDT Implementation & Adjustment	Support effectiveness and timeliness of development trajectory adjustments	Development dynamics, alignment of adjustments with educational outcomes, achievement of IDT goals	IDT history, monitoring results, re-diagnostic results
Accumulation, Certification & Transfer of Educational Outcomes	Accuracy of tracking, verifying, and recognizing educational achievements	Completeness of accumulated results, credibility of digital verification, correctness of educational outcome transfers	Digital portfolio, achievement registry, digital verification records, history of educational outcomes

Based on the results of the expert assessment, each object may be assigned one of the following statuses:

– complies with the provisions of the Concept;

– partially complies with the provisions of the Concept;

– requires revision;

– does not comply with the provisions of the Concept.

The results of the expert assessment are used to improve the ILS architecture, adjust algorithms, update diagnostic tools, enhance the quality of Individual Development Trajectories (IDTs), refine learning personalization mechanisms, update regulatory and methodological documents, and make decisions regarding the system's further implementation and scaling.

25 Expected Results

Implementation of the Concept will enable:

1. Creation of a unified ILS for the personalized support of gifted schoolchildren.
2. Provision of diagnostics, analytics, instruction, IDT formulation, and recommendations within a single digital cycle.
3. Reduction of the workload on educators through the automation of material preparation, analytics, and preliminary recommendations.
4. Enhancement of the quality of individual student support through data, expert review, and progress monitoring.
5. Assurance of student data protection, transparency, explainability, and human oversight of AI-generated recommendations.
6. Building trust among parents, educators, students, and partner organizations regarding the use of AI in education.
7. Creation of a scientific and methodological foundation for the development of the ILS in Kazakhstan and the training of teaching staff to work with gifted children.

26 Final Provisions

This Concept enters into force on the date of its approval by the authorized body or the head of the project-executing organization. The Concept serves as the basis for the development, piloting, implementation, and maintenance of the ILS, as well as for the preparation of technical documentation, methodological materials, internal regulations, consent forms, instructions, and monitoring procedures. The concept is subject to revision in the event of changes to the legislation of the Republic of Kazakhstan, international standards, the ILS architecture, the composition of processed data, AI modules, or the conditions for the Program’s implementation, or upon the identification of new pedagogical, ethical, legal, or technological risks.

Appendix A. Implementation Roadmap

№	Action / Event	Responsible Parties	Deliverable / Result
1	Approval of the IES Concept	Working group, Scientific and Technical Council, Academic Council	Approved conceptual framework document.
2	Updating Regulations, Ethics Code, Access Matrix, and Procedures	Working group, legal counsel, data governance officer	Complete set of internal regulations and policies.
3	Development of System Architecture and Data Model	Developers, business analysts, methodologists	Architectural diagram, data map, module specifications.
4	Development of Screening, Diagnostic, and Learning Modules	Developers, methodologists, educators	Functional system modules and educational content.
5	Development of AI Modules and Expert Review Mechanisms	Developers, domain experts, psychologists	AI recommendation engine with human oversight.
6	Configuration of Security, Roles, Logging, and Backup Systems	System administrator, developers	Secured IT infrastructure.
7	Internal Testing and Ethical Review	Working group, subject matter experts	Testing report and ethical evaluation approval.
8	Pilot Implementation in Partner Schools	Project coordinators, teachers, psychologists	Pilot implementation report and enhancement proposals.
9	Refinement and System Expansion	Developers, methodologists	Updated and expanded IES release version.
10	Continuous Monitoring and Annual Document Review	Working group, ethics committee	Annual progress report and updated regulatory documents.

Appendix B. Key Performance Indicators

KPI Group	Metric / Indicator	Target Value / Benchmark
Technical	IDT Generation Time	No more than 5 minutes per user
Technical	Interface Response Time	Up to 2 seconds under standard load
Technical	Scalability	Up to 10,000 concurrent active users with suitable infrastructure
Pedagogical	Content Adaptability	Adaptation of tasks and materials to student age, level, interests, and profile
Pedagogical	IDT Quality	Mandatory confirmation of IDT by a teacher/expert prior to implementation
Ethical	Human Verification of Critical Recommendations	100% of high-impact AI recommendations
Security	Action Logging	100% of logins, data modifications, expert adjustments, and administrative actions
Data Protection	Anonymization for Research Reports	100% of external reports and publications strictly in anonymized/aggregated form
User Experience	User Satisfaction Rate	At least 85–90% based on survey results
Monitoring	Risk and Incident Reporting	At least once per quarter during the pilot testing phase

Appendix C. Risk Matrix

№	Risk Description	Risk Level	Control Measure
1	Absence of data processing consent	High	Consent registry, blocking data processing in case of missing or revoked consent.
2	Unauthorized access	High	RBAC, two-factor authentication, system logging, permission auditing.
3	Unjustified use of sensitive data	Critical	Data mapping, separate explicit consent, ethical evaluation, restricted access.
4	Erroneous AI recommendation	High	Human verification, explainability, override capability, adjustment history logging.
5	Discriminatory output / bias	Critical	Bias assessment, group result analysis, module suspension upon anomaly detection.
6	Stigmatizing terminology	High	Ban on labeling, psychological review, adjustment of recommendation phrasing.
7	Data leakage during export	High	Export control, data anonymization, prohibition of personal devices and public clouds.
8	Low-quality AI-generated content	Medium / High	Mandatory review by a teacher/methodologist prior to deployment.
9	Excessive student workload	Medium / High	Monitoring completion time, error rates, behavior; teacher and psychologist intervention.
10	Insufficient user onboarding	Medium	Briefings, methodological guidelines, technical support, and user training.

