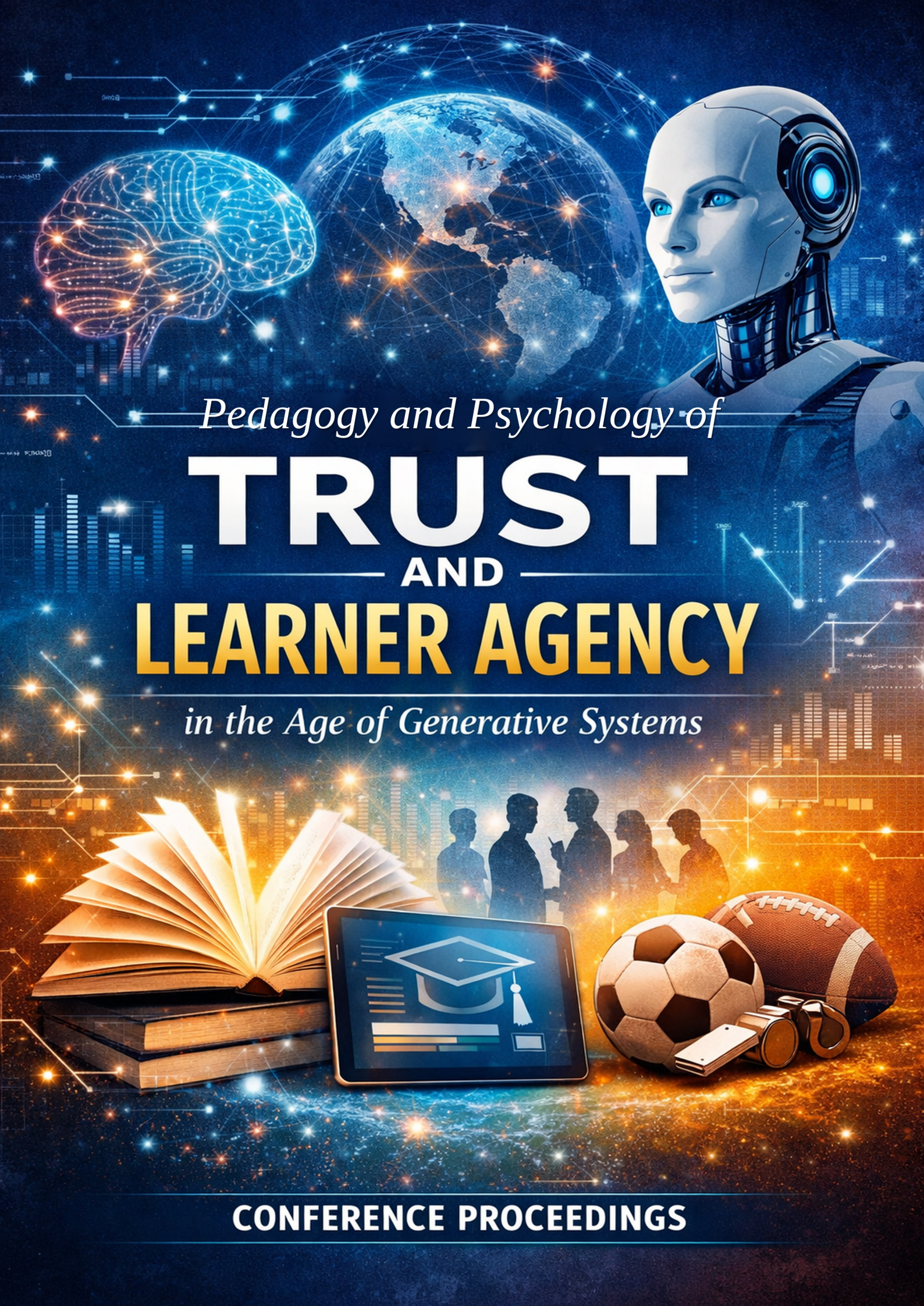
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Table of Contents

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Psychology

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Klironomical Thinking in Cultural Heritage Education: A Pedagogical Model for Training Specialists in Preservation, Revitalisation and Digital Heritage [1]

Abstract:
This article is devoted to the theoretical substantiation of klironomical thinking as an educational outcome and pedagogical foundation for training specialists in the field of cultural heritage. The relevance of the study is determined by the growing complexity of cultural heritage education under conditions of social, cultural and digital transformation. The scientific novelty of the study lies in the theoretical interpretation of klironomical thinking as a specific pedagogical category and as an integrated result of cultural heritage education. The object of the study is the educational process in the field of cultural heritage. The subject of the study is the pedagogical mechanisms for forming klironomical thinking among future specialists in cultural heritage preservation, revitalisation and digital heritage. The study aims to develop and theoretically substantiate a pedagogical model for the formation of klironomical thinking in cultural heritage education on the basis of author's concept of klironomy and his works on cultural heritage from 2013 to 2025. The methodological basis of the research includes theoretical analysis, conceptual reconstruction, systematisation, interpretative analysis and pedagogical modelling. The source base consists of author's works on klironomy, cultural heritage preservation, klironomical thinking, revitalisation and klironomical methods, as well as international studies on heritage theory, cultural memory, heritage education, digital heritage and professional training. The study establishes that klironomical thinking should be understood as an integral professional worldview that enables future specialists to perceive cultural heritage as a complex system of preservation, interpretation, revitalisation and responsible transmission. The proposed model includes five interrelated components. The cognitive component provides an understanding of cultural heritage as a multidimensional historical and cultural phenomenon. The axiological component forms responsibility for cultural value, continuity and preservation. The methodological component develops the ability to analyse heritage phenomena through klironomical categories and principles. The practical component connects theoretical knowledge with professional activity in preservation, interpretation and revitalisation. The digital component prepares specialists to work with contemporary forms of heritage documentation, representation and transmission. The author concludes that the formation of klironomical thinking may serve as a conceptual basis for modernising cultural heritage education. The proposed model makes it possible to overcome the fragmentation of specialist training and to organise cultural heritage education as a coherent pedagogical process aimed at developing professional consciousness, methodological competence and cultural responsibility. The results may be used in the design of university courses, interdisciplinary curricula, professional training programmes and project-based educational modules in heritage studies, museum studies, restoration education, cultural management, digital humanities and urban revitalisation.

Keywords: cultural heritage education, klironomy, klironomical thinking, heritage pedagogy, cultural memory, cultural heritage preservation, revitalisation, digital heritage, professional training, pedagogical modelling, cultural continuity.

Introduction

In the context of contemporary educational transformation, cultural heritage is increasingly understood not only as an object of preservation, restoration or museum representation, but also as a complex pedagogical resource capable of shaping historical consciousness, cultural identity, axiological orientation and professional responsibility. The growing role of digital technologies, the expansion of intangible and hybrid forms of heritage, and the increasing vulnerability of cultural memory under conditions of global instability require new approaches to the training of specialists in the field of cultural heritage. In this regard, cultural heritage

education should be considered not merely as the transmission of knowledge about monuments, artefacts, traditions and historical environments, but as a systematic process of forming a specific type of professional thinking oriented towards preservation, interpretation, revitalisation and responsible cultural transmission.

The relevance of the present study is determined by the need to develop pedagogical models that correspond to the complexity of cultural heritage as a multidimensional phenomenon. Contemporary heritage education often remains divided between several disciplinary fields, including history, art history, museology, restoration, architecture, cultural studies, urban studies, digital humanities and heritage management. This disciplinary fragmentation makes it difficult to form an integral understanding of cultural heritage as a dynamic system that combines tangible, intangible, historical, symbolic, social and technological dimensions. Therefore, there is a need for a pedagogical framework capable of integrating these dimensions into a coherent educational model.

A significant theoretical basis for such integration is provided by the works of the author, who has consistently developed the concept of klironomy as a science of cultural heritage preservation. In his works from 2014 to 2025, cultural heritage is considered not as a passive set of inherited objects, but as a complex phenomenon requiring systematic scientific, philosophical, methodological and educational comprehension (*Buychik, 2014*; *Buychik, 2019*; *Buychik, 2020*; *Buychik, 2021*; *Buychik, 2023*; *Buychik, 2024*; *Buychik, 2025*). The development of klironomy as an independent field of knowledge makes it possible to rethink the foundations of cultural heritage education and to define the formation of klironomical thinking as one of its key pedagogical outcomes.

Within this conceptual framework, klironomical thinking may be understood as a systemic mode of professional cognition that enables a specialist to perceive cultural heritage in its historical continuity, axiological significance, social function, material and intangible forms, and potential for revitalisation and digital transformation. Such thinking includes the ability to identify cultural value, interpret heritage phenomena in their historical and social contexts, distinguish between conservation, restoration, renovation and revitalisation, and understand the relationship between cultural memory and future development. Consequently, klironomical thinking is not limited to technical competence; it represents an integrated intellectual, methodological and ethical orientation of the future specialist.

The pedagogical significance of this approach lies in the fact that cultural heritage education must prepare not only restorers, curators, researchers or managers, but also specialists capable of working with heritage as a living and developing cultural system. In the conditions of the digital age, this task becomes particularly important. Digital documentation, reconstruction, visualisation, virtual museums, hybrid cultural artefacts and digital archives transform both the forms of heritage preservation and the competencies required of specialists. A modern heritage professional must be able to combine historical-cultural analysis with digital literacy, methodological reflection and an understanding of cultural continuity.

At the same time, the existing educational models in the field of cultural heritage do not always provide sufficient conceptual unity. In many cases, the training of specialists is focused either on the technical aspects of restoration, the historical analysis of cultural objects, the management of heritage institutions, or the application of digital tools. These components are

undoubtedly important; however, when they are studied separately, they do not form a holistic professional worldview. As a result, the educational process may produce specialists with fragmented competencies, but without an integral understanding of cultural heritage as a systemic object of preservation, interpretation and revitalisation.

This circumstance defines the research problem of the present article. The problem lies in the insufficient theoretical and pedagogical elaboration of klironomical thinking as an educational outcome in cultural heritage education. Although the works of Alexander Buychik substantiate klironomy as a scientific field, its pedagogical potential requires further systematisation. It is necessary to determine how the principles of klironomy can be translated into the structure of educational content, teaching methods, professional competencies and models of specialist training.

The scientific novelty of the present study consists in the theoretical substantiation of klironomical thinking as a pedagogical category and in the development of a model for its formation in cultural heritage education. Unlike approaches that consider heritage education mainly as a field of historical, artistic or technical training, the present article proposes to interpret it as a process of forming an integral klironomical worldview. This worldview combines cognitive, axiological, methodological, practical and digital components and provides a basis for professional activity in the fields of preservation, revitalisation and digital heritage.

The object of the study is the educational process in cultural heritage.

The subject of the study is the pedagogical mechanisms for forming klironomical thinking among future specialists in cultural heritage preservation, revitalisation and digital heritage.

The study aims to develop and theoretically substantiate a pedagogical model for the formation of klironomical thinking in cultural heritage education on the basis of author's concept of klironomy and his works on cultural heritage from 2014 to 2025.

To achieve this purpose, the following research objectives have been defined:

- to analyse the theoretical foundations of klironomy in author's works on cultural heritage;
- to clarify the concept of klironomical thinking as a pedagogical and professional category;
- to identify the key components of klironomical thinking in cultural heritage education;
- to determine the pedagogical conditions for forming klironomical thinking among future heritage specialists;
- to develop a theoretical model of klironomical education aimed at training specialists in preservation, revitalisation and digital heritage.

The methodological basis of the study is formed by theoretical analysis, conceptual reconstruction, systematisation and pedagogical modelling. These methods make it possible to analyse the conceptual content of klironomy, identify its educational potential and transform it into a pedagogical framework for specialist training.

The theoretical significance of the study lies in the clarification of klironomical thinking as an educational category and in the development of a pedagogical interpretation of klironomy. The article contributes to the theoretical understanding of cultural heritage education by proposing an integrated model that connects cultural continuity, preservation, revitalisation, digital transformation and professional training.

The practical significance of the study consists in the possibility of applying the proposed model in the design of educational programmes, university courses, professional training modules and interdisciplinary curricula in the field of cultural heritage. The model may be used in programmes related to heritage studies, museum studies, restoration, cultural management, digital humanities, urban revitalisation and cultural policy.

Thus, the study addresses the need for a new pedagogical framework in cultural heritage education. By interpreting klironomical thinking as a key outcome of specialist training, the article offers a theoretical basis for the formation of professionals capable of preserving cultural heritage, interpreting its meanings, revitalising cultural environments and working with heritage in the conditions of digital transformation.

Methods

The study has a theoretical and analytical research design and is aimed at developing a pedagogical model for forming klironomical thinking in cultural heritage education. In accordance with the nature of the research problem, the study does not include empirical measurement, experimental testing or quantitative data collection. Instead, it is based on theoretical analysis, conceptual reconstruction and pedagogical modelling, which make it possible to identify the educational potential of Alexander Buychik's concept of klironomy and to transform it into a coherent pedagogical framework.

The research material consists of author's scholarly works on cultural heritage, klironomy, cultural memory, preservation, revitalisation and digital heritage published in Russian and English between 2014 and 2025. These works were selected as the main theoretical corpus because they consistently develop the idea of klironomy as a scientific field concerned with the study, preservation and transformation of cultural heritage. Additional contextual material includes contemporary scholarly literature on cultural heritage education, heritage pedagogy, digital heritage, interdisciplinary professional training and the formation of professional competencies in the humanities.

The criteria for selecting sources were as follows:

- relevance to the concept of cultural heritage preservation;
- connection with klironomy and klironomical methodology;
- significance for the development of cultural heritage education;
- applicability to the training of specialists in preservation, revitalisation and digital heritage;
- representativeness for the interdisciplinary field of heritage studies.

Particular attention was paid to works that make it possible to interpret cultural heritage not only as a material or historical object, but also as a dynamic cultural, axiological, social and educational system.

The methodological procedure of the study included several consecutive stages. At the first stage, the theoretical foundations of klironomy in author's works were analysed in order to identify the key conceptual categories relevant to cultural heritage education. At the second stage, the concept of klironomical thinking was reconstructed as a pedagogical and professional category. At the third stage, the main components of klironomical thinking were classified according to their educational functions. At the fourth stage, the pedagogical conditions

necessary for the formation of klironomical thinking were determined. At the final stage, the obtained results were integrated into a theoretical pedagogical model.

The methodology of the study includes general scientific methods and specialised pedagogical methods. The general scientific methods include analysis, synthesis, generalisation, comparison and classification. These methods were used to examine the conceptual structure of klironomy, identify its key categories and determine their relevance to cultural heritage education. The specialised methods include conceptual reconstruction, interpretative analysis and pedagogical modelling. Conceptual reconstruction was used to clarify the meaning of klironomical thinking as an educational outcome. Interpretative analysis made it possible to reveal the pedagogical significance of the klironomical approach. Pedagogical modelling was applied to design a structured model for forming klironomical thinking among future specialists.

The study is based on an interdisciplinary methodological approach. This approach is necessary because cultural heritage education cannot be adequately analysed within the boundaries of a single discipline. The formation of klironomical thinking requires the integration of knowledge from pedagogy, cultural studies, heritage studies, philosophy of culture, history, museology, restoration theory, digital humanities and cultural management. Therefore, the research methodology is oriented towards identifying the links between theoretical knowledge, professional competencies and pedagogical practice.

The proposed model was developed through the identification of several interrelated components of klironomical thinking: cognitive, axiological, methodological, practical and digital. The cognitive component reflects the ability to understand cultural heritage as a complex historical and cultural phenomenon. The axiological component concerns the recognition of cultural value and responsibility for cultural continuity. The methodological component includes the ability to analyse heritage phenomena through klironomical categories and principles. The practical component is related to professional activity in preservation, revitalisation and interpretation. The digital component reflects the ability to work with digital forms of heritage documentation, representation and transmission.

The validity of the study is ensured by the systematic analysis of the selected theoretical corpus, the logical consistency of the research stages and the correspondence between the research aim, methodology and proposed model. The reliability of the study is achieved through the transparent description of the analytical procedure, the consistent application of selected methods and the clear connection between the conceptual foundations of klironomy and their pedagogical interpretation.

The limitations of the study are associated with its theoretical character. The proposed pedagogical model has not been empirically tested within the framework of the present article. Therefore, the results should be considered as a theoretical basis for further research rather than as a final empirically verified educational model. Future studies may include expert evaluation of the model, comparative analysis of educational programmes, curriculum design, pilot implementation in university courses and empirical assessment of students' development of klironomical thinking.

Thus, the chosen methodology corresponds to the aim of the study, which is to theoretically substantiate a pedagogical model for the formation of klironomical thinking in cultural heritage education. The combination of theoretical analysis, conceptual reconstruction and pedagogical

modelling makes it possible to transform the concept of klironomy into an educational framework applicable to the training of specialists in preservation, revitalisation and digital heritage.

Literature Review

The scholarly field of cultural heritage education is developing at the intersection of heritage studies, pedagogy, cultural memory studies, restoration theory, digital humanities and cultural policy. The analysed literature makes it possible to identify several key research lines relevant to the present study: the theoretical interpretation of cultural heritage, the pedagogical dimension of heritage transmission, the concept of klironomy and klironomical thinking, the revitalisation of cultural heritage, and the transformation of heritage education in the digital age.

The first research line is connected with the general theoretical understanding of cultural heritage as a complex cultural and social phenomenon. Choay (*1992*) considers heritage not only as a set of inherited monuments or historical objects, but also as a symbolic and ideological construct through which societies define their relationship with the past. This approach is important because it reveals that heritage is never neutral: it is always included in processes of selection, interpretation and cultural legitimisation. A similar critical perspective is developed by Smith (*2006*), who argues that heritage should be understood not simply as material objects or sites, but as a cultural practice connected with identity, memory, power and social meaning. Harrison (*2012*) further expands this interpretation by presenting heritage as a dynamic process shaped by institutional, social, political and cultural factors. These works provide an essential theoretical foundation for the study, since they allow cultural heritage education to be understood not as the mechanical transmission of information about the past, but as the formation of interpretative and value-based competencies.

