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DEVELOPING STUDENTS' CRITICAL AND ANALYTICAL THINKING THROUGH INDEPENDENT LEARNING

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Abstract. This article examines the theoretical and practical foundations for developing students' critical and analytical thinking competencies through the effective organization of independent learning in higher education institutions. The study explores the essence of independent learning, modern pedagogical technologies, problem-based and project-based learning methods, as well as the role of digital learning environments and artificial intelligence tools in the educational process. Based on Bloom's Revised Taxonomy, Self-Directed Learning (SDL), Self-Regulated Learning (SRL), and the Paul–Elder Critical Thinking Framework, methodological approaches aimed at improving students' independent learning activities are proposed. The findings indicate that organizing independent learning through innovative pedagogical approaches significantly enhances students' abilities to critically evaluate information, analyze scientific literature, solve complex problems, make evidence-based decisions, and develop creative thinking skills. Furthermore, the study proposes a conceptual model integrating digital technologies and artificial intelligence into the independent learning process and provides practical recommendations for its implementation in higher education.

Keywords: independent learning, critical thinking, analytical thinking, higher education, artificial intelligence, Bloom's Revised Taxonomy, problem-based learning (PBL), self-directed learning.

Introduction. In the context of globalization and digital transformation, one of the primary objectives of higher education is to prepare specialists who are capable of independent learning and possess well-developed critical and analytical thinking skills. As higher education shifts from a traditional lecture-centered model toward a competency-based approach, independent learning has become an essential mechanism for fostering students' intellectual development. Artificial intelligence technologies, digital libraries, scientific databases, and interactive educational platforms have significantly enhanced the quality and effectiveness of independent learning. Critical thinking involves analyzing evidence, evaluating the credibility of information sources, and drawing well-founded conclusions, whereas analytical thinking requires breaking down complex problems into manageable components and identifying the relationships among them. Therefore, organizing independent learning through modern pedagogical approaches has become an important scientific and practical priority in contemporary higher education.



Literature Review. The theoretical foundations of effective independent learning are supported by Bloom's Revised Taxonomy, Facione's Critical Thinking Model, the Paul–Elder Critical Thinking Framework, Knowles' Theory of Self-Directed Learning, and Zimmerman's Self-Regulated Learning Model. These theoretical perspectives emphasize students' active engagement in the learning process and their ability to regulate, monitor, and evaluate their own learning activities. Recent studies have also demonstrated that the integration of artificial intelligence tools into education enhances students' reflective thinking, information literacy, scientific inquiry skills, and independent research competencies.

Literature Review. Independent learning is widely recognized as one of the fundamental components of contemporary higher education. Within the modern educational paradigm, students are no longer viewed as passive recipients of knowledge but rather as active learners who independently seek, analyze, synthesize, and apply knowledge in practical contexts. Consequently, the development of critical and analytical thinking skills through independent learning has become one of the leading priorities in educational research. Recent studies indicate that the core competencies required in the twenty-first century include **critical thinking, analytical thinking, problem-solving, and self-directed learning**. These competencies are widely acknowledged as essential attributes of competitive graduates capable of adapting to the rapidly evolving demands of the global labor market.

Theoretical Foundations of Independent Learning – The concept of **Self-Directed Learning (SDL)** developed by **Malcolm Knowles** occupies a central position in the theoretical foundations of independent learning. According to this theory, learners independently determine their learning objectives, select appropriate learning resources, manage the learning process, and evaluate learning outcomes. Such an approach not only enhances students' responsibility for their own learning but also promotes independent decision-making and reflective thinking. Recent studies have further expanded the SDL model by integrating it with digital learning environments, emphasizing that artificial intelligence (AI) tools can support learners' individualized learning pathways. However, scholars also argue that AI contributes to the development of independent thinking only when it is used as a supportive tool rather than as a substitute for students' own cognitive efforts.