Appendix D. Scientific and Methodological Justification of the Giftedness Assessment Model in the ILS

Scientific Basis	Included in Model	Impact on Diagnostics	Integration into ILS
J. Renzulli's Three-Ring Conception of Giftedness	Giftedness as the interaction of three components: above-average ability, creativity, and task commitment/motivation.	Diagnostic assessment evaluates not only intelligence quotient (IQ), but also creative thinking, task interest, perseverance, and readiness to handle complex material.	ILS builds a multi-component profile of the child (ability, creativity, motivation) rather than relying solely on a final cumulative score.
H. Gardner's Theory of Multiple Intelligences	Diverse types of intelligence and varied forms of talent expression.	Diagnostics are not limited to academic achievement and IQ; they account for various domains of giftedness.	ILS helps determine the dominant type of giftedness: intellectual, academic, creative, technical, social, leadership, artistic-aesthetic, or mixed.
R. Sternberg's Triarchic Theory of Successful Intelligence	Theoretical foundation for identifying analytical, creative, and practical modes of intelligence application.	Diagnostics must evaluate not only knowledge, but also analysis, the generation of novel solutions, and practical application.	ILS uses this rationale as a framework for tasks and indicators, which are then operationalized through the EPTS model.
EPTS Model of Educational Programs for Gifted Students (U. Sak)	Interconnection of identification, curriculum, instruction, assessment, support organization, and teacher training.	Diagnostics are treated not as a one-time selection process, but as an integral part of the child's ongoing educational program and support.	ILS goes beyond identifying signs of giftedness by linking diagnostic results directly to recommendations, educational pathways, and pedagogical support.
EPTS Hierarchy	A hierarchy of abilities and skills: 3 first-order	Diagnostic assessment shifts from a general evaluation of giftedness to the analysis of a	ILS translates EPTS skills and subskills into digital metrics:

of Skills (U. Sak)	abilities (analytical, creative, practical); 43 second-order skills; 152 third-order subskills.	child's specific skills and subskills during problem-solving.	solution methods, errors, prompts/hints, level of independence, transfer of learning, and developmental dynamics.
Dynamic Approach (L.S. Vygotsky)	Zone of Proximal Development (ZPD), adult guidance, and potential realization.	Diagnostics measure not only what a child can do independently, but also what they can accomplish with prompts or support.	ILS tracks independence levels, the quantity and type of hints required, task completion dynamics, and potential growth zones.
Comprehensive Diagnostic Approach	Combination of quantitative and qualitative methods: standardized tests, observation, expert evaluation, and artifact analysis.	Diagnostics become more holistic: accounting for test scores as well as behavioral patterns, solution pathways, interest, and autonomy.	ILS consolidates data across multiple sources: task performance, observations, responses, error patterns, dynamics, and specialist comments.
Person-Centered (Learner-Centered) Approach	Consideration of individual child characteristics, strengths, interests, pace of work, and educational needs.	Diagnostics aim to understand the child's unique individual profile rather than apply a restrictive "label."	ILS generates a personalized profile and tailored recommendations, selecting tasks and educational pathways aligned with the child's characteristics.
Inclusive Approach	Recognition that potential can manifest non-traditionally, especially in children with special educational	Diagnostics extend beyond conventional academic metrics to include alternative pathways of demonstrating ability.	ILS helps identify core strengths and potential in children with special educational needs.

	needs (SEN / twice-exceptional).		
System-Activity Approach	Giftedness manifests through active engagement, problem-solving, and interaction with learning materials and the environment.	Diagnostics are structured around task execution, direct observation of the child's actions, and solution-process analysis.	ILS records real-time child actions in a digital environment: answer selection, step sequence, time spent, retry attempts, and strategy adjustments.
Metacognitive Approach	The child's capacity to recognize, regulate, and articulate their own thinking processes.	Diagnostics assess whether the child can explain their solution rationale, spot errors, and adapt strategies.	ILS incorporates tasks focused on solution explanations, self-checking, error correction, and strategy selection.
Profile-Based Support Approach	Construction of an individual profile: strengths, growth areas, giftedness domain, required support level, and action plans.	Diagnostics culminate not in a binary outcome (gifted/non-gifted), but in a detailed structural mapping of the child's potential.	ILS generates a digital profile and an individualized educational trajectory (route) for the child.