The second line of research is associated with the problem of cultural memory and the preservation of cultural continuity. Assmann (*2003*) analyses cultural memory as a system of forms, spaces and practices through which societies preserve and transform representations of the past. This perspective is particularly relevant for heritage education, because the educational process does not merely transmit historical facts; it also forms the ability to understand, interpret and critically engage with cultural memory. From this point of view, future specialists in cultural heritage should be trained not only to preserve objects, but also to understand the symbolic, mnemonic and axiological functions of heritage in society. Settis (*2002*), analysing threats to cultural heritage in the Italian context, also emphasises the importance of public responsibility for heritage preservation. His work demonstrates that cultural heritage cannot be separated from civic consciousness, cultural policy and ethical responsibility. This is significant for the pedagogical dimension of the present study, since the training of heritage specialists must include not only professional knowledge, but also an understanding of cultural responsibility.

The third line of research concerns cultural heritage education as a specific pedagogical field. Fontal (*2016*), analysing the Spanish Heritage Education Observatory, shows that heritage education requires systematic monitoring, methodological development and institutional support. Her work is important because it demonstrates that heritage education should be understood as a structured field with its own pedagogical principles, educational goals and evaluation mechanisms. The guidelines developed within the CHARTER Consortium also

indicate the need for innovative educational and training paths in the field of cultural heritage, especially in connection with new professional profiles, interdisciplinary competencies and the changing labour market in the heritage sector (*Baatz et al., 2023*). These approaches confirm that contemporary cultural heritage education must move beyond traditional disciplinary boundaries and develop integrated curricula capable of combining historical, cultural, technological and practical components.

The contemporary international agenda also confirms the growing significance of cultural and arts education. The UNESCO framework for culture and arts education emphasises the role of culture in sustainable development, inclusive education, creativity, intercultural dialogue and the formation of critical thinking (*UNESCO, 2024*). This position is important for the present study because it situates cultural heritage education within a broader pedagogical and social context. Heritage education should therefore be understood not only as specialist professional training, but also as a means of forming cultural literacy, social responsibility and the capacity to participate in the preservation and development of cultural environments.

A separate and central research line for the present article is formed by the works of the author on klironomy and cultural heritage. In the earlier work on the restoration of the Great Sphinx, the author (*Buychik, 2014*) addresses the relevance of preserving monuments of world cultural heritage. This work is significant because it reflects the practical and historical dimension of heritage preservation and demonstrates the need to understand restoration as part of a broader cultural process. Later, the author (*Buychik, 2019*) formulates klironomy as a science of preserving historical and cultural heritage. This marks an important conceptual transition from the consideration of separate heritage objects to the construction of an independent scientific field aimed at the systematic study, preservation and interpretation of cultural heritage.

The educational potential of klironomy is developed more explicitly in author's subsequent works. The author (*Buychik, 2020*) interprets klironomy as a systematic scientific approach to the preservation of cultural heritage and considers its place in the educational system. This position is directly relevant to the present study, since it provides a basis for understanding klironomy not only as a theoretical field, but also as a pedagogical framework. If klironomy is understood as a system of knowledge about cultural heritage, then cultural heritage education should include the formation of a specific mode of professional thinking based on klironomical principles.

The concept of klironomical thinking is further developed by author (*Buychik, 2021*), who analyses its formation within the system of social outlook. This work is especially important for the present article because it allows klironomical thinking to be interpreted as more than a narrow professional skill. It may be understood as a worldview-oriented form of cognition that connects cultural memory, value orientation, historical continuity and social responsibility. In the context of pedagogy, this means that the educational process should be aimed not only at transmitting knowledge about heritage, but also at shaping the ability to perceive cultural heritage as a systemic and value-laden phenomenon.

The problem of training specialists is directly addressed in author's work on the relevance of creating a scientific and educational complex for training specialists in revitalisation (*Buychik, 2023*). This source is of particular importance because it connects klironomy with professional education and the practical need to prepare specialists capable of working with cultural heritage

in conditions of transformation. Revitalisation is not limited to the physical restoration of heritage objects; it involves returning cultural meaning, social function and contemporary relevance to heritage phenomena. Therefore, training specialists in revitalisation requires an integrated pedagogical model that combines theoretical knowledge, methodological reflection, practical competencies and cultural responsibility.

Author's monograph *Klironomy: The Science of Cultural Heritage* systematises the conceptual foundations of klironomy and presents cultural heritage as a complex object of scientific analysis (*Buychik, 2024*). This work provides the theoretical basis for considering klironomy as a comprehensive field that integrates philosophical, cultural, historical and practical dimensions of heritage preservation. For the present study, this is significant because it makes it possible to interpret klironomical education as a structured pedagogical direction aimed at forming specialists capable of understanding heritage in its integrity.

The methodological dimension of klironomy is further developed in author's work on klironomical methods for the study of cultural heritage (*Buychik, 2025*). The importance of this work lies in the transition from the general concept of klironomy to the methods of analysing cultural heritage. In pedagogical terms, this means that klironomical thinking should include methodological competence: the ability to identify, interpret, classify and evaluate cultural heritage phenomena using specific conceptual and analytical tools. This aspect is particularly important for the proposed model, since professional training in cultural heritage must be based not only on factual knowledge, but also on methods of independent analysis.

A comparison of the analysed sources shows that international heritage studies and author's klironomical approach address related but not identical aspects of the same problem. The works of Choay (*1992*), Smith (*2006*) and Harrison (*2012*) reveal the theoretical complexity of heritage as a cultural construct and social practice. Assmann (*2003*) and Settis (*2002*) emphasise memory, continuity and responsibility. Fontal (*2016*), Baatz et al. (*2023*) and UNESCO (*2024*) demonstrate the need for systematic educational approaches to heritage, professional training and cultural participation. Author's works, in turn, provide a specific conceptual and methodological framework for understanding cultural heritage through the prism of klironomy, klironomical thinking, preservation, revitalisation and digital transformation.

At the same time, the literature review reveals a research gap. International studies on heritage education emphasise interdisciplinarity, cultural participation, professional competencies and innovative training paths, but they do not develop the concept of klironomical thinking as a specific pedagogical outcome. Conversely, author's works substantiate klironomy as a science of cultural heritage and develop the concepts of klironomical thinking, revitalisation and klironomical methodology, but their pedagogical interpretation requires further systematisation in the context of cultural heritage education.

Thus, the analysed literature confirms the relevance of developing a pedagogical model for the formation of klironomical thinking in cultural heritage education. Such a model may integrate the theoretical achievements of heritage studies, the pedagogical principles of heritage education and the conceptual apparatus of klironomy. It would make it possible to train specialists who are capable not only of preserving and studying cultural heritage, but also of interpreting, revitalising and transmitting it in conditions of cultural, social and digital transformation.

Results

1. Klironomical Thinking as an Integral Educational Outcome in Cultural Heritage Education

The theoretical analysis made it possible to establish that klironomical thinking may be considered one of the central educational outcomes of contemporary cultural heritage education. In contrast to traditional models of specialist training, which often concentrate on the transmission of historical knowledge, restoration techniques, museum practices or cultural management skills, the klironomical approach presupposes the formation of a systemic professional worldview. This worldview enables future specialists to understand cultural heritage not as a static set of monuments, objects or traditions, but as a dynamic system of cultural meanings, historical continuity, social memory, value transmission and possible revitalisation.

The need for such an integral educational outcome is determined by the complexity of cultural heritage itself. Theoretical approaches in heritage studies demonstrate that heritage is not limited to material objects or officially recognised monuments. It is also a cultural practice, a field of interpretation and a mechanism through which societies construct relationships with the past, the present and the future (*Smith, 2006*; *Harrison, 2012*). Choay (*1992*) shows that heritage is historically connected with symbolic interpretation and the social construction of memory, while Assmann (*2003*) emphasises the role of cultural memory in preserving and transforming collective meanings. These positions make it possible to substantiate the pedagogical conclusion that a heritage specialist must be trained not only to identify and describe cultural objects, but also to interpret their meanings, social functions and value structures.

Within the framework of author's works, this integrative understanding receives a specific conceptual form through the development of klironomy as a science of cultural heritage. The author (*Buychik, 2019*) defines klironomy as a scientific direction aimed at the preservation of historical and cultural heritage, while later works expand this approach by connecting klironomy with education, professional thinking, revitalisation and methods of heritage analysis (*Buychik, 2020*; *Buychik, 2021*; *Buychik, 2023*; *Buychik, 2025*). As a result, klironomical thinking can be interpreted as a specific form of professional cognition that integrates historical, cultural, axiological, methodological, practical and digital dimensions of heritage work.

The study established that klironomical thinking performs several important educational functions. First, it provides a systemic framework for understanding cultural heritage as a multidimensional phenomenon. Students should learn to see heritage simultaneously as a historical source, a cultural value, a social resource, an object of preservation, a medium of memory and a potential basis for revitalisation. Secondly, klironomical thinking forms a value-based attitude towards cultural heritage. In this respect, it is closely connected with the idea of responsibility for cultural continuity, which is also emphasised in international approaches to culture and arts education (*UNESCO, 2024*). Thirdly, it develops methodological competence, since future specialists must be able to analyse heritage phenomena through specific categories, criteria and interpretative procedures. Fourthly, it supports practical orientation, because heritage education must prepare specialists for real professional tasks connected with preservation, interpretation, revitalisation, communication and digital representation.

The results of the study show that klironomical thinking cannot be reduced to the possession of information about cultural heritage. It is not a sum of separate facts, terms or disciplinary skills. Rather, it represents an organised mode of professional understanding that determines how a future specialist perceives heritage, formulates problems, evaluates cultural value, chooses methods of analysis and makes decisions concerning preservation or transformation. In this sense, klironomical thinking functions as a cognitive and axiological regulator of professional activity.

It was also established that the formation of klironomical thinking is especially important under conditions of digital transformation. Digital technologies change not only the technical tools of heritage preservation, but also the forms of cultural memory, public access, interpretation and communication. Digital archives, virtual exhibitions, online museums, three-dimensional reconstructions and heritage databases create new educational possibilities, but they also require new competencies. The specialist must be able to understand the difference between the digital representation of heritage and the heritage object itself, between documentation and interpretation, between preservation and simulation. Therefore, the digital dimension of klironomical thinking should be understood not merely as technical literacy, but as the ability to critically and responsibly use digital instruments in the processes of heritage preservation and transmission.

Thus, the first major result of the study is the theoretical substantiation of klironomical thinking as an integral educational outcome. This outcome combines knowledge, values, methods, practical orientation and digital competence. It enables the training of specialists who are capable not only of working with separate cultural heritage objects, but also of understanding cultural heritage as a complex system requiring preservation, interpretation, revitalisation and responsible transmission.

2. Structural Model of Klironomical Thinking and Its Pedagogical Components

As a result of the theoretical analysis, a structural model of klironomical thinking in cultural heritage education was developed. The model includes five interrelated components: cognitive, axiological, methodological, practical and digital. These components do not function as isolated educational blocks. They form a unified pedagogical structure in which each component supports and develops the others.

The cognitive component forms the intellectual foundation of klironomical thinking. It includes knowledge of cultural history, heritage theory, cultural memory, museum studies, restoration principles, urban heritage, intangible heritage and digital heritage. This component allows students to understand cultural heritage as a historically formed and socially interpreted phenomenon. It is important that the cognitive component should not be limited to the accumulation of factual material. Its task is to develop the ability to understand the internal logic of heritage phenomena: their origin, transformation, symbolic meaning, social function and role in the continuity of culture.

The theoretical basis for this component is supported by critical heritage studies, which interpret heritage as a process rather than as a fixed object (*Smith, 2006*; *Harrison, 2012*). From a pedagogical viewpoint, this means that students should be taught to analyse heritage not only through chronology, typology or stylistic classification, but also through questions of meaning,

use, memory, identity and interpretation. The cognitive component therefore transforms heritage education from a descriptive discipline into an analytical and interpretative field.

The axiological component is associated with the formation of a value-based attitude towards cultural heritage. It includes understanding heritage as a carrier of cultural memory, identity, symbolic significance and social responsibility. Without this component, professional training risks becoming purely technical or administrative. Settis (*2002*) demonstrates that cultural heritage requires civic responsibility and public awareness, while UNESCO (*2024*) emphasises the role of culture and arts education in sustainable development, cultural participation and social cohesion. These approaches confirm that heritage education must include ethical and value-oriented reflection.

Within the klironomical model, the axiological component performs a fundamental function. It helps students understand why heritage should be preserved, what makes a cultural object or practice valuable, how authenticity and continuity should be interpreted, and what risks arise when heritage is treated only as an economic, tourist or decorative resource. In this sense, the axiological component forms professional responsibility. It teaches future specialists that decisions concerning heritage are never neutral: they affect cultural memory, social identity, local communities and future generations.

The methodological component is connected with the formation of analytical tools. It includes the ability to classify, compare, interpret, reconstruct and evaluate heritage phenomena. This component is particularly important in the context of author's klironomical approach, where heritage is studied through specific conceptual and analytical methods (*Buychik, 2024*; *Buychik 2025*). The methodological component enables students to move from general cultural knowledge to independent professional reasoning. They learn not only to describe heritage phenomena, but also to formulate research questions, identify structural features, determine cultural significance and justify preservation or revitalisation strategies.

The practical component ensures the connection between theoretical knowledge and professional activity. It includes competencies in preservation, revitalisation, cultural project design, educational interpretation, museum communication, work with local communities and the development of heritage routes or programmes. The significance of this component is supported by author's work on the need to create a scientific and educational complex for training specialists in revitalisation (*Buychik, 2023*). Revitalisation requires more than physical restoration. It presupposes the return of meaning, function and social relevance to cultural heritage. Therefore, the practical component should train students to work with heritage as a living cultural system, rather than as an isolated object removed from its social context.

The digital component reflects the transformation of heritage education in the digital age. It includes skills related to digital documentation, databases, virtual exhibitions, online communication, visualisation, digital archives and the interpretation of digital heritage materials. The Charter guidelines emphasise the need for innovative cultural heritage education and training paths that correspond to new professional profiles and changing labour market demands (*Baatz et al., 2023*). In this context, digital competence becomes an essential part of specialist training. However, within the proposed model, digital tools are not treated as an independent technological addition. They are integrated into the cognitive, axiological, methodological and practical dimensions of klironomical thinking.

The study showed that the effectiveness of the proposed model depends on the internal coherence of these five components. If the cognitive component is developed without the axiological one, education may produce technically informed but value-neutral specialists. If the axiological component is not supported by methodological competence, students may demonstrate general respect for heritage without being able to analyse or preserve it professionally. If the practical component is separated from theoretical reflection, professional activity may become mechanical. If the digital component is taught without methodological and ethical grounding, digital representation may replace critical heritage interpretation.

Thus, the second major result of the study is the development of a structural pedagogical model in which klironomical thinking is formed through the integration of five components. The model demonstrates that cultural heritage education should not be organised as a set of unrelated courses, but as a coherent process aimed at developing an integral professional worldview.

3. Pedagogical Conditions and Stages of Forming Klironomical Thinking

The study established that the formation of klironomical thinking requires specific pedagogical conditions. These conditions determine how the proposed model can be implemented in the educational process and how separate components of specialist training can be transformed into a coherent system.

The first condition is interdisciplinarity. Cultural heritage education cannot be effective if it is limited to one disciplinary framework. Heritage includes historical, artistic, philosophical, social, technological, legal, economic and educational dimensions. Therefore, the formation of klironomical thinking requires the integration of heritage studies, pedagogy, cultural studies, history, restoration theory, museology, digital humanities, cultural management and philosophy of culture. This corresponds to contemporary trends in heritage education, where interdisciplinary training is increasingly considered necessary for preparing specialists capable of working with complex cultural environments (*Baatz et al., 2023*; *UNESCO, 2024*).

The second condition is the unity of theory and practice. Students should not only study theoretical concepts of cultural heritage, but also apply them to concrete cases. These cases may include historical monuments, museum collections, urban spaces, intangible traditions, digital archives, restoration projects or revitalisation initiatives. Such an approach allows students to understand that heritage work always involves the correlation of knowledge, value judgement, methodological analysis and practical decision-making. The practical orientation of learning is especially important in relation to revitalisation, since this field requires the ability to connect cultural preservation with social use and contemporary relevance (*Buychik, 2023*).

The third condition is the development of value-based reflection. Since cultural heritage is connected with memory, identity and responsibility, educational programmes should include tasks that require students to reflect on the ethical and axiological dimensions of professional activity. These tasks may include discussions of authenticity, cultural loss, reconstruction, contested heritage, the social meaning of monuments, public access, digital reproduction and the responsibility of specialists towards communities. The works of Assmann (*2003*), Settis (*2002*) and UNESCO (*2024*) confirm that heritage education must be connected with the preservation of cultural memory and the formation of social responsibility.

The fourth condition is methodological training. Students should be introduced to klironomical categories, principles and methods that enable them to analyse heritage phenomena systematically. This may include classification of heritage objects, identification of cultural value, reconstruction of historical and cultural contexts, analysis of preservation risks, interpretation of symbolic meanings and evaluation of revitalisation potential. The methodological dimension is essential because it transforms heritage education from general cultural awareness into professional preparation.

The fifth condition is the inclusion of digital heritage practices. Contemporary specialists must be prepared to work with digital forms of preservation, representation and communication. This includes digital cataloguing, online collections, virtual exhibitions, three-dimensional models, multimedia interpretation, digital storytelling and public communication through digital platforms. However, the study showed that digital tools should be included in the educational process not as technical exercises, but as instruments of cultural transmission. Students should learn to ask what is preserved, how it is represented, what meanings are transformed and how digital mediation influences public perception of heritage.

The sixth condition is project-based and research-oriented learning. Klironomical thinking is formed most effectively when students are involved in independent analytical and creative work. Possible educational projects may include the development of a concept for revitalising a cultural object, designing an educational route, preparing a museum interpretation plan, creating a digital exhibition, analysing a local heritage environment or developing a strategy for the preservation of intangible heritage. Such tasks require the integration of all components of the model and therefore support the formation of holistic professional thinking.

The study also made it possible to identify three stages in the formation of klironomical thinking. The first stage may be defined as conceptual and cognitive. At this stage, students acquire basic knowledge about cultural heritage, klironomy, cultural memory, preservation, restoration, revitalisation and digital heritage. The aim of this stage is to form a conceptual foundation and to introduce students to the systemic nature of heritage.