Contemporary Perspectives on Critical Thinking – One of the most influential scholars in the field of critical thinking is **Peter A. Facione**, who defines critical thinking as the process of analyzing evidence, evaluating arguments, drawing logical conclusions, interpreting information, and reflectively monitoring one's own reasoning. From this perspective, critical thinking reflects not only the quantity of knowledge but also the quality of thinking. Furthermore, the **Paul–Elder Critical Thinking Framework**, developed by **Richard Paul** and **Linda Elder**, is



widely implemented in higher education institutions worldwide. This framework proposes essential standards of thinking, including clarity, accuracy, logic, depth, fairness, evidence-based reasoning, and consistency. These standards provide an important methodological foundation for designing independent learning activities.

Analytical Thinking and Metacognition – Recent research demonstrates that critical thinking is closely associated with metacognition and self-regulated learning. Students develop higher-order analytical competencies by planning, monitoring, and evaluating their own thinking processes. Reflection and metacognition are therefore regarded as integral components of analytical thinking. In this regard, **Barry Zimmerman's Self-Regulated Learning (SRL) model** plays a significant role. The model encompasses the stages of goal setting, self-monitoring, and self-evaluation, thereby enhancing the effectiveness of independent learning.

Independent Learning and Contemporary Pedagogical Technologies – Studies published between 2020 and 2026 identify **Problem-Based Learning (PBL)**, **Project-Based Learning (PjBL)**, **Case Study**, **Inquiry-Based Learning**, **Flipped Classroom**, and **Collaborative Learning** as among the most effective pedagogical approaches for developing critical and analytical thinking skills. Rather than encouraging students to memorize ready-made answers, these methods promote the exploration of underlying causes, the comparison of multiple perspectives, and evidence-based decision-making.

Artificial Intelligence and Independent Learning – The rapid advancement of **generative artificial intelligence technologies** between 2024 and 2026 has created new opportunities for higher education. Current research indicates that **ChatGPT** and other **Large Language Models (LLMs)** can personalize independent learning, facilitate access to scientific literature, and support reflective thinking. At the same time, excessive or uncontrolled reliance on AI may increase **cognitive offloading**, whereby learners shift substantial cognitive effort to technological systems, potentially weakening independent and critical thinking abilities. Consequently, researchers recommend adopting the principle of "**human oversight with AI assistance**," ensuring that AI serves as a supportive educational tool while preserving students' active cognitive engagement.

Research Gap – The reviewed literature indicates that international studies have extensively investigated critical thinking, metacognition, and independent learning. However, within the context of higher education institutions in **Uzbekistan**, limited research has examined integrated models that combine independent learning with artificial intelligence technologies, project-based learning, reflective assessment, and digital monitoring systems to foster critical and analytical thinking. The scientific novelty of the present study lies precisely in addressing this research gap by proposing an integrated conceptual framework



suitable for the national higher education context. **Conclusion** – The literature review demonstrates that the effectiveness of independent learning is directly influenced by students' active engagement, metacognitive regulation, the application of contemporary pedagogical technologies, and the responsible use of artificial intelligence tools. Based on these theoretical foundations, the following section presents the research methodology and the conceptual model proposed by the author.

RESEARCH METHODOLOGY. Research Purpose. The primary purpose of this study is to develop the scientific and methodological foundations for fostering university students' critical and analytical thinking competencies through the effective organization of independent learning in higher education institutions and to propose an innovative model aimed at improving this process. The study comprehensively examines the content of independent learning, modern pedagogical technologies, digital learning platforms, and the potential of artificial intelligence tools in developing students' critical and analytical thinking.

Research Object. The object of the study is the independent learning process organized in higher education institutions and the development of students' critical and analytical thinking competencies within this process.

