

Values-Driven AI Framework for Preschool and Elderly Learning in Bulgaria

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ABSTRACT

The accelerated integration of artificial intelligence (AI) into educational settings has intensified debates concerning pedagogical quality, ethical responsibility, and alignment with human values. In Bulgaria, preschool education and elderly learning environments represent socially sensitive domains in which AI technologies may offer benefits such as adaptive learning, improved accessibility, and reduced professional workload, while simultaneously posing risks related to inequity, value erosion, and diminished human oversight. Situated within the context of societal turbulence and shifting value structures examined by COST Action CA24150 Values in Turbulent Times (VISTA), this paper responds to the need for analytical tools capable of evaluating AI's educational implications without requiring immediate empirical deployment. The study develops a conceptually grounded framework for assessing AI-supported learning environments across early childhood and older-adult education. Drawing on media pedagogy, human-computer interaction, and value-sensitive design, the framework articulates three analytical dimensions: **(1) Pedagogical Value Alignment**, addressing developmental appropriateness, learner autonomy, curiosity, and educator-learner interaction; **(2) Environmental and Relational Value Dynamics**, encompassing inclusivity, emotional climate, accessibility, and social cohesion; and **(3) Ethical-Systemic Value Integration**, focusing on transparency, data protection, fairness, human oversight, and sociocultural contextualization within Bulgarian educational structures. These dimensions synthesize insights from European regulatory frameworks, national policy documents, and prior research on AI literacy, education governance, and generational differences in technology adoption. Rather than measuring outcomes, the framework provides a structured foundation for future experimental, observational, and comparative studies. By embedding value analysis into early-stage AI evaluation, the model supports human-centered technological integration and contributes to VISTA's broader inquiry into how socio-technological turbulence reshapes educational values.

Keywords: Artificial intelligence, Human values, Preschool education, Elderly learning, Media pedagogy, VISTA, Bulgaria

INTRODUCTION

The rapid expansion of artificial intelligence (AI) in educational contexts has intensified scholarly and policy debates concerning its pedagogical relevance, ethical implications, and compatibility with fundamental human values. While AI-driven systems promise increased efficiency, personalization, and

accessibility, their integration into education raises critical questions about autonomy, relational learning, and human oversight—particularly in socially sensitive learning environments.

In Bulgaria, preschool education and elderly learning represent two such domains characterized by heightened vulnerability, asymmetries in digital competence, and strong reliance on human mediation. Preschool education emphasizes developmental appropriateness, emotional security, and educator–child interaction, while elderly learning is closely linked to autonomy, dignity, and social participation. In both contexts, poorly aligned AI interventions risk reinforcing exclusion, undermining trust, or weakening pedagogical relationships.

These concerns are further amplified by broader conditions of social and technological turbulence. As examined within COST Action CA24150 Values in Turbulent Times (VISTA), periods of rapid transformation reshape individual and collective value orientations, often exposing tensions between innovation-driven policy agendas and lived educational practices. In such contexts, AI adoption cannot be treated as a purely technical or efficiency-oriented process but must be examined through a value-sensitive and context-aware lens.

Despite growing interest in AI in education, much of the existing research focuses on empirical outcomes or technical performance, offering limited guidance for early-stage, value-oriented evaluation—particularly in national contexts such as Bulgaria. This paper addresses this gap by proposing a conceptually grounded analytical framework for assessing AI-supported learning environments without requiring immediate empirical implementation. By integrating insights from media pedagogy, human–computer interaction, and value-sensitive design, the study contributes to ongoing debates on human-centered AI and provides a structured basis for future research, policy development, and ethically informed educational innovation.

THEORETICAL BACKGROUND

Research on artificial intelligence in education increasingly recognizes that AI systems influence not only instructional efficiency but also pedagogical values, professional agency, and social relations within learning environments (Selwyn, 2019; Williamson & Eynon, 2020). As algorithmic systems mediate access to content, assessment, and feedback, they reshape decision-making processes traditionally held by educators, raising concerns about autonomy, accountability, and the preservation of educational values.