The second stage is analytical and methodological. At this stage, students learn to analyse heritage phenomena using theoretical categories and research methods. They compare different approaches, interpret cultural meanings, classify heritage objects and evaluate preservation or revitalisation problems. The main result of this stage is the development of methodological competence and independent professional reasoning.

The third stage is practical and project-based. At this stage, students apply klironomical thinking to practical tasks. They design educational, preservation, revitalisation or digital heritage projects. The main result of this stage is the ability to integrate knowledge, values, methods and practical decisions in professional activity.

Thus, the third major result of the study is the identification of pedagogical conditions and stages necessary for the formation of klironomical thinking. The results demonstrate that this process cannot be achieved through passive transmission of information. It requires an educational environment based on interdisciplinary integration, methodological training, value reflection, practical work and digital competence.

In summary, the study shows that klironomical thinking may serve as a conceptual basis for modernising cultural heritage education. The proposed model makes it possible to overcome

the fragmentation of specialist training and to form professionals capable of understanding cultural heritage as a complex system of preservation, interpretation, revitalisation and digital transmission. This result is significant both for the theoretical development of heritage pedagogy and for the practical design of educational programmes in the field of cultural heritage.

Discussion

The results of the study demonstrate that klironomical thinking may be interpreted as an integral pedagogical outcome of cultural heritage education. This conclusion is significant because it shifts the focus of heritage education from the transmission of disciplinary knowledge to the formation of a systemic professional worldview. In this respect, cultural heritage education is understood not only as preparation for work with monuments, museum collections, restoration processes or digital archives, but as a pedagogical process aimed at developing the ability to think about heritage as a complex phenomenon of cultural continuity, memory, value, preservation and transformation.

The proposed interpretation corresponds to the contemporary understanding of cultural heritage as a dynamic and socially constructed phenomenon. Critical heritage studies have shown that heritage is not limited to material objects or officially recognised cultural monuments. Rather, it functions as a process of interpretation, memory production, identity formation and social negotiation (*Smith, 2006*; *Harrison, 2012*). Choay (*1992*) also demonstrates that heritage is connected with symbolic representation and the cultural organisation of memory. Therefore, the results of the present study confirm that future specialists in cultural heritage must be trained not only to identify and describe heritage objects, but also to understand the cultural meanings, social functions and value structures embedded in them.

The pedagogical model developed in the study makes it possible to interpret klironomical thinking as a bridge between theoretical heritage studies and professional education. In this model, knowledge about heritage is not separated from value orientation, methodological analysis, practical activity and digital competence. This is particularly important because the contemporary heritage sector requires specialists who are able to work in interdisciplinary and changing environments. A specialist in cultural heritage must understand history, cultural memory, preservation principles, institutional contexts, public communication, digital technologies and the social relevance of heritage. The proposed model therefore responds to the need for integrated professional training.

The results also indicate that klironomical thinking performs a regulating function in the educational process. It organises different types of knowledge and competence into a coherent structure. The cognitive component provides theoretical understanding; the axiological component forms responsibility for cultural continuity; the methodological component develops analytical tools; the practical component connects knowledge with professional action; and the digital component enables work with contemporary forms of heritage documentation and transmission. In this sense, klironomical thinking is not an additional topic within heritage education, but a structural principle that can organise the entire educational process.

The significance of this result is strengthened by the fact that many existing approaches to cultural heritage education remain fragmented. Educational programmes may include courses in art history, restoration, museology, cultural management or digital humanities, but these

components do not always form a unified professional logic. The proposed model attempts to overcome this fragmentation by presenting klironomical thinking as the conceptual centre of specialist training. This makes it possible to form professionals who can work not only with separate heritage objects, but also with heritage as a cultural system requiring interpretation, preservation, revitalisation and responsible transmission.

The results of the study are consistent with major theoretical approaches in heritage studies, cultural memory studies and heritage education, while also expanding them through the klironomical perspective. The works of Choay (*1992*), Smith (*2006*) and Harrison (*2012*) provide an important theoretical basis for understanding heritage as a constructed, interpreted and socially meaningful phenomenon. The study develops this position in the pedagogical direction by showing that such an understanding of heritage requires a corresponding educational model. If heritage is not merely an object, but a process and a system of meanings, then specialist training must be oriented towards the formation of interpretative, methodological and value-based thinking.

The relationship between heritage and cultural memory is also important for interpreting the results. Assmann (*2003*) emphasises that cultural memory is preserved and transformed through symbolic forms, spaces and practices. This idea supports the conclusion that cultural heritage education should form the ability to work with memory, continuity and cultural meaning. The proposed model reflects this requirement through the axiological and cognitive components of klironomical thinking. These components enable students to understand heritage as a carrier of cultural memory and as a field of responsibility towards past, present and future generations.

The results also correspond to the civic and ethical dimension of heritage preservation. Settis (*2002*) argues that cultural heritage requires public responsibility and cannot be reduced to economic or administrative categories. This is directly relevant to the axiological component of the proposed model. The formation of klironomical thinking should include the ability to recognise the public significance of heritage, understand the risks of cultural loss and evaluate professional decisions from the perspective of cultural responsibility. In this regard, the present study confirms that heritage education should not be value-neutral. It must form an ethical attitude towards preservation, authenticity, continuity and public access.

The findings are also consistent with contemporary approaches to heritage education and professional training. Fontal (*2016*) demonstrates the need for systematic approaches to heritage education and the development of methodological tools for its monitoring and improvement. The CHARTER guidelines emphasise the importance of innovative cultural heritage education and training paths, especially in relation to new professional profiles and interdisciplinary competencies (*Baatz et al., 2023*). The UNESCO framework for culture and arts education also highlights the role of culture in education, sustainable development, critical thinking and social participation (*UNESCO, 2024*). The proposed model develops these approaches by offering a concrete conceptual centre for heritage education: the formation of klironomical thinking.

The works of the author provide the specific theoretical foundation for this model. The author (*Buychik, 2019*) substantiates klironomy as a science of preserving historical and cultural heritage. The author (*Buychik, 2020*) connects klironomy with the educational system, thereby opening the possibility of interpreting it as a pedagogical framework. The author (*Buychik, 2021*)

develops the concept of klironomical thinking in the system of social outlook, which is especially important for the present study because it allows this type of thinking to be understood as a worldview-oriented form of professional cognition. The author (*Buychik, 2023*) directly addresses the need to create a scientific and educational complex for training specialists in revitalisation, while later works systematise klironomy as the science of cultural heritage and develop klironomical methods for heritage analysis (*Buychik, 2024*; *Buychik, 2025*).

The present study does not merely reproduce these theoretical positions, but develops their pedagogical implications. It shows that klironomy can serve not only as a scientific field, but also as a basis for designing educational content, professional competencies and pedagogical conditions. In this sense, the article contributes to the transition from the theoretical concept of klironomy to the pedagogical model of klironomical education.

The main theoretical contribution of the study consists in the substantiation of klironomical thinking as a pedagogical category. In previous discussions of cultural heritage, attention is usually focused on preservation, restoration, interpretation, memory, identity, authenticity, participation or digitalisation. These categories remain important, but the present study integrates them within the concept of klironomical thinking. This makes it possible to describe the educational outcome of cultural heritage training more precisely.

The proposed model contributes to the development of heritage pedagogy by offering a multidimensional structure of specialist training. The five components of klironomical thinking—cognitive, axiological, methodological, practical and digital—make it possible to describe what exactly should be formed in the educational process. This is important because many discussions of heritage education remain general and emphasise interdisciplinarity without defining the internal structure of the professional thinking that should result from such interdisciplinarity. The present study clarifies this structure.

Another theoretical contribution lies in the integration of klironomy with contemporary heritage education. Klironomy, as developed in Buychik's works, provides a conceptual apparatus for the study and preservation of cultural heritage. The present article extends this apparatus into the field of pedagogy. It demonstrates that the categories of klironomy can be transformed into educational principles and competencies. This makes it possible to speak not only about klironomy as a science, but also about klironomical education as a specific direction in cultural heritage pedagogy.

The study also contributes to the theoretical understanding of revitalisation in education. Revitalisation is often interpreted as a practical process related to the renewal or reactivation of cultural heritage objects and environments. However, from the pedagogical perspective developed in this article, revitalisation should also be understood as an educational competence. Future specialists must be trained to identify the cultural potential of heritage, understand its social relevance and develop strategies for returning heritage to active cultural life. This requires not only practical skills, but also systemic thinking.

The digital component of the model also has theoretical significance. Digital heritage is frequently discussed in terms of technologies, tools and access. The present study suggests that digital competence should be integrated into klironomical thinking rather than treated as a separate technical addition. Digital representation of heritage requires methodological and ethical reflection: what is selected for digitalisation, how it is interpreted, how authenticity is

represented, how audiences interact with digital heritage, and how digital tools influence cultural memory. Therefore, the digital dimension should be included in the conceptual structure of heritage education.

The practical significance of the study lies in the possibility of applying the proposed model to the design of educational programmes in cultural heritage. The model may be used in undergraduate, postgraduate and professional training programmes related to heritage studies, restoration, museum studies, cultural management, digital humanities, urban revitalisation and cultural policy.

First, the model may be used for curriculum development. Educational programmes can be structured around the five components of klironomical thinking. The cognitive component may be represented by courses in heritage theory, cultural history, cultural memory, restoration theory and museum studies. The axiological component may be developed through courses and seminars on heritage ethics, authenticity, cultural responsibility and contested heritage. The methodological component may include courses on heritage analysis, klironomical methods, classification, interpretation and research design. The practical component may be formed through project work, internships, field studies and revitalisation projects. The digital component may include digital documentation, virtual exhibitions, databases, digital storytelling and online heritage communication.

Secondly, the proposed model may be used for the development of learning outcomes. Instead of defining outcomes only in terms of knowledge or skills, educational programmes may describe the formation of klironomical thinking as an integrated result. Such learning outcomes may include the ability to analyse heritage as a system, evaluate cultural value, apply methodological tools, design preservation or revitalisation projects and use digital technologies responsibly.

Thirdly, the model may be useful for interdisciplinary programme design. Cultural heritage education often involves several disciplines, but interdisciplinary education requires more than the mechanical addition of different courses. The proposed model provides an organising principle that can integrate different disciplines into a coherent educational trajectory. This may help avoid the fragmentation of training and strengthen the professional identity of future heritage specialists.

Fourthly, the model may be applied in project-based learning. Students may be asked to develop heritage interpretation projects, revitalisation concepts, digital exhibitions, local heritage maps, educational routes or preservation strategies. Such projects would require them to apply cognitive knowledge, value-based reflection, methodological analysis, practical planning and digital tools. This makes project-based learning especially suitable for forming klironomical thinking.

Fifthly, the model may be used in the evaluation of educational quality. If klironomical thinking is considered an intended educational outcome, then assessment should not be limited to factual tests or descriptive assignments. It should also include analytical tasks, reflective essays, project presentations, case studies, digital portfolios and evaluation of students' ability to justify professional decisions concerning heritage.

The study has several limitations that should be acknowledged. The first limitation is its theoretical and analytical character. The proposed model was developed through conceptual

analysis, systematisation and pedagogical modelling, but it has not yet been empirically tested in a specific educational programme. Therefore, the results should be understood as a theoretical basis for further research rather than as a final verified pedagogical framework.

The second limitation is connected with the selected theoretical corpus. The study relies significantly on Alexander Buychik's works on klironomy and cultural heritage, as well as on selected international literature in heritage studies and heritage education. Although these sources are relevant to the research aim, the inclusion of a broader range of empirical studies on heritage education, digital pedagogy and professional competencies could further refine the model.

The third limitation concerns the general nature of the proposed pedagogical model. Cultural heritage education varies significantly depending on national educational systems, institutional traditions, professional standards, cultural policy and the specific type of heritage being studied. Therefore, the model may require adaptation when applied to particular contexts, such as museum education, restoration training, architectural heritage, intangible heritage, urban heritage or digital heritage programmes.

The fourth limitation is related to the concept of klironomical thinking itself. Although the study proposes a theoretical definition and structural components of this concept, further work is needed to develop diagnostic criteria and assessment tools. Without such instruments, it may be difficult to measure the degree to which klironomical thinking is formed among students.

The fifth limitation concerns digital heritage. The article includes the digital component as part of the model, but digital heritage is a rapidly developing field. New technologies, including artificial intelligence, immersive environments and automated digital reconstruction, may require additional refinement of the digital dimension of klironomical thinking.

Future research should focus on empirical verification of the proposed model. One possible direction is expert evaluation involving specialists in cultural heritage, pedagogy, restoration, museum studies, digital humanities and cultural management. Such evaluation would make it possible to assess the relevance, completeness and applicability of the five-component structure of klironomical thinking.

Another important direction is the development of diagnostic tools for assessing klironomical thinking. These tools could include criteria for evaluating cognitive understanding, axiological reflection, methodological competence, practical readiness and digital literacy. The creation of such instruments would allow researchers to move from theoretical modelling to empirical measurement.

A further direction is the pilot implementation of the model in educational programmes. This could be done through a university course, a professional training module, a project-based workshop or an interdisciplinary heritage education programme. The results of such implementation would make it possible to evaluate how students develop klironomical thinking in practice and which pedagogical methods are most effective.

Comparative research would also be valuable. Future studies may compare the formation of klironomical thinking in different countries, educational systems and cultural contexts. Such research would help determine which components of the model are universal and which require contextual adaptation.

Finally, future research should explore the relationship between klironomical thinking and digital heritage competencies. This is especially important in the context of digital archives, virtual museums, three-dimensional reconstructions, digital storytelling and AI-supported heritage interpretation. The development of this direction would make it possible to update the model in accordance with technological changes and the evolving needs of the heritage sector.

Overall, the discussion confirms that the proposed model has both theoretical and practical relevance. It contributes to the development of cultural heritage pedagogy by offering an integrated interpretation of specialist training based on klironomical thinking. At the same time, its further development requires empirical testing, contextual adaptation and the creation of methodological tools for educational implementation.

Conclusion

The study conducted made it possible to establish that the formation of klironomical thinking may be considered a key pedagogical condition for modernising cultural heritage education. In the context of contemporary cultural, social and digital transformation, the training of specialists in the field of cultural heritage cannot be limited to the transmission of fragmented disciplinary knowledge or separate professional skills. It requires the formation of an integral professional worldview that enables future specialists to understand cultural heritage as a complex system of preservation, interpretation, revitalisation and responsible transmission.

The purpose of the study, which consisted in developing and theoretically substantiating a pedagogical model for the formation of klironomical thinking in cultural heritage education, was achieved. The theoretical analysis of author's works on klironomy and cultural heritage, together with contemporary research in heritage studies, cultural memory studies, heritage education and digital heritage, made it possible to identify the conceptual foundations of klironomical education and to define its pedagogical significance.

The research objectives were consistently fulfilled. The theoretical foundations of klironomy were analysed as a scientific and methodological basis for cultural heritage education. The concept of klironomical thinking was clarified as a pedagogical and professional category. The key components of klironomical thinking were identified and systematised. The pedagogical conditions for its formation were determined. Finally, a theoretical model of klironomical education aimed at training specialists in preservation, revitalisation and digital heritage was proposed.

The main result of the study is the substantiation of klironomical thinking as an integrated educational outcome. It was shown that this type of thinking includes five interrelated components: cognitive, axiological, methodological, practical and digital. The cognitive component provides an understanding of cultural heritage as a multidimensional historical and cultural phenomenon. The axiological component forms responsibility for cultural value, continuity and preservation. The methodological component develops the ability to analyse heritage phenomena through klironomical categories and principles. The practical component connects theoretical knowledge with professional activity in preservation, interpretation and revitalisation. The digital component enables future specialists to work with contemporary forms of heritage documentation, representation and transmission.

The proposed model demonstrates that these components should not be treated as isolated educational elements. Their effectiveness depends on their integration within a coherent pedagogical process. Klironomical thinking is formed when students acquire not only knowledge about cultural heritage, but also the ability to interpret its meanings, evaluate its value, apply methodological tools, design practical solutions and use digital technologies responsibly. Therefore, cultural heritage education should be organised as a process of gradual formation of professional consciousness, methodological competence and cultural responsibility.

The theoretical contribution of the article lies in developing a pedagogical interpretation of klironomy. The study shows that klironomy can function not only as a science of cultural heritage, but also as a conceptual foundation for educational modelling. This makes it possible to define klironomical education as a specific direction in cultural heritage pedagogy aimed at forming specialists capable of systemic analysis, value-based judgement and practical work with heritage in changing cultural conditions.

The practical significance of the study consists in the possibility of applying the proposed model in the design of university courses, professional training programmes, interdisciplinary curricula and project-based educational modules. The model may be used in heritage studies, museum studies, restoration education, cultural management, digital humanities, urban revitalisation and cultural policy programmes. It may also serve as a basis for developing learning outcomes, assessment criteria and educational projects aimed at forming klironomical thinking.

At the same time, the study has several limitations. Its results are theoretical and require further empirical verification. The proposed model has not yet been tested in a concrete educational programme, which determines the need for future research. Further studies may include expert evaluation of the model, comparative analysis of existing cultural heritage curricula, pilot implementation in university education and the development of diagnostic tools for assessing the formation of klironomical thinking.

In conclusion, the article demonstrates that klironomical thinking may serve as a conceptual basis for overcoming the fragmentation of cultural heritage education. By integrating cognitive, axiological, methodological, practical and digital components, the proposed model allows cultural heritage education to be understood as a holistic pedagogical process. Such an approach contributes to the formation of specialists who are capable not only of preserving cultural heritage, but also of interpreting, revitalising and transmitting it in the conditions of contemporary social and digital transformation.

Conflict of Interests

The author declares that there is no conflict of interests that could have influenced the objectivity of the study, the interpretation of the results, or the presentation of the conclusions. The article was prepared independently, without external funding, institutional pressure or the involvement of organisations or individuals with a direct financial or personal interest in the outcomes of the research.

The study is based on theoretical analysis, including the author's previous works on klironomy and cultural heritage, as well as relevant international scholarly literature in the fields of heritage studies, cultural heritage education, cultural memory, digital heritage and pedagogy.