Research Subject. The subject of the study consists of the pedagogical conditions, innovative teaching methods, digital technologies, and assessment mechanisms that contribute to the development of critical and analytical thinking during the independent learning process. **Research Methods.** This study employs a **Mixed Methods Research** approach, integrating both qualitative and quantitative research methodologies. **Theoretical Methods.** The theoretical part of the study employs the following scientific methods: Analysis of scientific literature; Comparative analysis of pedagogical and psychological sources; Generalization; Systems analysis; Content analysis; Scientific modeling. These methods enabled the systematization of contemporary scientific perspectives on independent learning, critical thinking, and analytical thinking. **Empirical Methods.** The empirical phase of the study was conducted using the following methods: Questionnaire survey; Semi-structured interviews; Pedagogical observation; Expert assessment of practical assignments; Case study; Project activity analysis. These methods made it possible to evaluate students' engagement in independent learning and to determine the level of development of their critical thinking competencies. **Revised Bloom's Taxonomy.** The **Revised Bloom's Taxonomy** developed by Anderson and Krathwohl categorizes cognitive learning into six hierarchical levels: Remember, Understand, Apply, Analyze, Evaluate, Create. Since independent learning tasks are primarily designed to target the **Analyze, Evaluate, and Create** levels, this taxonomy was adopted as one of the principal methodological foundations for developing students' critical thinking.



Paul–Elder Critical Thinking Framework. The **Paul–Elder Critical Thinking Framework** includes the following intellectual standards: Clarity; Logic; Accuracy of evidence; Fairness; Depth; Breadth; Consistency. Independent learning activities were designed according to these standards to promote high-quality critical thinking. **Self-Directed Learning Theory.** According to **Malcolm Knowles' Self-Directed Learning Theory**, learners: Identify their own learning goals; Select appropriate learning resources; Manage their own learning process; Evaluate learning outcomes independently. This theory serves as one of the methodological foundations of independent learning within the present study. **Self-Regulated Learning Model.** Based on **Zimmerman's Self-Regulated Learning Model**, students implement independent learning through the following stages: Planning; Monitoring; Reflection; Self-assessment. These stages provide a systematic framework for organizing and evaluating independent learning. **Research Stages.** The research was conducted in three consecutive stages. **Stage I – Diagnostic Stage.** During this stage: Relevant scientific literature was reviewed; International best practices were analyzed; The research problem was identified; The research hypothesis was formulated. **Stage II – Experimental Stage.** At this stage, students' independent learning was organized using the following innovative instructional approaches: Problem-Based Learning (PBL); Project-Based Learning; Case Study; Debate; Flipped Classroom; The use of ChatGPT and other artificial intelligence tools; Reflective journals; Electronic portfolios (e-portfolios). **Stage III – Analytical Stage.** During the final stage: The collected data were statistically analyzed; The effectiveness of the proposed model was evaluated; Scientific conclusions were formulated; Methodological recommendations were developed.

Research Hypothesis. The study is based on the following research hypothesis: If independent learning in higher education institutions is organized through modern pedagogical technologies, artificial intelligence tools, problem-based learning, project-based learning, reflective assessment, and digital monitoring systems, students' critical and analytical thinking competencies will improve significantly compared with those developed through traditional approaches to independent learning.

RESEARCH RESULTS AND DISCUSSION. Research Results. The findings of the study demonstrated that when the independent learning process is integrated with modern pedagogical technologies, digital learning tools, and artificial intelligence platforms, students' critical and analytical thinking competencies improve significantly. In particular, the implementation of **Problem-Based Learning (PBL)**, **Project-Based Learning (PjBL)**, **Case Study**, debates, reflective journals, and electronic portfolios was found to have a positive impact on students' independent thinking and their ability to solve scientific and practical problems. Furthermore, the study analyzed the differences between traditional

approaches to independent learning and innovative teaching practices. The results revealed that the quality of students' independent learning depends not only on the quantity of assigned tasks but also on the content of the assignments, methodological support, the effective use of digital technologies, and the assessment system. Development Indicators of Critical and Analytical Thinking Through Independent Learning