In early childhood education, international studies emphasize that digital and AI-supported tools can enhance engagement, differentiation, and formative assessment only when embedded within developmentally appropriate, play-based, and relational pedagogies (Edwards, 2013; Kucirkova et al., 2020). Research consistently shows that excessive automation or data-driven standardization risks undermining social interaction, exploratory learning, and emotional security—core elements of preschool education. Bulgarian studies support these findings, stressing

that technology use in kindergartens must reinforce educator-led scaffolding, collective activities, and emotional climate rather than substitute pedagogical judgment (Aleksieva & Racheva, 2025; Mizova et al., 2021).

In the domain of elderly learning, lifelong learning scholarship highlights autonomy, relevance, and social participation as key determinants of successful educational engagement (Formosa, 2014; Jarvis, 2012). AI-driven learning environments may support personalized pacing and accessibility, yet research also documents significant barriers related to trust, transparency, and perceived loss of control among older learners. Bulgarian empirical studies reveal persistent digital exclusion shaped by socioeconomic inequality, limited digital literacy, and institutional mistrust, suggesting that AI adoption without value-sensitive design may exacerbate existing disparities (Tosheva, 2024; Ilieva-Trichkova & Boyadjieva, 2018).

Media pedagogy and value-sensitive design offer complementary frameworks for addressing these challenges by conceptualizing technology as a cultural and normative mediator rather than a neutral tool (Buckingham, 2015; Friedman & Hendry, 2019). These approaches foreground the importance of contextual values, stakeholder perspectives, and power relations in technology design and evaluation. Within the broader European discourse on ethical and trustworthy AI (Floridi et al., 2018), such perspectives reinforce the need for analytical models that allow early-stage, non-empirical assessment of value alignment, particularly in national contexts characterized by institutional transformation.

Research Questions

Drawing on the reviewed sources, this study addresses the following research questions:

RQ1: Which pedagogical, relational, and ethical values are most critical when evaluating AI-supported learning environments in Bulgarian preschool and elderly education?

RQ2: How can a value-driven analytical framework support early-stage assessment of AI without relying on empirical intervention?

These questions guide the development of a values-driven analytical framework intended to support future empirical research, policy analysis, and pedagogical decision-making.

METHODOLOGY

This study adopts a conceptual and analytical research design rather than an empirical one. The methodology is grounded in qualitative synthesis of interdisciplinary sources spanning media pedagogy, AI in education, human-computer interaction, value-sensitive design, and European education policy.

Relevant academic publications, European regulatory documents, and Bulgarian policy and research texts were systematically reviewed and thematically analyzed. Through iterative comparison, recurring value-related

concerns were identified across preschool and elderly learning contexts. These concerns were then grouped into coherent analytical categories.

The outcome of this process is a three-dimensional evaluative framework designed to guide value-oriented analysis of AI-supported learning environments. The framework is not intended to produce measurable outcomes but to structure reflection, comparison, and anticipatory assessment in future research and policy work.

RESULTS

The main result of the study is the development of a values-driven analytical framework comprising three interrelated dimensions.

The first dimension, Pedagogical Value Alignment, addresses whether AI systems support developmental appropriateness, learner autonomy, curiosity, and meaningful educator–learner interaction. This dimension emphasizes the preservation of pedagogical agency and relational learning.

The second dimension, Environmental and Relational Value Dynamics, focuses on inclusivity, emotional climate, accessibility, and social cohesion. It captures how AI systems may influence trust, participation, and the overall learning environment, particularly for vulnerable learners.

The third dimension, Ethical-Systemic Value Integration, evaluates transparency, data protection, fairness, accountability, and human oversight, situating AI systems within broader institutional and sociocultural frameworks in Bulgaria.