The use of the author's own previous publications as part of the theoretical corpus is openly stated and is determined by the research aim, which is to develop and theoretically substantiate a pedagogical model for the formation of klironomical thinking on the basis of the concept of klironomy.

The author confirms that the inclusion of these works did not affect the independence of the analysis and does not constitute a financial, institutional or personal conflict of interests. All conclusions presented in the article are the result of independent theoretical interpretation, conceptual systematisation and pedagogical modelling.

Thus, the declaration confirms compliance with the principles of academic integrity, transparency of scholarly publication and ethical standards of academic research.

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Liuba Atanasova Zlatkova [2]

Integrity and Artificial Intelligence in Musical Stage Direction for Children [2]

Abstract:
The article examines the role of artificial intelligence in musical stage direction for children within the broader framework of holistic and integrative education. The study is based on the idea that contemporary education should not remain within fragmented subject boundaries, but should create conditions for the child to perceive knowledge as an interconnected system. In this context, musical stage direction is interpreted not only as an extracurricular artistic activity, but also as a pedagogical model that combines music, literature, theatre, visual imagery, emotional experience and digital technologies in a unified educational process. The purpose of the article is to present and theoretically justify a practice-oriented model for using artificial intelligence in art education, particularly in the preparation of a musical lecture-concert for primary school pupils. The research focuses on the university discipline "Musical and Stage Directing for Children", in which future music teachers develop the ability to create performances, celebrations, thematic concerts and educational stage forms outside the traditional classroom format. The study emphasises that such work prepares student teachers to act not only as instructors, but also as organisers, interpreters, directors and creators of an emotionally meaningful educational environment. The methodological framework combines theoretical analysis and synthesis, pedagogical modelling, case-study analysis, dramaturgical analysis, musical and timbral analysis, leitmotif modelling, AI-assisted creative experimentation and pedagogical interpretation. The practical model is based on Charles Perrault's fairy tale "Little Red Riding Hood", selected because of its clear dramatic structure, recognisable characters and suitability for primary school pupils. The fairy tale is transformed into a musical lecture-concert in which each character and key situation receive a musical characterisation. The model uses the principle of leitmotif technique: Little Red Riding Hood is associated with the flute, the Mother with the clarinet, the Wolf with the bassoon, the Grandmother with the oboe and the Hunter with the trumpet. The forest path is also given its own lyrical musical theme. Artificial intelligence is introduced as an auxiliary creative tool rather than as a substitute for human imagination and pedagogical judgement. The SUNO application is used to generate musical material according to selected parameters, including character, instrument, duration and expressive function. The article argues that AI can support the search for musical themes, sound images and artistic solutions, but the final educational and aesthetic decisions remain dependent on the teacher-director's interpretation, methodological competence and understanding of children's perception. The proposed model demonstrates that musical stage direction develops professional flexibility, imagination and methodological independence in future teachers. For children, it awakens interest in music and literature, supports emotional perception of timbre, helps them understand musical-expressive means and encourages creative participation. The study concludes that artificial intelligence can become a productive element of art education when it is integrated into a holistic pedagogical concept. In this form, AI does not destroy the integrity of musical and theatrical education, but enriches it by expanding the possibilities for artistic interpretation, interdisciplinary connection and child-centred creative experience.

Keywords: artificial intelligence, musical stage direction, children's art education, musical lecture-concert, holistic education, integrative pedagogy, leitmotif technique, timbral perception, Little Red Riding Hood, creative pedagogy, music education, AI-assisted creativity.

"In the 20th century, much was said about the psychology of creativity. One of the components of a genius personality is the so-called ease of idea generation, or the ability to

abandon an idea which, however good it may be, no longer brings anything new."
M. Kazinik [1]

Introduction

The time in which we live is a time of profound and rapid changes in all aspects of life. Our children are born with knowledge and interests that parents and educators need to catch up with in order to respond adequately to the aspirations and searches of the new generations. This presupposes flexibility and a willingness on the part of educators to engage in continuous learning, as well as the necessary respect for and acceptance of what is new and unfamiliar. Over the last decade, and even over the last year, technologies have made an enormous leap in their development, and in this respect young people and children orient themselves much faster than those from whom they are separated by even a single generation.

Contemporary education is faced with the need to reform itself by turning to the primordial essence of the child—their wholeness and connection with the world, which inevitably leads to the search for the holistic development of the child's personality. It is necessary to develop all aspects of this personality by creating an appropriate environment for unfolding potential, revealing and expressing abilities, so that full professional, social and personal realisation can be achieved. This can be accomplished through a holistic educational and formative foundation at school, which creates conditions for the child to look at a subject or phenomenon in the way that is inherent to them—artistically or logically and mathematically. Thus, different ways of discovering knowledge will provide knowledge in its entirety, with all its observable aspects; in other words, a comprehensive or holistic view of the world will be formed.

The concept of holism, from the Greek ὅλος, meaning whole or complete, and the English word whole, is associated with the perception of sets of elements as a single whole that reacts and interacts in a unique way. Holism is a philosophical concept that has been advocated by a number of well-known figures since Antiquity, including Aristotle, Thomas Aquinas, Leibniz, Schelling and Hegel, but as a term it appeared at the beginning of the twentieth century with *Holism and Evolution* by the South African philosopher Jan Christiaan Smuts. He considers the whole as composed of parts, but states that "the whole is more than the sum of its parts" (*Gradinarov, 2018*). According to the holistic concept, objects and phenomena are elements of the whole, but what is essential are the connections and relations between them, which form and define it as a unified structure. The connections between the elements have a "law-like" character and determine the place of each part within the system. Holistic systems are dynamic structures that change over time, with a tendency towards change in the direction of strengthening wholeness.

However, before organisational change is undertaken, the idea of the integration of knowledge must mature in the consciousness of society. Such a change should not be formal, so as not to distort its essence. In other words, if we change the system, we must first change our own understanding of the fact that the world is an integral system and that its elements interact. In this way, everything that is learned finds its place and application, and its role in culture and civilisation becomes visible.

In order for upbringing and education to be effective, and in order for the child's potential to manifest itself and develop, it is necessary:

- To teach children to know, to orient themselves in the global flow of information, to discover the connections and dependencies between processes and phenomena, and to perceive the world and knowledge as a holistic, dynamic and developing system; to learn to study in a concentrated way with the help of memory and thinking; and to strive for lifelong learning and development.
- To teach children to act, to develop skills for applying acquired knowledge, skills and personal experience in solving new similar problems and in practice, and to possess competences that make them constructive and guarantee their professional success.
- To teach children how we can live together in harmony; to be understanding, tolerant and empathetic; and to cooperate.
- To teach children to know themselves, to be independent, critically thinking and creative, to be able to accurately assess the different situations in which life places them, to make the best decisions and to assume their responsibilities (*Delors, 1999*).

Today, ways are being sought to coordinate efforts among specialists in different fields of knowledge. The easiest way is to broaden learners' perspective within the existing system beyond their narrow specialisation and the individual academic discipline. Ana Borisova also seeks and applies such integrative approaches in her scientific and pedagogical work: "Concerned about the needs of children, but also sensing the pulse of the technological age, it is imperative to use creative approaches that will make our folk song interesting and desirable for them. These two reasons have motivated the development of a scientific project that will attempt to build an integrative approach to the study of Bulgarian folk song in kindergarten, in the third and preparatory groups" (*Borisova, 2025*).

Here, one such attempt is considered in the methodological sphere of music in kindergarten and primary school, one that is close both to children and to students—the so-called thematic lessons.

Thematic lessons are a group of lesson situations subordinated to a specific theme. It is self-evident that this theme cannot be connected solely and exclusively with the material of a particular subject, but also requires a number of research tasks. In this way, the theme, through its stages, unfolds more fully and clearly. Thematic lessons are a challenge both for the teacher, in this case the students, and for the children. They require going beyond the framework of the curriculum, conversations, discussions on the topic, investigation of the material, the search for different solutions, as well as unexpected discoveries. This investigation can become a starting point for further searching not only on this topic, but also when it becomes necessary to resolve an educational or other type of case. In other words, it goes beyond the cause-and-effect model and moves further—towards lateral thinking.

Divergent thinking, also called lateral thinking, refers to the generation of multiple creative solutions to the same problem. It is a spontaneous, fluid and nonlinear approach to thinking, based on curiosity and free-mindedness. It is very often found in children, since joy, imagination and an innovative perspective make their reasoning freer (*Framar, n.d.*). Convergent thinking, that is, the logical use of past experience and knowledge to find a solution, is useful and

necessary in many cases. Nevertheless, the real problem is that we have been "trained" to think only in this way, neglecting spontaneity, wit and captivating freedom (*Framar, n.d.*).

Divergent thinking is the ability to find connections between ideas, concepts and processes that at first glance have no point of intersection.

George Bernard Shaw: "Imagination is the beginning of creation. You imagine what you desire, you will what you imagine and at last you create what you will." (*Teach for Bulgaria, n.d.*).

Artificial intelligence is the object of different opinions that represent two extremes of evaluation. We have no right to deny the new that comes to replace what has existed and has already completed its path. The denial of a technology will not stop its rise simply because what we are used to is more convenient and familiar. Instead, it is necessary to build upon the ideas already existing in consciousness, upon available knowledge and skills, which makes it possible to solve a given task more quickly and effectively and to find new paths that often lead to new knowledge. This is the path of searching for and discovering the new, and, accordingly, the path towards broadening the horizon not only in the field of academic disciplines, but much more deeply—towards awareness of the interconnections between the individual parts of the whole called Life. In other words, AI is a tool in today's world for solving a given task or case more quickly and flexibly, something that cannot happen without human creativity.

In scientific literature, popular science literature and various fields of knowledge alike, ideas about the connectedness between different domains increasingly emerge. Medicine no longer pays attention only to a specific physical suffering and its treatment, but begins to search for causes beyond the physical; it turns to the psyche and communicates with psychology in order to discover the root cause. In most cases, this root cause goes beyond the boundaries of the purely bodily into spheres that until recently were considered mystical—thinking, experience, ancestral connections in the past, and so on. In turn, scientists who observe reactions and external manifestations in animals and plants increasingly arrive at conclusions related to the attitude and behaviour of people towards the environment. This small example is intended to show that the human being is a link in an integral system in which the parts are interconnected, and the disruption of one element creates disorder in the whole system.

To a very large extent, this also applies to education and upbringing. "In Bulgaria, learning takes place in fragments, in a fragmented and partial manner, and instead of acquiring the idea that nature speaks in terms of processes, pupils possess isolated facts, the connection between which they are unable to trace" (*Karo, 2020*).

Today's child, like any other child who grew up in a previous era, relies, on the one hand, on the information and knowledge received from adults in the home and educational environment and, on the other hand, on certain givens called talents and inclinations, which could hardly be defined solely by means of conventional sciences. Purely hypothetically, this suggests that for certain characteristics to manifest themselves so assertively in one generation, a previous stage must already have been passed. The next generation steps onto this stage to build upon it and acquire something new. In this case, this is the "explosion" in our still materialistic age and the technology represented by artificial intelligence.

Methods

The study is based on a qualitative, practice-oriented pedagogical design. Its methodological logic corresponds to the integrative nature of the research problem: the connection between holistic education, musical-stage direction, children's artistic perception and the use of artificial intelligence as a creative auxiliary tool. The research does not aim to measure isolated quantitative indicators, but to construct and analyse a pedagogical model in which music, literature, theatrical action, visual imagery and AI-generated material are combined within a single educational process.

The methodological basis of the study is the principle of holism. In this context, the educational situation is examined not as a mechanical combination of separate subjects, but as an interconnected artistic and pedagogical system. Music, word, movement, image, stage action and digital technology are interpreted as mutually dependent elements that jointly form the child's experience. This approach makes it possible to analyse musical stage direction as a means of overcoming fragmented subject teaching and of creating conditions for the integral development of the child's personality.

The method of theoretical analysis and synthesis was used to examine the concepts of holistic education, divergent thinking, arts integration, theatrical play, suggestopedic learning and the pedagogical use of artificial intelligence. This method made it possible to define the conceptual framework of the study and to justify the need for an integrative model in which AI is not treated as a substitute for human creativity, but as a tool supporting imagination, artistic choice and the search for expressive solutions.

The method of pedagogical modelling was applied in the design of a musical lecture-concert as an educational format. The model was developed within the university discipline "Musical and Stage Directing for Children", studied by students in the final year of the bachelor's degree programme in Music Education Pedagogy. The modelling process included the selection of a literary source, the definition of an age group, the construction of a dramatic and musical plan, the selection of expressive means and the integration of AI-generated musical material into the future educational event.

The case-study method was used through the analysis of a concrete pedagogical project based on Charles Perrault's fairy tale "Little Red Riding Hood". The fairy tale was selected because of its clear dramatic structure, recognisable characters, moral conflict and suitability for primary school pupils. The case makes it possible to trace how a literary text can be transformed into a musical-stage educational event through characterisation, timbre, leitmotif and theatrical action.

The method of dramaturgical analysis was applied to identify the main structural stages of the fairy tale: introduction, presentation of the main characters, conflict, climax, resolution and ending. These stages were considered not only as elements of the literary plot, but also as possible musical and theatrical units. This made it possible to connect the development of the fairy-tale action with the principles of musical form, including the analogy with exposition, development and recapitulation.

The method of musical and timbral analysis was used to determine the sound characteristics of the main characters and situations. Each character was associated with a specific musical instrument: Little Red Riding Hood with the flute, the Mother with the clarinet,

the Wolf with the bassoon, the Grandmother with the oboe and the Hunter with the trumpet. The forest path was also given its own musical theme. This method allowed the fairy-tale images to be translated into musical-expressive means and enabled pupils to perceive characters and events through timbre, sound colour and emotional association.

The method of leitmotif modelling was applied in order to create stable musical identifiers for the characters and key situations. The use of leitmotifs makes it possible for children to recognise a character or emotional state not only through verbal explanation, but also through recurring musical material. In this way, music becomes an active participant in the construction of the artistic image and supports the child's memory, imagination and emotional involvement.

The method of AI-assisted creative experimentation was used in the process of searching for and generating musical themes. The SUNO application was used as an auxiliary digital tool for generating musical material according to selected parameters, such as character, instrument, duration of the motif and expressive function. The use of AI in the study was limited to supporting the creative and organisational work of the future teacher-director. The final pedagogical and artistic decisions remained dependent on human selection, interpretation and methodological judgement.

The project-based method was applied in the organisation of the students' work. Students worked in small groups and passed through several stages: choosing a theme and an idea for the performance, defining the target age group, determining the format of the lecture-concert, studying the relevant primary school curricula in music, literature and visual arts, preparing a scenario and presentation framework, selecting musical and visual means, and planning the participation of children. This method was chosen because it develops students' professional independence, imagination, methodological flexibility and readiness to organise extracurricular artistic forms.

The method of pedagogical interpretation was used to analyse the educational value of the model for two groups of participants: student teachers and children. For student teachers, the model was assessed in terms of professional formation, development of imagination, ability to connect methodology with practice, and readiness to organise artistic events. For children, the model was interpreted in terms of interest in music and literature, emotional perception of timbre, understanding of musical-expressive means, creative use of AI and participation in an emotionally rich artistic activity.

The study therefore combines theoretical, interpretive, design-based and project-based methods. This methodological combination corresponds to the object of research itself: musical stage direction for children is not a single technique, but an integrative pedagogical process. The selected methods make it possible to examine how artificial intelligence can be included in this process without destroying its human, artistic and educational integrity.

Literature Review

The problem of integrity and artificial intelligence in musical stage direction for children is situated at the intersection of holistic education, arts integration, creative pedagogy, theatrical play and contemporary digital technologies. The reviewed sources make it possible to construct a theoretical framework in which musical and stage activity is understood not merely as an extracurricular artistic form, but as an integrative educational environment where music,

literature, drama, visual imagery, movement and digital tools function as interconnected elements of a single pedagogical system.

The philosophical basis of the study is connected with the concept of holism. Gradinarov (*2018*) examines the essence of holism and its applicability to social theory, emphasising the idea that the whole cannot be reduced to a mechanical sum of isolated parts. In an educational context, this principle is especially important because the child's development cannot be adequately understood through separate disciplinary fragments alone. The musical-stage project, therefore, is interpreted as a holistic structure: a literary plot, musical characterisation, theatrical action, scenography and children's emotional response are not independent components, but mutually reinforcing elements. This approach supports the central idea of the article that education in the arts should develop the child as a whole personality rather than as a recipient of fragmented subject knowledge.

The same orientation towards wholeness is present in Delors' educational model, according to which education in the 21st century should be built around the pillars of learning to know, learning to do, learning to live together and learning to be (*Delors, 1999*). These principles are directly relevant to musical stage direction for children. In the process of preparing and realising a musical lecture-concert or theatricalised educational project, children acquire knowledge about literature, music and artistic expression; they act by participating in performance, listening, interpreting and creating; they learn to cooperate with peers and teachers; and they gradually develop self-awareness, confidence and creative identity. Thus, the musical-stage format embodies the multidimensional nature of education described by Delors, because it combines cognitive, practical, social and personal development.

The creative dimension of the study is supported by Kazinik's reflections on the psychology of creativity. His idea that one of the qualities of a gifted personality is the ability to generate ideas freely and abandon even a good idea when it no longer produces anything new (*Kazinik, 2010*) is particularly relevant to pedagogical work in the arts. Musical stage direction requires constant selection, transformation and renewal of artistic material. A future teacher-director must be able not only to reproduce known scenarios, but also to search for new forms of presenting them to children. This is why creativity in the analysed context is not limited to inspiration; it becomes a professional pedagogical competence that includes flexibility, associative thinking, sensitivity to children's perception and the ability to transform familiar material into a new educational event.

The issue of divergent thinking expands this theoretical perspective. The source devoted to divergent thinking emphasises the ability to generate multiple solutions to the same problem and to find connections between concepts that initially appear unrelated (*Framar, n.d.*). This idea is central to musical and stage work with children. A fairy tale such as "Little Red Riding Hood" may be approached not only as a literary text, but also as a sequence of musical images, a dramatic structure, a visual composition, a moral situation and a field for children's interpretation. Such work moves beyond a linear cause-and-effect model of teaching and activates lateral thinking. It encourages both student teachers and pupils to search for different artistic means, alternative interpretations and unexpected connections between word, sound, colour, gesture and stage action.