Indicator	Traditional Independent Learning	Innovative Independent Learning
Information retrieval	Moderate	High
Analysis of scientific sources	Low	High
Critical thinking	Moderate	Very High
Analytical thinking	Moderate	High
Problem-solving skills	Moderate	Very High
Decision-making	Low	High
Independent conclusion drawing	Moderate	Very High
Creative thinking	Low	High
Digital competence	Moderate	Very High

Analysis of the Table. The results presented in the table indicate that independent learning organized through innovative approaches outperforms traditional methods across all competency indicators. The most remarkable improvements were observed in critical thinking, scientific analysis, and problem-solving skills. These findings confirm that innovative instructional strategies substantially enhance students' higher-order thinking abilities and promote more effective independent learning outcomes. **Critical Thinking Indicators.** Based on the analysis, the following key indicators were developed to assess students' critical thinking competencies. **Assessment Criteria for Critical Thinking Competencies**

Indicator	Description	Assessment Criterion
Information verification	Determining the credibility and reliability of information sources	5 points
Evidence analysis	Distinguishing facts from opinions	5 points
Argument construction	Providing logical justification and reasoning	5 points

Indicator	Description	Assessment Criterion
Evaluation of opposing viewpoints	Analyzing alternative perspectives	5 points
Drawing conclusions	Making evidence-based decisions and conclusions	5 points

Total Score: 25 points. These indicators provide an objective framework for assessing students' critical thinking competencies and evaluating their ability to analyze information, construct logical arguments, and make evidence-based decisions.

Independent Learning Effectiveness Model: SMART-CTA Model. The primary advantage of the SMART-CTA model is that it views independent learning not merely as a means of acquiring knowledge but as a continuous pedagogical system aimed at developing learners' competencies. **The Impact of Modern Pedagogical Technologies.** The findings indicate that the following pedagogical technologies demonstrate the highest level of effectiveness in fostering independent learning.

Effectiveness of Innovative Methods Used in Independent Learning

Method	Critical Thinking	Analytical Thinking	Independent Learning
Problem-Based Learning	★★★★★	★★★★★	★★★★★
Project-Based Learning	★★★★★	★★★★★	★★★★★
Case Study	★★★★★	★★★★★	★★★★☆
Debate	★★★★★	★★★★☆	★★★★☆
Flipped Classroom	★★★★☆	★★★★☆	★★★★★
AI-Assisted Learning (ChatGPT)	★★★★☆	★★★★★	★★★★★
Peer Learning	★★★★☆	★★★★☆	★★★★☆
Reflective Journal	★★★★★	★★★★☆	★★★★★

As shown in the table, **Problem-Based Learning (PBL)** and **Project-Based Learning (PjBL)** demonstrate the highest level of effectiveness, significantly enhancing students' research skills, logical reasoning, analytical abilities, and problem-solving competencies. **The Role of Artificial Intelligence in Independent Learning.** Studies conducted between **2024 and 2026** indicate that artificial intelligence technologies have elevated the quality of independent learning to a new level. The analysis identified the following major opportunities: rapid analysis of scientific articles; improvement of academic writing; preparation of summaries and



annotations; generation and refinement of research ideas; creation of individualized learning trajectories; development of reflective thinking skills.

However, inappropriate use of AI may lead to several risks, including: plagiarism; superficial thinking; dependence on ready-made answers; violation of academic integrity. Therefore, artificial intelligence should not replace students' independent thinking but should instead function as a supportive educational tool that enhances learning and intellectual development. **Discussion.** The findings of this study are consistent with **Bloom's Revised Taxonomy**, the **Paul–Elder Critical Thinking Framework**, **Knowles' Self-Directed Learning Theory**, and **Zimmerman's Self-Regulated Learning Model**. The literature review demonstrates that critical thinking is developed not merely through increasing the volume of knowledge but through active pedagogical methods, reflection, problem-based learning, and independent scientific inquiry. The findings of the present study further support these theoretical perspectives. Moreover, the proposed **SMART-CTA model** enables the organization of independent learning through the integration of digital technologies and artificial intelligence. A key advantage of the model is that it integrates the stages of information searching, analysis, evaluation, and knowledge creation into a unified pedagogical framework.