Together, these dimensions provide a structured lens for identifying potential value reinforcement or value conflict prior to AI implementation.

DISCUSSION

The proposed framework responds to growing empirical and theoretical evidence that the educational impact of AI depends less on technological sophistication than on pedagogical, relational, and ethical alignment. Research in AI in education demonstrates that digital and AI-supported systems yield positive outcomes primarily when they augment professional practice rather than displace human judgment (Holmes et al., 2022; Selwyn, 2019). This insight directly supports the framework’s emphasis on pedagogical value alignment.

In preschool education, empirical studies indicate that educator mediation is a decisive factor in determining whether digital tools support or hinder developmental goals. Meta-analyses show that technology can enhance early learning when it is integrated into play-based, socially interactive contexts and guided by pedagogical intent (Edwards, 2013; Kucirkova et al., 2020). Bulgarian research further demonstrates that educators perceive digital technologies as beneficial only when they retain control over learning processes and maintain emotional security and collective interaction (Aleksieva & Racheva, 2025). These findings provide empirical justification for evaluating AI systems through a pedagogical lens rather than purely technical criteria.

In elderly learning contexts, studies consistently highlight trust, transparency, and perceived relevance as critical determinants of technology acceptance and sustained engagement (Formosa, 2014; Jarvis, 2012). Bulgarian evidence confirms that older adults are particularly sensitive to opaque systems and data-related concerns, which can discourage participation even when technological benefits are evident (Tosheva, E.). The framework's focus on relational and ethical-systemic values therefore reflects documented empirical patterns rather than abstract normative assumptions.

Within the Bulgarian educational landscape, characterized by prolonged reform processes and uneven digital transformation, value-oriented evaluation plays a crucial role in establishing institutional legitimacy (Boyadjieva & Kabakchieva, 2015). By integrating European ethical AI principles with national educational realities, the framework supports context-sensitive innovation aligned with the objectives of COST Action CA24150. It positions AI not as a disruptive force to be managed post hoc, but as a sociotechnical intervention whose value implications must be assessed in advance.

In response to the first research question, the most critical values in Bulgarian preschool and elderly AI-supported learning are pedagogical appropriateness, relational trust, inclusivity, and ethical accountability. AI systems must support learner and educator autonomy, maintain socially coherent and emotionally secure environments, and ensure transparent oversight. Regarding the second question, the framework enables anticipatory assessment by identifying potential value alignment or conflict before implementation, structuring evaluation around pedagogical, relational, and ethical-systemic dimensions without requiring immediate empirical testing.

LIMITATIONS

This study is limited by its non-empirical design and reliance on secondary literature. While the framework is theoretically grounded, it has not been tested through implementation, observation, or stakeholder evaluation. Additionally, the focus on Bulgaria limits immediate generalizability, although the framework may be adapted to comparable contexts.

The selection of sources, while interdisciplinary, may not capture all emerging AI applications or rapidly evolving technological developments.

FUTURE RESEARCH DIRECTIONS

Future studies should empirically apply the framework in preschool and elderly learning settings through case studies, participatory design approaches, or comparative analyses. Research involving educators, learners, and policymakers would be particularly valuable for validating and refining the framework's dimensions.

Cross-national studies within the COST CA-24150 network could explore how value priorities differ across European contexts. Further work may also integrate AI literacy assessment and institutional readiness analysis into the framework.

CONCLUSION

This paper proposes a values-driven analytical framework for evaluating AI-supported learning environments in Bulgarian preschool and elderly education. By integrating pedagogical, relational, and ethical-systemic dimensions, the framework offers a structured approach to anticipating value alignment and potential conflict prior to implementation.

Rather than promoting or rejecting AI adoption, the study emphasizes the importance of context-sensitive, human-centered evaluation in times of socio-technological turbulence. In doing so, it contributes to European debates on ethical AI, supports the aims of COST Action CA24150, and provides a foundation for future empirical research and policy development.

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