The literature on arts integration provides a practical pedagogical basis for this approach. Borisova and co-authors study parental attitudes towards the use of integrative links between the arts in the process of learning Bulgarian folk songs in preschool education (*Borisova, 2025*). Although the source focuses on folk song and preschool education, its methodological relevance is broader. It confirms the importance of connecting different artistic languages in early education and demonstrates that music can function as a core around which speech, movement, visual imagery and cultural knowledge are organised. This supports the idea that musical stage direction for children is an effective integrative form, because it does not isolate music from other arts, but places it within a broader artistic and educational whole.

A similar practical orientation is found in the Teach for Bulgaria source, which presents ideas for teaching more engagingly through art (*Teach for Bulgaria, n.d.*). The emphasis on art as a means of increasing learner involvement is important for the present study because musical-stage projects operate precisely through emotional participation and active experience. In contrast to purely verbal explanation, artistic action enables children to understand educational content through perception, imagination and embodied engagement. This confirms the pedagogical value of performance-based and art-based learning formats, especially when the aim is not only to transmit knowledge, but also to awaken curiosity, empathy, confidence and expressive freedom.

The educational relevance of suggestopedia is also significant. Karo's work on suggestopedia for parents and teachers, particularly the part devoted to letters, emphasises the importance of emotional atmosphere, imagination and non-coercive learning in the educational process (*Karo, 2020*). Although suggestopedia and musical stage direction are different methodological systems, they share several essential principles: learning should be emotionally safe, aesthetically rich and connected with the child's inner world. In musical-stage work, music, story, image and performance reduce the rigidity of formal instruction and create conditions in which children can perceive, remember and express knowledge more naturally. This is especially important in primary education, where emotional experience often precedes abstract conceptual understanding.

The literary basis of the analysed pedagogical model is provided by Perrault's fairy tale "Little Red Riding Hood" (*Perrault, 2010*). The fairy tale is pedagogically productive because it has a clear plot structure, recognisable characters and a moral conflict that can be translated into different artistic languages. In the context of musical stage direction, each character may receive a specific timbral or melodic characteristic, while the development of the plot may be presented through changes in musical mood, rhythm, instrumental colour and dramatic action. In this way, literature becomes not only a narrative source, but also a structural framework for musical and theatrical interpretation.

The importance of theatrical play is substantiated by Penchev and Aleksieva, who examine children's theatricalised play as a form of creative activity (*Penchev & Aleksieva, 1980*). Their approach supports the idea that dramatisation is one of the most natural and widely used forms of children's creativity. Through theatrical play, children do not merely reproduce literary material; they appropriate it, transform it, interpret situations and construct meanings through action. This is essential for the present study because musical stage direction is not limited to preparing a final performance. It is also a process of educational discovery in which children

learn to understand characters, motives, conflicts and emotional states through music and stage embodiment.

The broader understanding of theatre as a complex art is reinforced by the KidsArts source, which presents theatre as a synthetic form including literature, music, painting, dance, architecture and design (*KidsArts, n.d.*). This understanding is fundamental for justifying musical stage direction as an integrative educational practice. Theatre brings together various artistic codes and allows children to experience knowledge as a living whole. It develops figurative thinking, aesthetic sensitivity, imagination and value orientation. For future art teachers, this means that the preparation of a theatrical or musical-stage event is also a form of professional formation: the teacher learns to coordinate artistic means, understand children's perception and organise a meaningful educational experience.

Artificial intelligence introduces a new dimension into this framework. In the context of musical stage direction, AI should not be understood as a replacement for human creativity, but as a tool that expands the range of possible artistic and pedagogical solutions. When used to generate musical motifs, visual materials, scenographic ideas or sound images, AI can support the teacher-director and student teachers in transforming a literary plot into a multisensory educational event. However, the reviewed theoretical framework shows that the effectiveness of AI depends on its integration into a holistic pedagogical concept. Technology becomes educationally meaningful only when it serves the child's perception, imagination, emotional involvement and creative participation.

Thus, the analysed literature confirms that musical stage direction for children may be understood as a holistic educational practice in which literature, music, theatre, visual art and digital technology interact within one pedagogical space. The sources collectively justify the need to move beyond fragmented subject teaching and towards integrative forms of education that develop children's cognitive, emotional, social and creative potential. Within this framework, artificial intelligence appears not as an autonomous pedagogical force, but as an instrument that can enrich artistic interpretation, stimulate divergent thinking and support the creation of emotionally engaging educational projects. The research gap addressed by the present article lies precisely in the connection between holistic pedagogy, musical-stage directing and AI-assisted creative work with children.

Results

Every new discovery or phenomenon always appears when its time has come. In order to be "born", there is a reason for it; that is, its manifestation is a consequence. The question is not whether it should be praised or rejected, but how to find the best ways to introduce it into our everyday life so that it can serve and help us.

The following pages present one possible way of using AI in art lessons, and more specifically in extracurricular formats, as well as how students majoring in Music Education Pedagogy see its use from an educational perspective. This is also a way of integrating the different aspects of art—music, word, colour and form—on the basis of, and with the help of, the existing knowledge of primary school pupils.

1. Musical and Stage Directing for Children

According to a number of studies, experiencing knowledge is the most successful way for it to be remembered and understood. Therefore, the arts, in their full splendour and in their combination through the tools of theatre and drama, are widely used in education.

Art is always associated with experience and emotion, and for this reason it is also useful in the acquisition of social-emotional skills.

The integration of art in its various forms into lessons helps develop pupils' social skills in group tasks. It can also be used for the creative expression of strong emotions when specific situations arise in the classroom or in the experiences of a particular pupil (*Teach for Bulgaria, n.d.*).

The university discipline in which students demonstrate their creativity and imagination is elective and is called "Musical and Stage Directing for Children". It is studied in the final year of the bachelor's degree programme, and through its students, on the threshold of entering professional life as teachers, see another aspect of pedagogical work, namely the opportunity and necessity to be creators and organisers of performances, celebrations and productions outside direct classroom teaching.

Every music teacher faces the fact that, in addition to preparing and conducting lessons at school or activities in kindergarten, it is also necessary to organise and create extracurricular forms related to various occasions. In these forms, a young teacher needs to possess a particularly broad general culture and to have not only school and university knowledge, but also familiarity with artists and their works from different spheres of art, as well as the ability to know and connect this knowledge with historical epochs, geographical location and so on.

This general culture supports the selection of a theme for the relevant performance, activates imagination and flexible thinking in the choice of means. Knowledge of the characters and psychology of the children with whom and for whom the performance will be presented is a necessary starting point for its good and rapid realisation.

Such preliminary work develops the students' imagination, shows their suitability for this kind of work, as well as their future attitude towards the pedagogical sphere. The future teacher becomes a director both of art lessons and of the children's public performance. The director's task is to skillfully realise their idea for a production so that it sounds and looks in a new way. The realisation of the idea is the work of everyone. The task of the teacher-director is to unite them around a single idea, to make them understand it deeply and give all their strength, to put their soul into the performance.

The preparation of a "performance" includes several stages:

- forming groups—students are grouped according to their interests into groups of two or three;
- choosing a theme for the work and a children's audience before whom and with whom the students will present it;
- planning the work from an organisational perspective—whether it will be a performance, a celebration, a thematic concert, or a lecture-concert designed to help expand children's knowledge;
- choosing a team with whom the "music teacher" will communicate and from whom they will receive assistance—both practical assistance and support in terms of implementation;

- selecting pupils to join the team;
- creating a script;
- working on the text, music, dramatic action, mise-en-scène and so on;
- using various forms of AI to create scenery, to create music for the characters, including leitmotifs, and to visualise instruments and instrumental groups or orchestra.

This sequence, as well as its content, is conditional. Depending on the theme and idea of the performance, as well as on the teams formed, it may be expanded or synthesised, with the expectation that the teams will distribute their tasks for greater efficiency and speed of implementation.

2. Educational Directing—Integration and Erudition

Students are creative personalities and seek different possibilities for creating an idea. In this case, the difficulty lies not only in the emergence of the idea for such a performance, but also in engaging the students' imagination with regard to the path towards achieving it—the most effective work on the theme, the most interesting and developmental theme both for the children participating and for the children in the audience. On the other hand, there is also the question of the place and role of music in the preparation and realisation of the event.

Lecture-concerts are "lessons in a concert hall". In them, in an informal setting outside the classroom, several interconnected processes are realised simultaneously:

- An opportunity for pupils to be creators—to propose a theme, choose means and contribute to the occurrence of the event;
- The curiosity of the child spectators, for whom this art lesson is held in a different place, in a new environment, and is cared for simultaneously by their classmates and teachers;
- Alongside the work of creating the lecture-concert, educational and formative tasks are solved at its different stages;
- Last but not least, the proudly topical AI enters into action here as a fully-fledged participant: on the one hand, it relies on the existing knowledge and skills of pupils, and on the other, it provokes their curiosity, search, flexibility and desire for discovery, as well as competitiveness in solving a specific task.

Work on a theatrical project is an integrative process. In it, alongside the fairy-tale plot and the development of the action from introduction through climax to resolution, the knowledge of the participants is sought; in the process of work, this knowledge is enriched, connections are found between the arts that participate in the future performance, concepts are revised and understood, the place and role of the fairy tale as an educational tool are seen, and conclusions are drawn. Knowledge reaches the child's consciousness through emotion and action.

In cases of active communication between teachers in one school, the process of creating such a project is neither an end in itself nor an isolated phenomenon. It becomes an active teaching factor precisely because it breaks the stereotype of formal work—the class-and-lesson principle. This type of work, on the one hand, helps create good relationships and trust between pupils and teachers, thereby stimulating subject-subject interaction, and, on the other hand, points towards breaking the stereotypes that the pupil is the learner and the teacher is the instructor.

This is also a way for a good teacher to become a "psychologist", an initiator of the formation and development of the child's latent qualities, to stimulate and encourage the manifestation of what is specific and to awaken the creative principle. By using the means of music and the other arts, the teacher opens the child's consciousness, which in this way orients itself more easily and accessibly in the world, lowers its emotional and psychological barriers and, in some cases, sees itself and its future place in society.

Musical and stage directing helps children and the teacher or teachers to look at the lesson and the knowledge provided in it according to the curriculum as knowledge that "works", that does not "hang in space", but can be used and can serve a purpose. On the other hand, music becomes a factor in perceiving and understanding the deeds and actions of a character; that is, music helps the word make the artistic image deeper and more fully developed.

3. Little Red Riding Hood and AI

What is proposed in the following lines is a variant of a musical lecture-concert, that is, an educational lesson in a concert hall.

The lecture-concert is a format in which music is listened to and explained; that is, the leader or presenter in the process of what is happening explains and helps the audience understand and become aware of the action and the means by which it is "painted". In other words, in the lecture-concert, together with the story, the musical-expressive means that help the image acquire a clearer and fuller appearance are explained and connected with it.

For the creation of a musical lecture-concert based on a well-known children's fairy tale, the students propose "Little Red Riding Hood". The script is based on the characteristics of the characters—Little Red Riding Hood, the Mother, the Wolf, the Grandmother and the Hunter—as well as on the fairy-tale story and the conclusions drawn from it (*Perrault, 2010*).

The musical-educational effect sought is generally connected with the development of timbre hearing in primary school pupils. For this purpose, it is necessary:

- to trace the development of the fairy tale;
- to identify individual moments in which the relevant character appears or when two or more characters come into conflict with one another;
- to characterise the place or places of action;
- to determine the main moments—introduction to the story, acquaintance with the main characters, the conflict, the resolution and the ending.

These stages of the fairy tale are stages in general, in any life situation. Likewise, they are also stages of every musical work. They also underlie large forms, including the basis of sonata form: the three sections—exposition, development and recapitulation—are analogous both to the development of the fairy-tale action and to the path of any event.

It is necessary for each of the indicated characters and each moment of the fairy tale to be expressed and represented through music. This is required not only from an aesthetic and formal point of view, but above all because of the aspiration to connect word, namely the fairy tale, and music, in this case the sound characterisation of each character and each scene.

In searching for the best options for characterising characters, places and conflicts, the students focus on the timbral characteristics of instruments suitable for the case. This is also a

way of connecting fairy-tale characters and situations with the expressive means of music and, of course, of making them easier and more emotional to remember and recognise.

In addition to relying on timbre, the students working on this project propose giving each character and place its own sound; that is, using the principle of leitmotif technique. Subsequently, a verse can be created for each melody, and the whole can be turned into the character's song and learned by the children.

AI comes to assist in the search for and discovery of instruments and themes. The SUNO application is used mainly, generating, according to specified parameters, the corresponding theme—the characterisation of a character, the chosen instrument, the duration of the motif and so on.

In this case, the characters are represented by the following instruments:

- Little Red Riding Hood—flute;
- The Mother—clarinet;
- The Wolf—bassoon;
- The Grandmother—oboe;
- The Hunter—trumpet.
- The forest path also has its own theme.

It is perceived as a lyrical digression through musical means and possesses the descriptive character that should direct the children's thoughts towards a pastoral idyll.

In order to explain their working path, their choice of means and their search for a suitable application for the musical design, the student group working on this project goes through several stages:

- Selection of a theme and idea for the performance;
- Choice of the age group with whom and before whom the lecture-concert will be presented;
- Format of the performance;
- Familiarisation of the students with the curricula in music, visual arts and literature.

This is necessary so that they can orient themselves regarding the children's knowledge of the fairy tale and its structure, expressive means and programme music, the musical forms known to the children, and musical fairy tales and fairy tales with music that they have listened to or watched in animated or live-action versions;

Creation of a work plan based on a presentation principle — each slide represents a kind of "skeleton" or framework that is gradually filled in.

The student group sets itself the task of checking the extent to which children know and respond to the different timbres of musical instruments, how the children themselves "see" each of the characters, whether they can assess what the character of each theme might be, and how the transitions should be sounded—Little Red Riding Hood's walk through the forest; the anxiety in front of the grandmother's house; the resolution at the end. In the process of work, other intermediate moments may also be added to supplement the action.

The lecture-concert is intended to be implemented in two third-grade primary school classes that have been introduced to the fairy tale in advance. The fairy tale itself has been

recalled in literature class, the characters have been characterised, their qualities have been identified, and the pupils have reached a conclusion about its moral lesson.

Discussion

The results of the study allow the problem of artificial intelligence in children's art education to be discussed not as a question of technological replacement, but as a question of pedagogical integrity. The proposed model demonstrates that AI becomes educationally meaningful only when it is included in a broader system of artistic, methodological and developmental purposes. In this sense, artificial intelligence does not function as an autonomous creator of educational content, but as an auxiliary instrument that expands the teacher-director's range of expressive possibilities. Its pedagogical value depends on the ability of the future music teacher to select, interpret, adapt and subordinate AI-generated material to the age, emotional perception and creative needs of children.

This interpretation is especially important in the context of holistic education. The musical lecture-concert based on *Little Red Riding Hood* shows that music, literature, theatre, visual imagery, emotional experience and digital technologies can be organised as interdependent elements of one educational situation. Such organisation corresponds to the holistic understanding of education, according to which the child does not perceive knowledge as a mechanical set of isolated fragments, but as a living system of relations. The fairy tale becomes not only a literary source, and music becomes not only an illustrative background. Together, they form a unified artistic-pedagogical space in which the child can listen, recognise, imagine, compare, participate and interpret.

The use of leitmotif technique in the proposed model confirms the importance of stable musical identifiers for children's perception. By associating each character with a specific instrument and sound image, the model transforms abstract musical-expressive means into concrete emotional and imaginative experience. The flute, clarinet, bassoon, oboe and trumpet do not merely represent timbral differences; they become pedagogical signs through which children can recognise characters, situations and emotional states. In this respect, the model supports the development of timbral hearing, musical memory and associative thinking. It also demonstrates that musical form and fairy-tale dramaturgy may be meaningfully connected: exposition, conflict, development, resolution and ending can be perceived both as literary and musical structures.

The role of AI in this process is ambivalent and therefore requires careful pedagogical mediation. On the one hand, AI applications such as SUNO can accelerate the search for musical themes, offer unexpected sound solutions and stimulate students' creative experimentation. On the other hand, the availability of automatically generated material may create the illusion that artistic and pedagogical decisions can be delegated to technology. The study shows the opposite: the more accessible AI-generated material becomes, the more significant the teacher's interpretive responsibility is. The future teacher-director must decide whether a generated motif corresponds to the character, whether its timbre and mood are appropriate for primary school pupils, whether it supports the dramaturgical logic of the lecture-concert, and whether it enriches rather than overloads the child's perception.

This finding is directly connected with the problem of integrity in the title of the article. Integrity in AI-assisted musical stage direction means preserving the unity of artistic idea, educational purpose and child-centred perception. AI can enrich the educational process only when it remains subordinated to this unity. If technology is used mechanically, without dramaturgical, musical and pedagogical selection, it may fragment the experience and reduce the artistic process to a set of attractive digital effects. If, however, AI is used within a consciously designed pedagogical model, it can help future teachers search for expressive solutions, compare alternatives, refine musical images and involve children in a more vivid experience of music and literature.

The study also has implications for the professional preparation of future music teachers. Musical and stage directing requires competencies that go beyond the traditional lesson format. The teacher must be able to think as a musician, director, organiser, interpreter and mediator of children's creative experience. The analysed model develops precisely these qualities: imagination, methodological flexibility, erudition, teamwork, understanding of curricula, sensitivity to children's age characteristics and readiness to organise extracurricular artistic forms. AI does not remove these requirements; rather, it makes them more visible. In order to use AI productively, the future teacher must possess a clear artistic idea, a pedagogical criterion for selection and an understanding of how children perceive sound, image, word and stage action.

For children, the model opens possibilities for a more emotionally rich and participatory form of learning. The lecture-concert format allows them to encounter music outside the ordinary classroom situation and to understand that musical-expressive means are not abstract theoretical concepts, but active participants in the creation of meaning. Through the connection between fairy-tale characters and musical timbres, children can experience how music "paints" a character, marks a conflict, creates tension, expresses movement or supports resolution. This is particularly significant in primary school, where concrete imagery, emotional response and play remain essential mechanisms of understanding.