Scientific Novelty of the Study. The scientific novelty of this research can be summarized as follows: a conceptual **SMART-CTA model** for developing critical and analytical thinking through independent learning has been designed; new indicators for assessing critical thinking competencies have been proposed; methodological foundations for integrating artificial intelligence into independent learning have been developed; a comprehensive methodological approach combining reflective assessment, electronic portfolios, and project-based assignments has been introduced; practical recommendations for higher education institutions have been formulated. The findings demonstrate that when independent learning is integrated with modern pedagogical technologies, digital learning environments, and artificial intelligence tools, students' critical and analytical thinking competencies improve significantly. The proposed **SMART-CTA model** provides an effective methodological framework for systematically organizing independent learning, enhancing students' research activities, and developing the essential competencies required in the twenty-first century.

CONCLUSION. The findings of this study scientifically demonstrate that organizing independent learning in higher education institutions based on modern pedagogical approaches effectively promotes the development of students' critical and analytical thinking competencies. The study comprehensively examined the content of independent learning, its organizational mechanisms, innovative pedagogical technologies, and the role of artificial intelligence tools in this process.



The literature review revealed that at the world's leading universities, independent learning is regarded not merely as a means of reinforcing knowledge but as a fundamental pedagogical mechanism for developing students' research skills, analytical thinking, problem-solving abilities, creative thinking, and reflective evaluation competencies. In particular, Bloom's Revised Taxonomy, the Paul–Elder Critical Thinking Framework, Knowles' Self-Directed Learning Theory, and Zimmerman's Self-Regulated Learning Theory constitute the methodological foundation for the effective organization of independent learning. During the study, the **SMART-CTA (Self-directed Modern Analytical Reflective Critical Thinking Approach)** model was developed as a novel conceptual framework for systematically organizing the independent learning process. This model integrates the stages of information searching, scientific literature analysis, critical evaluation, development of alternative solutions, reflection, and knowledge creation into a unified and coherent system. One of the major advantages of the model is its ability to integrate traditional independent learning activities with modern digital technologies and artificial intelligence tools. The research findings indicate that the purposeful implementation of **Problem-Based Learning (PBL), Project-Based Learning (PjBL), Case Study, Flipped Classroom, debates, reflective journals, electronic portfolios, and generative artificial intelligence tools** significantly improves students' critical and analytical thinking performance. At the same time, the study emphasizes that the use of artificial intelligence technologies must strictly adhere to the principles of academic integrity, verification of information reliability, and preservation of independent thinking. The scientific novelty of this research lies in the development of a conceptual model for enhancing critical and analytical thinking through independent learning, competency assessment indicators, and methodological recommendations for the effective application of artificial intelligence in higher education. These findings contribute to improving the organization of independent learning practices in higher education institutions while enhancing educational quality and students' professional competencies. Based on the research findings, the following practical recommendations have been proposed: designing independent learning tasks using problem-based and project-based approaches; incorporating critical and analytical thinking indicators into every independent assignment; developing methodological guidelines for the effective use of artificial intelligence tools; implementing reflective assessment and electronic portfolios within the student evaluation system; organizing specialized training on academic writing, scientific information analysis, and media literacy; and continuously monitoring independent learning outcomes through digital assessment systems.

In conclusion, integrating independent learning with modern pedagogical technologies and digital learning environments enhances not only students'



knowledge acquisition but also their critical, analytical, and creative thinking competencies. Consequently, such an approach represents an essential prerequisite for preparing competitive professionals who are capable of independent decision-making and innovative thinking.

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