The proposed model also contributes to the development of divergent thinking. A familiar fairy tale is reinterpreted as a musical, theatrical and digital project. The same narrative material becomes a field for multiple artistic solutions: a dramatic structure, a system of leitmotifs, a timbral map, a visual scenario, a concert lesson and a space for children's participation. Such work encourages both students and pupils to search for connections between domains that are often separated in school practice. In this sense, AI may become not only a tool for producing musical material, but also a stimulus for asking new questions: how can a character sound, how can a forest path be expressed musically, how can fear or safety be conveyed through timbre, rhythm or melodic contour?

At the same time, the limitations of the study should be clearly recognised. The research is qualitative, theoretical and practice-oriented; it constructs and interprets a pedagogical model rather than measuring its effects through quantitative indicators. Therefore, the conclusions should not be understood as evidence of universal effectiveness in all primary school contexts. Further research may include direct implementation of the lecture-concert with pupils, observation of children's responses, analysis of their ability to recognise timbres and leitmotifs, interviews with student teachers, and comparison between AI-assisted and non-AI-assisted

preparation of similar musical-stage projects. Such empirical work would make it possible to evaluate more precisely how AI influences children's musical perception, creative involvement and understanding of artistic connections.

Another important direction for further research concerns ethical and methodological criteria for the use of AI in children's art education. Since AI-generated material can be produced quickly and in large quantities, future teachers need clear principles for selection, adaptation and responsible use. These principles should include age appropriateness, artistic quality, emotional safety, transparency of AI use, respect for authorship, and the preservation of human creative agency. In art education, the central question is not how much technology can generate, but how meaningfully the teacher can transform technological output into an educational experience.

Thus, the discussion confirms that artificial intelligence can be productively integrated into musical stage direction for children when it is placed within a holistic pedagogical framework. The value of the model lies not in the technological novelty itself, but in the way AI is connected with literature, music, theatre, timbre, leitmotif, children's imagination and the professional formation of future teachers. Properly mediated, AI does not destroy the integrity of musical and theatrical education. On the contrary, it can support artistic interpretation, stimulate methodological creativity and help create emotionally significant educational situations in which children perceive knowledge as interconnected, meaningful and alive.

Conclusion

Work on creating a project that connects music and literature has a multifaceted effect on the participants.

I. For student teachers

1. It awakens imagination in relation to the search for a theme and idea, as well as for a format of implementation.
2. It directs students towards the search for an appropriate text which, on the one hand, is connected with the child and their current intellectual level and, on the other hand, requires familiarity with the primary school curricula in music, literature and visual arts.
3. It develops observation skills—the ability to understand what the child of this age and generation is looking for, what they are interested in, what their inclinations are, whether they receive support from their parents, whether they read books other than school literature, whether they imagine what happens in a fairy tale, and whether and how they can depict it through the means of visual art, and so on.
4. It enables them to connect their own knowledge of music methodology with practice, not only in regular lessons, but also in a free form—an extracurricular form of learning in the concert hall.
5. They find like-minded students from the speciality "Pedagogy of Visual Arts" who can help with the scenery and with elements of costumes and masks.

II. For children

1. It awakens interest in music and the other arts.
2. They understand that music "paints" characters and events and makes them recognisable through expressive means and through the timbres of musical instruments.

3. They emotionally perceive timbres and other expressive means, connecting them with the concrete, which is fundamental to thinking in this age group.
4. In the practical implementation of a lecture-concert in a concert hall, interest in music and the spoken word is awakened, and the fairy tale acquires a different form in the children's consciousness.
5. They understand that AI can be used creatively and directs them towards the search for models for their own ideas.
6. Alongside verbal creativity, dramatisation is the most frequent and widely used type of children's creativity. Children compose, improvise and stage ready-made literary material themselves. Skillfully formulated questions from the teacher during preparation for the game encourage children to think, to analyse quite complex situations, and to draw conclusions and generalisations (*Penchev & Aleksieva, 1980*).
7. It creates joy and confidence in the child that they can participate in an emotionally rich activity in which music is the main means of expression.
8. The child understands and becomes aware of musical-expressive means as active participants not only in the process of creating and perceiving music, but also as part of musically enriched life itself.

Theatre is a complex art in which literature, music, painting, dance, architecture and design are present. Precisely because of this specificity, contact with theatrical art contributes to the spiritual growth of children, forms a sense of beauty, and enriches their value system, artistic outlook, figurative thinking and imagination (*KidsArts, n.d.*).

Musical and stage directing is not only a means of practically creating a performance, but also a form of psychological preparation for future art teachers, helping them understand the rich world of the child's soul and serving as a path towards awareness of wholeness in the educational process.

Conflict of Interests

The author declares that there is no conflict of interests that could have influenced the objectivity of the study, the interpretation of the results, or the presentation of the conclusions. The article was prepared independently, without external funding, institutional pressure or the involvement of organisations or individuals with a direct financial, commercial or personal interest in the outcomes of the research.

The study is based on theoretical analysis, pedagogical modelling, case-study interpretation and practice-oriented reflection within the field of music education, children's musical and stage directing, holistic pedagogy and AI-assisted creative experimentation. The use of artificial intelligence in the article is considered exclusively from a pedagogical, methodological and artistic perspective. AI is analysed as an auxiliary creative tool that can support the search for musical themes, sound images and expressive solutions, but it is not presented as a substitute for the teacher's professional judgement, artistic interpretation or responsibility for the educational process.

The SUNO application is mentioned in the article only as an example of a digital tool used for generating musical material according to selected pedagogical and artistic parameters, such as character, instrument, motif duration and expressive function. The author declares that there

is no financial, commercial, advertising or institutional relationship with the developers, owners or distributors of this application. Its inclusion in the study is determined solely by the research aim: to demonstrate one possible model of integrating AI-generated musical material into a holistic musical lecture-concert for primary school pupils.

The author confirms that the reference to this AI tool did not affect the independence of the analysis, the selection of methodological approaches or the formulation of the conclusions. All pedagogical interpretations presented in the article are the result of independent theoretical reflection, artistic-pedagogical modelling and professional evaluation of the role of AI in musical and stage directing for children.

The study does not promote any specific commercial product, platform or technological solution. The discussion of AI is subordinated to broader educational questions: the development of children's musical perception, the integration of literature, music and theatre, the formation of timbral hearing, the use of leitmotif technique, and the professional preparation of future music teachers. Therefore, the technological component is interpreted only as one element within a wider pedagogical system.

Thus, the declaration confirms compliance with the principles of academic integrity, transparency of scholarly publication, independence of research interpretation and ethical standards of academic work in the field of music education, art pedagogy and the pedagogical use of artificial intelligence.

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Maxim Bakhtin [3]

Epistemic Trust and Learner Agency in Generative AI-Mediated Education: A Philosophical-Pedagogical Model of Responsible Co-Agency [3]

Abstract:
This article is devoted to the theoretical analysis of epistemic trust and learner agency in education mediated by generative artificial intelligence. The relevance of the study is determined by the rapid integration of generative systems into educational practice, where they are increasingly used for explanation, feedback, writing support, problem-solving, assessment assistance and the individualisation of learning. The scientific novelty of the study lies in interpreting trust in generative AI not as a purely technical or ethical issue, but as a philosophical-pedagogical condition for preserving learner agency. The object of the study is educational interaction in learning environments mediated by generative AI systems. The subject of the study is the philosophical and pedagogical mechanisms through which epistemic trust and learner agency are formed, transformed or weakened in the use of generative systems. The study aims to develop and theoretically substantiate a philosophical-pedagogical model of responsible co-agency in generative AI-mediated education. The study has a theoretical and analytical research design. Its methodology includes theoretical analysis, conceptual reconstruction, comparative interpretation, systematisation and philosophical-pedagogical modelling. The source base includes works on philosophy of education, epistemic trust, learner agency, AI in education, generative AI, responsible AI, digital pedagogy and human–AI interaction. The article establishes that epistemic trust in generative AI should not be understood as passive confidence in algorithmic output. It must be structured as critical, calibrated and verifiable trust based on comparison, verification, interpretation and human responsibility. The study identifies algorithmic delegation as a key risk of AI-mediated learning: learners may formally complete educational tasks while transferring interpretation, judgement, argumentation or authorship to the system. At the same time, generative AI may support learner agency when it is used as a dialogical and cognitive tool for questioning, reflection, comparison, revision and intellectual exploration. The author proposes the model of responsible co-agency, in which the learner remains the subject of judgement and responsibility, the teacher acts as the organiser of pedagogical and ethical conditions, and the generative system functions as a supportive cognitive tool rather than an autonomous epistemic authority. The study identifies pedagogical conditions necessary for preserving agency: epistemic AI literacy, agency-protective task design, explicit distribution of responsibility, dialogical AI use, teacher-mediated trust calibration and process-oriented assessment. The author concludes that the central challenge of generative AI-mediated education is not technological, but philosophical and pedagogical. Generative systems can become valuable educational tools only when they strengthen learners' capacity for understanding, judgement and responsibility rather than replace intellectual activity with ready-made algorithmic output.

Keywords: epistemic trust, learner agency, generative AI, responsible co-agency, AI-mediated learning, philosophy of education, digital pedagogy, algorithmic delegation, epistemic AI literacy, critical thinking, human responsibility, educational autonomy.

Introduction

In the context of the rapid development of generative artificial intelligence, education is undergoing a profound transformation that affects not only teaching methods and learning tools, but also the philosophical foundations of the educational process. Generative systems are increasingly involved in explanation, feedback, writing, translation, problem-solving, assessment support, creative modelling and the individualisation of learning trajectories. As a result, the learner no longer interacts only with the teacher, the textbook, the task and their own reasoning, but also with an algorithmic system capable of producing plausible, coherent and context-sensitive responses.

The relevance of the study is determined by the need to rethink the relationship between trust and learner agency in AI-mediated education. In traditional pedagogical contexts, trust is primarily associated with the teacher, the educational institution, the curriculum, scholarly knowledge and the learner's own intellectual effort. In generative AI-mediated learning environments, however, a new epistemic actor appears: a system that can generate explanations and solutions without possessing human understanding, responsibility or pedagogical intention. This creates a new educational situation in which learners may use generative AI as a cognitive and dialogical tool, but may also delegate judgement, interpretation and responsibility to it.

The problem of the study is associated with the ambiguity of epistemic trust in generative systems. On the one hand, trust in AI-generated support may expand learner agency by providing access to explanations, alternative formulations, examples, feedback and intellectual scaffolding. On the other hand, excessive or uncritical trust may weaken agency when learners accept generated outputs as authoritative knowledge, avoid independent reasoning, reduce verification practices or transfer responsibility for the final result to the system. Therefore, the key pedagogical problem is not whether generative AI should be trusted or distrusted, but how epistemic trust should be structured so that it supports rather than replaces learner agency.

The scientific novelty of the study lies in interpreting trust in generative AI not as a purely technical, psychological or ethical issue, but as a philosophical-pedagogical condition for preserving and developing learner agency. The article proposes the concept of responsible co-agency, within which the learner remains the subject of judgement, interpretation, choice and responsibility, while the generative system functions as a cognitive, dialogical and methodological tool. Within this approach, AI-mediated education is understood not as the replacement of human thinking by algorithmic output, but as a structured interaction in which agency must be consciously distributed and pedagogically regulated.

The object of the study is educational interaction in learning environments mediated by generative AI systems.

The subject of the study is the philosophical and pedagogical mechanisms through which epistemic trust and learner agency are formed, transformed or weakened in the use of generative systems.

The study aims to develop and theoretically substantiate a philosophical-pedagogical model of responsible co-agency that explains how epistemic trust in generative AI can support, rather than replace, learner agency.

To achieve this aim, the following research objectives have been defined:

- to analyse the philosophical meaning of epistemic trust in education mediated by generative AI;
- to clarify the concept of learner agency in the context of generative systems;
- to identify the risks of blind algorithmic trust and the delegation of judgement to AI-generated outputs;
- to distinguish between supportive AI-mediated learning and agency-reducing dependence on generative systems;
- to develop a model of responsible co-agency between learner, teacher and generative AI system;

– to substantiate pedagogical conditions for maintaining learner autonomy, critical thinking, verification practices and responsibility in AI-mediated education.

The theoretical significance of the study lies in the development of a philosophical-pedagogical interpretation of trust and agency in the age of generative systems. The article expands the conceptual apparatus of contemporary pedagogy by introducing responsible co-agency as a category that allows AI-mediated learning to be analysed not only in terms of technological efficiency, but also in terms of epistemic responsibility, autonomy, judgement and the preservation of the learner as an active subject of education. This approach contributes to the philosophy of education, digital pedagogy and the emerging field of AI-mediated learning.

The practical significance of the study consists in the possibility of applying its results to the design of educational strategies, teacher training programmes, AI literacy modules, academic integrity policies and learning activities involving generative AI. The proposed model may help educators distinguish between pedagogically productive uses of generative systems and practices that weaken learner autonomy. It may also support the development of tasks that require learners to compare, verify, criticise, revise and justify AI-generated outputs rather than passively consume them.

Thus, the study addresses the need for a philosophical and pedagogical framework that can explain how trust should function in generative AI-mediated education. The central argument of the article is that learner agency can be preserved and strengthened only when epistemic trust is combined with critical verification, reflective judgement and human responsibility. In this sense, the future of education in the age of generative systems depends not on replacing learners' intellectual activity with algorithmic assistance, but on forming responsible co-agency between learners, teachers and technological systems.

Methods

The present study has a theoretical and analytical research design and is aimed at developing a philosophical-pedagogical model of responsible co-agency in generative AI-mediated education. In accordance with the nature of the research problem, the study does not include empirical measurement, experimental intervention or quantitative data collection. Instead, it is based on theoretical analysis, conceptual reconstruction, comparative interpretation and philosophical-pedagogical modelling.

The choice of this design is determined by the need to analyse epistemic trust and learner agency not only as psychological or technological phenomena, but also as philosophical and pedagogical categories. Generative AI-mediated education changes the structure of educational interaction, since the learner receives explanations, suggestions, feedback and possible solutions from an algorithmic system that does not possess human intentionality, responsibility or understanding. Therefore, the methodological focus of the study is directed towards clarifying the conceptual conditions under which trust in generative systems can support, rather than weaken, learner agency.

The research material consists of scholarly works devoted to philosophy of education, epistemic trust, learner agency, educational autonomy, digital pedagogy, AI in education, generative AI, academic integrity, critical thinking, responsible AI and human–AI interaction. The source base includes theoretical and methodological studies that make it possible to analyse

the transformation of learning under the influence of generative systems. Particular attention is paid to works that examine the relationship between trust, knowledge, responsibility, autonomy, human judgement and technological mediation in educational contexts.

The criteria for selecting sources were as follows: relevance to the concepts of epistemic trust, learner agency and AI-mediated learning; significance for philosophy of education and digital pedagogy; applicability to the analysis of generative AI as a learning tool; contribution to the discussion of autonomy, responsibility and verification in educational practice; and representativeness for contemporary interdisciplinary research on artificial intelligence in education. Sources were selected in order to provide a conceptual basis for interpreting generative AI not merely as a technological instrument, but as a factor that transforms the epistemic and pedagogical structure of learning.

The analytical procedure included several consecutive stages. At the first stage, theoretical approaches to trust in education, epistemic authority and learner agency were analysed. At the second stage, the specific features of generative AI-mediated learning were identified, including the production of plausible outputs, personalised explanation, dialogical interaction, feedback simulation and the risk of delegating judgement to algorithmic systems. At the third stage, the risks of blind algorithmic trust and agency-reducing dependence were systematised. At the fourth stage, the conditions under which generative systems can support learner autonomy, critical thinking and reflective judgement were determined. At the final stage, the obtained results were integrated into a philosophical-pedagogical model of responsible co-agency.

The methodology of the study includes general scientific methods and specialised theoretical methods. General scientific methods include analysis, synthesis, comparison, generalisation and classification. These methods were used to identify key categories, compare existing approaches and systematise the pedagogical risks and possibilities of generative AI-mediated education. Specialised methods include conceptual reconstruction, philosophical interpretation, comparative theoretical analysis and pedagogical modelling. Conceptual reconstruction was used to clarify the meaning of epistemic trust, learner agency and responsible co-agency. Philosophical interpretation made it possible to examine the normative and epistemic dimensions of trust, autonomy and responsibility. Comparative theoretical analysis was applied to distinguish between supportive AI-mediated learning and dependence on AI-generated outputs. Pedagogical modelling was used to construct an integrated model of responsible co-agency.

Within the framework of the study, epistemic trust is understood as the learner's readiness to rely on a source of information, explanation or guidance while preserving the capacity for verification, interpretation and critical judgement. Learner agency is interpreted as the learner's ability to act as a subject of learning: to formulate questions, make decisions, evaluate information, revise understanding, justify conclusions and assume responsibility for the final intellectual result. Responsible co-agency is defined as a pedagogically regulated form of interaction in which the learner, the teacher and the generative system participate in the learning process, but human judgement and responsibility remain central.

The study proceeds from the assumption that generative AI has an ambivalent pedagogical status. On the one hand, it may support learner agency by providing explanations, alternative perspectives, examples, feedback, scaffolding and opportunities for self-directed learning. On

the other hand, it may weaken learner agency when students use generated outputs as substitutes for reasoning, interpretation, verification or authorship. Therefore, the central methodological task of the study is to identify the conditions under which generative AI becomes a tool of agency development rather than a mechanism of cognitive delegation.

The proposed model was developed through the identification of several interrelated components of responsible co-agency: epistemic, reflective, critical, dialogical, ethical and pedagogical. The epistemic component concerns the learner's ability to distinguish between information, explanation, probability, argument and knowledge. The reflective component includes awareness of one's own learning goals, difficulties and decisions. The critical component involves verification, comparison of sources and evaluation of AI-generated outputs. The dialogical component reflects the use of generative AI as a partner in questioning, reformulation and exploration rather than as an authority. The ethical component concerns authorship, responsibility and academic integrity. The pedagogical component includes the role of the teacher in designing tasks, rules and learning environments that preserve learner agency.

The validity of the study is ensured by the logical consistency between the research problem, aim, methodological procedure and proposed model. It is also supported by the interdisciplinary comparison of approaches from philosophy of education, digital pedagogy, AI ethics and educational technology studies. The reliability of the study is achieved through the transparent description of the analytical stages, the consistent application of selected methods and the clear differentiation between conceptual analysis, normative interpretation and pedagogical modelling.

The limitations of the study are associated with its theoretical character. The proposed model has not yet been empirically tested in a specific educational environment. Therefore, the results should be regarded as a conceptual framework for further research and practical implementation. Future studies may include empirical investigation of student interaction with generative AI, qualitative interviews with learners and teachers, analysis of AI-supported assignments, comparative studies of learning outcomes, and the development of diagnostic tools for assessing epistemic trust and learner agency in AI-mediated education.

Thus, the chosen methodology corresponds to the aim of the study and makes it possible to analyse the transformation of trust and agency in the age of generative systems. The combination of theoretical analysis, conceptual reconstruction and philosophical-pedagogical modelling provides a basis for interpreting generative AI-mediated education through the concept of responsible co-agency.

Literature Review

The problem of epistemic trust and learner agency in generative AI-mediated education is situated at the intersection of several research traditions: philosophy of education, epistemology, psychology of agency, digital pedagogy, artificial intelligence in education, ethics of AI and human–AI interaction. The reviewed literature demonstrates that the integration of generative AI into educational environments cannot be adequately understood only as a technological innovation. It requires a deeper philosophical-pedagogical analysis of how knowledge, trust, autonomy, responsibility and human judgement are transformed when learners interact with systems capable of generating explanations, texts, solutions, arguments and feedback.

A fundamental theoretical basis for analysing learner agency is provided by Bandura's concept of human agency. Bandura (*2006*) argues that agency involves intentionality, forethought, self-reactiveness and self-reflectiveness. From this perspective, learners are not passive recipients of information, but active subjects capable of setting goals, regulating behaviour, evaluating outcomes and reflecting on their actions. This understanding is especially significant in the context of generative AI, because algorithmic systems can either support these dimensions of agency or weaken them. When generative AI is used as a tool for exploration, feedback and reflection, it may enhance the learner's capacity for self-directed learning. However, when it is used as a substitute for judgement, reasoning or authorship, it may reduce the learner's active role in the educational process.

The philosophical dimension of learner agency is further developed in Biesta's theory of education. Biesta (*2010*) criticises the reduction of education to measurable outcomes and emphasises the ethical, political and democratic dimensions of educational practice. His approach is important for the present study because it allows learner agency to be understood not merely as performance, productivity or individual choice, but as subjectification: the formation of the learner as a responsible subject capable of judgement and action. In generative AI-mediated education, this raises a crucial question: does the use of AI contribute to the learner's development as a subject, or does it transform learning into the efficient production of outputs? This question is central to the philosophical-pedagogical analysis of responsible co-agency.

The epistemological problem of trust is connected with the fact that learning always involves dependence on others. Hardwig (*1985*) demonstrates that epistemic dependence is an unavoidable feature of knowledge practices: individuals often rely on the testimony, expertise and judgement of others. This idea is directly relevant to AI-mediated education, since learners may increasingly rely on generative systems for explanations, information and intellectual support. However, epistemic dependence on AI differs from traditional dependence on teachers or experts. A generative system may produce plausible responses without possessing understanding, accountability or pedagogical intention. Therefore, epistemic trust in AI requires specific forms of verification, critical evaluation and pedagogical regulation.

The ethical dimension of epistemic trust is further clarified by Fricker's concept of epistemic injustice. Fricker (*2007*) shows that knowledge practices are shaped by power, credibility and the unequal distribution of epistemic authority. In the context of generative AI, this raises the problem of algorithmic epistemic authority. Learners may attribute excessive credibility to AI-generated outputs because they appear fluent, structured and confident. At the same time, generative systems may reproduce biases, inaccuracies or culturally limited perspectives. Thus, trust in AI is not neutral. It must be analysed as part of the broader epistemic structure of education, where authority, credibility, interpretation and responsibility are distributed among learners, teachers, institutions and technological systems.

The broader philosophical context of digital transformation is provided by Floridi's analysis of the infosphere. Floridi (*2017*) argues that contemporary human life is increasingly shaped by informational environments in which the boundaries between online and offline, human and artificial, production and mediation of knowledge become more complex. This approach is important for understanding generative AI-mediated education because learning increasingly

takes place within an infosphere where algorithmic systems participate in the creation, organisation and circulation of knowledge. In such conditions, education must develop not only digital skills, but also epistemic orientation: the ability to understand how information is generated, mediated, evaluated and responsibly used.

The ethical and anthropological implications of artificial intelligence are also central to Benanti's approach. Benanti (*2022*) emphasises the need to preserve human decision-making in interaction with artificial intelligence and develops the idea of the human-in-the-loop. This position is directly relevant to the concept of responsible co-agency proposed in the present study. In education, the learner and teacher must remain in the loop not only technically, but also epistemically and morally. Generative AI may support learning, but it should not become an autonomous authority that replaces human judgement, responsibility or pedagogical intentionality. Therefore, responsible co-agency requires a clear distinction between assistance and delegation.

A pedagogical-technological perspective is represented by Rivoltella and Rossi (*2019*), who analyse technologies for education as components of learning environments rather than as neutral instruments. This approach is important because it prevents the reduction of AI to a simple tool. Educational technologies shape practices, interactions, roles and expectations. In generative AI-mediated education, this means that the introduction of AI changes the structure of learning tasks, the role of the teacher, the learner's strategies, the forms of feedback and the criteria of academic integrity. Consequently, generative AI should be pedagogically designed into the educational process, rather than informally added as an uncontrolled external assistant.

The field of artificial intelligence in education provides an important empirical and conceptual background for the present study. Zawacki-Richter et al. (*2019*), in their systematic review of AI applications in higher education, show that much research has been technologically driven and that the role of educators has often been underrepresented. This finding is significant because it confirms a gap between technological development and pedagogical reflection. AI in education cannot be analysed only through automation, prediction or efficiency. It must also be examined in relation to teaching, learning, agency, responsibility and the educational purposes that guide the use of technology.

Ouyang and Jiao (*2021*) identify three paradigms of artificial intelligence in education: AI-directed, learner-as-recipient; AI-supported, learner-as-collaborator; and AI-empowered, learner-as-leader. This framework is especially useful for the present study because it provides a conceptual basis for distinguishing between different degrees of learner agency. In the first paradigm, AI may dominate the educational process and reduce the learner to a passive recipient of algorithmically organised content. In the second, AI supports learning through collaboration and feedback. In the third, AI becomes a means of empowering learners to set goals, make decisions and take responsibility for learning. The model of responsible co-agency proposed in the present study is closest to the learner-as-leader paradigm, but it adds a philosophical emphasis on epistemic trust, judgement and responsibility.

Recent research on generative AI in education further clarifies the opportunities and risks of large language models. Kasneci et al. (*2023*) analyse the potential of ChatGPT and similar systems for education, highlighting opportunities for personalised learning, feedback, language support and accessibility, while also identifying challenges related to accuracy, bias, overreliance,

assessment and academic integrity. This balanced approach is important because it avoids both technological optimism and technological rejection. Generative AI may be pedagogically valuable, but only if learners are trained to interact with it critically and responsibly. This supports the central thesis of the present study: the key issue is not the presence of AI in education, but the structure of trust and agency within AI-mediated learning.

UNESCO (*2023*) provides an institutional and normative framework for the use of generative AI in education and research. The guidance emphasises the need for human-centred approaches, regulation, inclusion, transparency, teacher support, protection of learners and the development of AI literacy. For the present study, UNESCO's position is significant because it confirms that generative AI must be integrated into education under conditions of human responsibility and pedagogical governance. AI literacy should include not only technical knowledge of how systems work, but also the ability to verify outputs, understand limitations, recognise risks and maintain human agency.

The most directly relevant contemporary review is provided by Roe and Perkins (*2024*), who examine generative AI and agency in education. Their critical scoping review demonstrates that generative AI may both support and undermine agency, depending on how it is used, how tasks are designed and whether learners remain active participants in the learning process. This source is particularly important for the present article because it confirms the need to analyse agency not as a fixed characteristic of the learner, but as a dynamic relation shaped by educational design, technological affordances and institutional expectations. The present study develops this line by introducing epistemic trust as a key mediating category between generative AI and learner agency.

The comparative analysis of the reviewed sources shows that each research tradition explains an important aspect of the problem. Bandura (*2006*) provides a psychological understanding of agency as intentional and reflective self-regulation. Biesta (*2010*) expands this understanding through the philosophy of education and the formation of the learner as a subject. Hardwig (*1985*) and Fricker (*2007*) reveal the epistemological and ethical dimensions of trust, dependence and credibility. Floridi (*2017*) and Benanti (*2022*) provide a philosophical and ethical framework for understanding human action in technologically mediated informational environments. Rivoltella and Rossi (*2019*) interpret educational technologies as structuring elements of learning environments. Zawacki-Richter et al. (*2019*), Ouyang and Jiao (*2021*), Kasneci et al. (*2023*), UNESCO (*2023*), and Roe and Perkins (*2024*) show that AI and generative AI create both new opportunities and significant risks for education.

At the same time, the literature reveals a clear research gap. Existing studies analyse learner agency, epistemic trust, AI ethics, digital pedagogy and generative AI in education, but these areas are often examined separately. Research on AI in education frequently focuses on applications, benefits, risks and technological implementation. Philosophical discussions of trust and agency often remain insufficiently connected to the concrete pedagogical conditions of generative AI-mediated learning. Conversely, practical discussions of generative AI in education do not always provide a sufficiently developed philosophical model of how trust should be structured so that learner agency is preserved.

This gap determines the need for the present study. A philosophical-pedagogical model is required that can explain how epistemic trust, learner agency and generative AI interaction

should be organised within education. The concept of responsible co-agency proposed in this article addresses this need by interpreting AI-mediated learning as a structured interaction between learner, teacher and generative system. In this model, the learner remains the subject of judgement, interpretation and responsibility; the teacher organises the pedagogical conditions for critical and reflective AI use; and the generative system functions as a cognitive and dialogical tool rather than as an autonomous epistemic authority.

Thus, the reviewed literature confirms the relevance of analysing epistemic trust and learner agency in generative AI-mediated education. It also shows that the educational value of generative AI depends not on the mere availability of algorithmic assistance, but on the formation of pedagogical conditions under which learners can use AI critically, reflectively and responsibly. This conclusion provides the theoretical basis for developing a model of responsible co-agency in the age of generative systems.

Results

1. Epistemic Trust as a Regulated Pedagogical Condition rather than Passive Reliance on Generative AI

The study established that epistemic trust in generative AI-mediated education should not be understood as the learner's simple confidence in the correctness of AI-generated outputs. In pedagogical terms, such an interpretation is insufficient and potentially dangerous, since generative systems are capable of producing fluent, coherent and persuasive responses without possessing human understanding, responsibility or intentionality. Therefore, trust in generative AI must be interpreted as a regulated pedagogical condition that enables the learner to use AI-generated content critically, reflectively and selectively.

The analysis showed that epistemic trust in education traditionally emerges from the relationship between the learner, the teacher, the curriculum, scholarly knowledge and institutional authority. In the case of generative AI, this structure becomes more complex, because an algorithmic system enters the learning process as an additional source of explanation, suggestion and apparent expertise. However, unlike a teacher or expert, generative AI cannot be treated as a subject of pedagogical responsibility. It does not understand the learner's educational development in the human sense and cannot assume responsibility for the learner's final judgement. This creates a new epistemic asymmetry: the system may appear authoritative, while the basis of its authority remains opaque to the learner.

The study identified three forms of epistemic trust in generative AI-mediated learning. The first form is instrumental trust, in which the learner uses AI as a tool for clarification, reformulation, summarisation, comparison or idea generation. This form is pedagogically productive because it preserves the learner's active role. The second form is interpretative trust, in which the learner treats AI-generated content as a possible perspective that requires evaluation, contextualisation and comparison with other sources. This form may support deeper learning if the learner remains critically engaged. The third form is delegative trust, in which the learner accepts AI-generated output as a ready-made solution and transfers judgement, authorship and responsibility to the system. This form is pedagogically destructive because it reduces the learner's agency.

The results indicate that the key pedagogical problem is not the presence of trust itself, but the absence of its regulation. Complete distrust of generative AI would make it impossible to

use its educational potential, while blind trust would undermine the learner's autonomy and critical capacity. Therefore, the study proposes the concept of calibrated epistemic trust. This means that the learner may rely on generative AI as a source of support, but only under the conditions of verification, comparison, interpretation and personal responsibility. Trust becomes educationally valid only when it is combined with critical distance.

This interpretation develops Hardwig's idea of epistemic dependence by showing that dependence on a source of knowledge is not necessarily negative if it is accompanied by awareness of limits, criteria of credibility and responsibility for judgement (*Hardwig, 1985*). However, in the case of generative AI, such dependence requires additional safeguards, because AI-generated outputs may imitate expertise without providing transparent grounds for knowledge. Fricker's concept of epistemic injustice also becomes relevant here, since learners may overestimate or underestimate sources of knowledge depending on credibility structures, power relations and perceived authority (*Fricker, 2007*). Generative AI may become an artificially inflated epistemic authority if learners are not trained to question its outputs.

Thus, the first result of the study is the substantiation of epistemic trust as a pedagogically regulated condition of AI-mediated learning. Trust in generative AI should not be passive reliance on algorithmic fluency, but a calibrated relation in which the learner uses AI support while preserving verification, critical judgement and intellectual responsibility.

This, epistemic trust in generative AI becomes pedagogically productive only when it is structured as critical, calibrated and verifiable trust. It should support the learner's thinking rather than replace it.

2. Learner Agency under the Risk of Algorithmic Delegation

The second result of the study concerns the transformation of learner agency in generative AI-mediated education. The analysis showed that generative AI does not simply add a new tool to the learning process; it changes the distribution of cognitive actions between the learner and the technological system. A learner may use AI to generate ideas, structure arguments, explain concepts, correct language, solve problems, prepare drafts or evaluate alternatives. Each of these actions may either strengthen or weaken agency depending on how the learner positions themselves in relation to the generated output.

Learner agency may be understood as the capacity of the learner to formulate goals, ask questions, make choices, evaluate information, regulate learning strategies, justify conclusions and take responsibility for the final intellectual result. This interpretation corresponds to Bandura's understanding of human agency as intentional, self-regulative and reflective action (*Bandura, 2006*). In the context of generative AI, however, the learner's agency becomes unstable because many actions that previously required independent reasoning can now be outsourced to the system.

The study identified the phenomenon of algorithmic delegation as one of the central risks of generative AI-mediated education. Algorithmic delegation occurs when learners do not merely use AI for support, but transfer to it key functions of learning: problem formulation, interpretation, argument construction, verification, evaluation and final decision-making. In such cases, the learner may formally complete an educational task while internally withdrawing

from the process of intellectual formation. The result is not genuine learning, but the production of an educational artefact with reduced personal cognitive participation.

This risk is especially important because generative AI often produces outputs that look complete. A coherent answer may create the illusion that the problem has been understood, even when the learner has not performed the necessary cognitive work. In this sense, generative AI may produce what can be called the appearance of competence. The learner receives a well-structured text, explanation or solution, but the internal structure of understanding remains underdeveloped. This is one of the most serious pedagogical risks of generative systems: they can separate the external product of learning from the internal process of learning.

At the same time, the study showed that generative AI may also strengthen learner agency if it is used as a tool of inquiry rather than as a substitute for thinking. AI can help learners compare explanations, identify gaps, generate counterarguments, test interpretations, reformulate unclear ideas and receive immediate feedback. In such cases, the learner remains the subject of the process, while the system functions as a dialogical and cognitive scaffold. This distinction corresponds to Ouyang and Jiao's differentiation between AI-directed, AI-supported and AI-empowered learning paradigms (*Ouyang & Jiao, 2021*). The pedagogically desirable model is not AI-directed learning, where the learner becomes a recipient, but AI-empowered learning, where technology expands the learner's capacity to act.

The study therefore proposes a distinction between agency-supporting AI use and agency-reducing AI use. Agency-supporting use involves questioning, verification, revision, comparison and reflective appropriation of AI-generated content. Agency-reducing use involves copying, passive acceptance, substitution of judgement and avoidance of cognitive effort. The same technological system may support both types of use; the difference lies in pedagogical design, task structure and the learner's epistemic habits.

This result also develops Biesta's philosophical understanding of education as subjectification, that is, the formation of the learner as a responsible subject rather than merely a performer of measurable tasks (*Biesta, 2010*). If generative AI is used only to optimise output production, education risks losing its subject-forming dimension. If, however, AI is used to provoke questioning, reflection and judgement, it may support the learner's becoming as an autonomous educational subject.

Thus, the second result of the study is the identification of algorithmic delegation as a key threat to learner agency and the substantiation of the conditions under which generative AI can support agency. The learner must remain the author of questions, the evaluator of answers and the responsible subject of the final result.

Thus, generative AI strengthens learner agency only when it expands the learner's capacity for questioning, interpretation and judgement. It weakens agency when it replaces the learner's cognitive participation with ready-made algorithmic output.

3. Responsible Co-Agency as a Philosophical-Pedagogical Model of AI-Mediated Learning

The third result of the study is the development of the concept of responsible co-agency as a philosophical-pedagogical model for generative AI-mediated education. The model is based on the idea that learning with generative AI should not be interpreted either as autonomous human learning with an external tool or as human dependence on an intelligent system. Instead,

it should be understood as a structured interaction among three elements: the learner, the teacher and the generative system.

In this model, the learner remains the central subject of learning. The learner formulates questions, interprets information, evaluates AI-generated outputs, integrates knowledge and assumes responsibility for the final intellectual product. The teacher performs the role of pedagogical organiser, epistemic guide and ethical regulator. The teacher designs tasks, defines acceptable uses of AI, teaches verification strategies, supports reflection and protects the learner from uncritical dependence. The generative system functions as a cognitive and dialogical tool that can provide explanations, examples, alternatives and feedback, but cannot replace human judgement or responsibility.

The model of responsible co-agency differs from ordinary AI-assisted learning because it focuses not on assistance as such, but on the structure of responsibility within assistance. A learning process may be technologically advanced but pedagogically weak if responsibility is displaced from the learner to the system. Conversely, a learning process may be genuinely educational when AI participation is organised in such a way that the learner's judgement becomes more active, not less active.

The study identified six components of responsible co-agency. The epistemic component concerns the learner's ability to distinguish between information, explanation, interpretation, probability and knowledge. The reflective component concerns the learner's awareness of how and why AI is being used. The critical component includes verification, source comparison, error detection and argument evaluation. The dialogical component involves using AI for questioning, reformulation and exploration rather than final authority. The ethical component concerns authorship, academic integrity, responsibility and transparency of AI use. The pedagogical component concerns the teacher's role in designing learning environments that preserve human agency.

This model is consistent with Benanti's human-in-the-loop approach, which emphasises the need to preserve human decision-making in interaction with artificial intelligence (*Benanti, 2022*). However, the present study extends this idea pedagogically. In education, being "in the loop" should not mean merely approving or rejecting AI-generated outputs. It should mean remaining intellectually, ethically and reflectively present in the learning process. A learner is truly in the loop only when they understand the task, evaluate the generated response, revise it critically and can justify the final result.

The model also corresponds to UNESCO's human-centred approach to generative AI in education and research, which emphasises transparency, inclusion, teacher support, AI literacy and the protection of learners (*UNESCO, 2023*). However, the present study adds a philosophical-pedagogical dimension: the central value to be protected is not only safety or fairness, but learner agency as the capacity for responsible judgement.

The study proposes that responsible co-agency should be operationalised through specific pedagogical practices. These may include requiring learners to explain how they used AI, compare AI outputs with scholarly sources, identify weaknesses in generated answers, revise prompts, justify final decisions and reflect on what they understood independently. Such tasks transform AI use from hidden substitution into visible learning activity. They also allow the teacher to evaluate not only the final product, but the learner's process of judgement.

Thus, the third result of the study is the substantiation of responsible co-agency as a model in which generative AI participates in learning without becoming an autonomous epistemic authority. The model preserves the learner's subject position while recognising the real cognitive potential of generative systems.

Thus, responsible co-agency means that AI may participate in the learning process, but human judgement remains central. The learner acts, the teacher regulates, and the generative system supports rather than replaces educational agency.

4. Pedagogical Conditions for Preserving Trust and Agency in the Age of Generative Systems

The fourth result of the study is the identification of pedagogical conditions necessary for preserving epistemic trust and learner agency in generative AI-mediated education. The analysis showed that the productive use of generative systems does not emerge automatically. It requires purposeful pedagogical design, explicit rules, reflective practices and assessment models that value reasoning rather than only final outputs.

The first condition is AI literacy understood not as technical familiarity with tools, but as epistemic literacy. Learners must understand that generative AI produces probabilistic outputs, not guaranteed knowledge. They should know that AI-generated responses may contain errors, omissions, biases, invented references and unsupported claims. Therefore, AI literacy should include the ability to ask: What kind of answer is this? What evidence supports it? What may be missing? What should be checked? How does this output relate to the task and to my own reasoning?

The second condition is task design that makes delegation unproductive. If a task can be fully completed by copying an AI-generated answer, then the task itself no longer protects learner agency. In the age of generative systems, educational tasks should require comparison, justification, contextualisation, personal reasoning, process documentation and reflective evaluation. The learner should not only present a final answer, but demonstrate the intellectual path through which the answer was examined and transformed.

The third condition is the explicit distribution of responsibility. Learners should understand that AI may assist in producing intermediate materials, but responsibility for the final content remains human. This includes responsibility for accuracy, argumentation, citation, interpretation, ethical use and academic integrity. The educational value of AI use depends on whether the learner can explain and defend the final result as their own intellectual position.

The fourth condition is dialogical use of AI. Generative systems should be used to stimulate thinking through questions, alternatives and counterarguments rather than to provide final conclusions. For example, learners may ask AI to generate opposing views, identify weaknesses in an argument, suggest further questions or explain a concept at different levels of complexity. Such use supports learner agency because it expands the field of reflection rather than closing it.

The fifth condition is teacher-mediated trust calibration. Teachers should help learners distinguish between situations in which AI can be useful and situations in which reliance on AI is risky. For example, AI may be useful for brainstorming, reformulation or preliminary explanation, but risky for specialised factual claims, source attribution, ethical judgement or final assessment. Trust calibration should therefore become part of pedagogical guidance.

The sixth condition is assessment of process rather than only product. In AI-mediated education, assessment should include evidence of the learner's reasoning, verification and revision. Possible assessment formats include reflective commentaries, AI-use logs, comparison tables, annotated drafts, oral defence, source verification tasks and critical analysis of AI-generated responses. Such formats make the learner's agency visible.

The study also identified a broader institutional implication. Educational institutions should not respond to generative AI only through prohibition or uncontrolled acceptance. Prohibition may ignore the reality of technological change, while uncontrolled acceptance may normalise hidden delegation. A more productive strategy is the creation of pedagogical norms that distinguish acceptable, questionable and unacceptable AI use according to the educational purpose of the task.

This result is consistent with contemporary research showing that generative AI creates both opportunities and risks for learning (*Kasneci et al., 2023*; *Roe & Perkins, 2024*). However, the present study adds that the central pedagogical criterion should be agency preservation. AI use is educationally justified when it increases the learner's capacity for understanding, judgement and responsibility. It is pedagogically problematic when it reduces the learner to a manager of generated outputs.

Thus, the fourth result of the study is the identification of pedagogical conditions that transform generative AI from a potential source of dependency into a tool of responsible learning. These conditions include epistemic AI literacy, agency-protective task design, explicit responsibility, dialogical AI use, teacher-mediated trust calibration and process-oriented assessment.

Thus, learner agency in the age of generative systems is preserved not by rejecting AI, but by designing educational conditions in which AI use requires verification, reflection, justification and human responsibility. The pedagogical task is to teach learners not merely to use generative systems, but to remain subjects of learning while using them.

Discussion

The results of the study demonstrate that the integration of generative AI into education should be interpreted not only as a technological innovation, but also as a transformation of the epistemic and pedagogical structure of learning. The central issue is no longer limited to whether generative systems can provide useful explanations, examples, feedback or support. A deeper question concerns how learners relate to AI-generated outputs, how they distribute trust and responsibility, and whether their agency is strengthened or weakened in the process. In this respect, the study confirms that generative AI-mediated education requires a philosophical-pedagogical framework capable of explaining the relationship between epistemic trust, learner agency and responsibility.

The first major result of the study concerns the interpretation of epistemic trust as a regulated pedagogical condition. This finding is significant because trust in generative AI is often discussed either in technical terms, such as reliability and accuracy, or in ethical terms, such as transparency and safety. The present study suggests that, in education, trust must also be understood pedagogically. A learner does not simply use information; they learn through the process of selecting, interpreting, questioning and justifying information. Therefore, epistemic

trust in AI becomes educationally meaningful only when it is connected with verification, comparison and reflective judgement.

This result develops Hardwig's concept of epistemic dependence, according to which reliance on others is an unavoidable part of knowledge practices (*Hardwig, 1985*). However, dependence on generative AI differs from dependence on teachers, scholars or experts. A human expert can be questioned as a responsible subject, whereas a generative system produces outputs without human understanding, intentionality or accountability. Therefore, the study shows that epistemic dependence on AI requires a special form of calibrated trust. Learners may rely on AI as a source of support, but they must not treat its outputs as self-sufficient knowledge. This distinction is crucial for preventing algorithmic authority from replacing educational judgement.

The findings also correspond to Fricker's analysis of epistemic injustice, where credibility, authority and knowledge are connected with power relations (*Fricker, 2007*). In generative AI-mediated learning, a new form of epistemic imbalance may emerge: the learner may attribute excessive credibility to algorithmic output because it appears fluent, structured and confident. This creates the risk of what may be called artificial epistemic authority. The system looks like a knowledgeable interlocutor, but its apparent authority is not equivalent to understanding. Consequently, pedagogical practice must teach learners to distinguish between fluency, plausibility, evidence and truth.

The second major result concerns learner agency under the risk of algorithmic delegation. The study shows that generative AI can both support and weaken agency depending on how it is used. This finding is consistent with Bandura's understanding of agency as intentional, self-reflective and self-regulative action (*Bandura, 2006*). If learners use AI to ask better questions, compare perspectives, identify gaps and revise their reasoning, generative systems may strengthen self-regulated learning. However, if learners use AI to replace interpretation, argumentation, verification or authorship, their agency is weakened.

The concept of algorithmic delegation is one of the key theoretical contributions of the study. It explains a specific risk of generative AI-mediated education: the learner may formally complete a task while internally withdrawing from the cognitive process. In such cases, the educational product remains visible, but the educational experience becomes hollow. The learner submits a text, solution or project, but the intellectual work that should have formed understanding, judgement and competence has been outsourced to the system. This distinction is especially important because traditional assessment often focuses on the final product, while generative AI makes it necessary to assess the process of thinking.

This result also develops Biesta's understanding of education as subjectification (*Biesta, 2010*). If education is understood merely as the production of measurable outputs, generative AI appears highly efficient. It can produce essays, answers, plans and explanations quickly. However, if education is understood as the formation of the learner as a responsible subject, then the question changes. The issue is not whether AI helps to produce an answer, but whether the learner becomes more capable of judgement, interpretation and responsibility through the process. The study therefore confirms that the philosophical purpose of education cannot be reduced to output optimisation.

The third major result is the model of responsible co-agency. This model offers a way to avoid two extremes: technological rejection and uncritical technological acceptance. On the one hand, generative AI cannot simply be prohibited or ignored, since it has already become part of contemporary knowledge practices. On the other hand, it cannot be allowed to function as an uncontrolled substitute for learner reasoning. Responsible co-agency proposes a structured relationship among learner, teacher and generative system. The learner remains the subject of learning; the teacher organises and regulates the pedagogical environment; the generative system functions as a cognitive and dialogical tool.

This model is close to Benanti's human-in-the-loop approach, which emphasises the need to preserve human decision-making in interaction with artificial intelligence (*Benanti, 2022*). However, the present study extends this idea in a specifically pedagogical direction. In education, being "in the loop" should not mean merely approving AI-generated content. It should mean remaining cognitively, ethically and reflectively involved in the learning process. A learner is in the loop only when they understand the task, evaluate the generated output, compare it with other sources, revise it critically and can justify the final result.

The model also corresponds to UNESCO's human-centred approach to generative AI in education and research, which emphasises regulation, AI literacy, transparency, inclusion and protection of learners (*UNESCO, 2023*). However, the present study adds that the central pedagogical value to be protected is learner agency. The danger of generative AI is not only misinformation, bias or academic dishonesty, but also the gradual weakening of the learner's capacity to act as an author of thought. Therefore, AI literacy should be understood not only as knowledge about AI tools, but also as epistemic literacy: the ability to evaluate, question and responsibly use algorithmic outputs.

The fourth major result concerns pedagogical conditions for preserving trust and agency. The study identified several conditions: epistemic AI literacy, agency-protective task design, explicit distribution of responsibility, dialogical AI use, teacher-mediated trust calibration and process-oriented assessment. These conditions are important because they transform the discussion from abstract principles to educational design. Generative AI becomes pedagogically productive only when learning tasks require learners to think with AI rather than allow them to hide behind AI.

This conclusion is consistent with Ouyang and Jiao's distinction between AI-directed, AI-supported and AI-empowered learning paradigms (*Ouyang & Jiao, 2021*). The model proposed in the present study rejects AI-directed learning, in which the learner becomes a passive recipient of algorithmically structured content. It also goes beyond simple AI-supported learning, where technology provides assistance but the structure of responsibility remains underdeveloped. Responsible co-agency corresponds most closely to AI-empowered learning, but adds a stronger philosophical emphasis on trust, judgement, authorship and ethical responsibility.

The results also support the concerns raised by Zawacki-Richter et al. (*2019*), who note that research on AI in higher education has often been technologically driven and has insufficiently addressed the role of educators. The study confirms that teachers remain central in generative AI-mediated education. Their role is not diminished, but transformed. The teacher becomes not only a source of knowledge, but also a designer of epistemic conditions: they define

how AI may be used, how outputs should be verified, how responsibility is distributed and how the learner's agency is made visible.

The findings are also consistent with Kasneci et al. (*2023*), who show that large language models create both opportunities and challenges for education, including personalised support, feedback, accessibility, bias, overreliance and academic integrity issues. The present study develops this balanced view by proposing that the decisive criterion is not whether AI is used, but whether its use contributes to learner agency. A practice is pedagogically justified when AI helps the learner understand more deeply, ask better questions, revise reasoning and assume responsibility. It is problematic when AI becomes a substitute for the learner's intellectual participation.

The theoretical contribution of the study consists in the development of the concept of responsible co-agency as a philosophical-pedagogical model of generative AI-mediated education. Existing research discusses AI literacy, academic integrity, learner agency, trust and AI ethics, but these issues are often analysed separately. The proposed model integrates them into one conceptual framework. It shows that epistemic trust, learner agency and AI use are not independent variables, but interconnected dimensions of educational interaction.

The study also contributes to the philosophy of education by clarifying the normative status of the learner in the age of generative systems. The learner should not be understood merely as a user of AI tools or as a producer of assessable outputs. The learner remains a subject of judgement, interpretation and responsibility. This position is especially important because generative systems can produce the appearance of competence. The article therefore argues that education must protect the difference between having an answer and understanding an answer.

The practical significance of the study lies in the possibility of applying the proposed model to educational design. First, the model may be used in the development of AI literacy courses. Such courses should include not only prompt engineering or technical familiarisation with tools, but also source verification, recognition of hallucinations, bias detection, ethical authorship and reflection on cognitive delegation. Secondly, the model may inform academic integrity policies by distinguishing between acceptable AI-supported learning and unacceptable substitution of learner work.

Thirdly, the proposed model may be used in teacher training. Teachers need methodological tools for designing assignments that make passive AI use ineffective and reflective AI use productive. For example, tasks may require students to compare AI-generated explanations, identify errors, explain revisions, document their use of AI, defend their final conclusions orally or submit reflective commentaries. These practices make learner agency visible and assessable.

Fourthly, the model has implications for assessment. In generative AI-mediated education, assessment should focus not only on the final product, but also on the process of reasoning. Process-oriented assessment may include AI-use logs, annotated drafts, comparison tables, verification reports, reflective essays and oral defence. Such formats allow educators to evaluate whether the learner has engaged critically with AI-generated material or merely delegated the task.

Despite its theoretical and practical value, the study has several limitations. The first limitation is its theoretical character. The model of responsible co-agency has been developed

through conceptual analysis and philosophical-pedagogical modelling, but it has not yet been empirically tested in real educational environments. Therefore, future research should examine how the model functions in different educational contexts and disciplines.

The second limitation concerns the rapidly changing nature of generative AI. The capabilities, limitations and forms of interaction with generative systems are developing quickly. As a result, any theoretical model must remain flexible and open to revision. Future systems may have greater multimodal capacity, stronger personalisation and deeper integration into learning platforms, which may create new forms of agency support and new forms of dependency.

The third limitation concerns contextual variability. The relationship between trust, agency and AI may differ across educational levels, disciplines, cultures and institutional policies. For example, the use of generative AI in philosophy, engineering, medicine, language learning or creative writing may produce different risks and opportunities. Therefore, the proposed model should be adapted to concrete pedagogical contexts rather than applied mechanically.

Future research should develop in several directions. First, empirical studies are needed to investigate how students understand and practise epistemic trust in generative AI. Such studies may include interviews, classroom observations, analysis of student prompts, AI-use diaries and comparison of learning outcomes. Secondly, researchers should examine how different task designs influence learner agency. It would be useful to compare assignments that allow easy delegation with assignments that require verification, reflection and justification.

Thirdly, future research should develop diagnostic criteria for responsible co-agency. These criteria may include the learner's ability to formulate questions, evaluate AI-generated outputs, identify errors, compare sources, revise reasoning, disclose AI use and justify final conclusions. Fourthly, further studies should investigate the role of teachers as mediators of epistemic trust. Teacher training programmes should be analysed in terms of their capacity to prepare educators for regulating AI-mediated learning environments.

Finally, future research should examine the ethical and institutional implications of responsible co-agency. Universities and schools need policies that do not reduce the problem to prohibition or permission. Instead, they should define different levels of acceptable AI use according to the educational aim of each task. The same tool may be appropriate in one learning context and inappropriate in another. Therefore, educational governance of generative AI must be pedagogically differentiated.

Overall, the discussion confirms that the central challenge of generative AI-mediated education is not technological, but philosophical and pedagogical. Generative systems can support learning only when trust is calibrated, agency is preserved and responsibility remains human. The proposed model of responsible co-agency makes it possible to interpret AI-mediated education as a structured interaction in which the learner does not surrender judgement to the system, but uses the system to deepen understanding, strengthen autonomy and develop responsible intellectual action.

Conclusion

The study conducted made it possible to establish that epistemic trust and learner agency are central philosophical and pedagogical categories for understanding education in the age of

generative systems. Generative AI does not merely provide new technical instruments for explanation, writing, feedback or problem-solving. It changes the structure of educational interaction by introducing an algorithmic system into the relationship between learner, teacher, knowledge and responsibility. Therefore, the use of generative AI in education requires not only methodological regulation, but also a deeper philosophical understanding of how trust, judgement and agency should be organised.

The aim of the study, which consisted in developing and theoretically substantiating a philosophical-pedagogical model of responsible co-agency in generative AI-mediated education, was achieved. The analysis showed that learner agency can be preserved and strengthened only when epistemic trust in generative AI is structured as critical, calibrated and verifiable trust. Trust becomes pedagogically productive not when learners passively rely on AI-generated outputs, but when they use such outputs as objects of interpretation, comparison, verification and revision.

The research objectives were consistently fulfilled. The philosophical meaning of epistemic trust in AI-mediated education was analysed. The concept of learner agency was clarified in the context of generative systems. The risks of blind algorithmic trust and delegation of judgement to AI were identified. The distinction between agency-supporting and agency-reducing AI use was substantiated. A philosophical-pedagogical model of responsible co-agency between learner, teacher and generative system was developed. Pedagogical conditions for maintaining learner autonomy, critical thinking, verification practices and human responsibility were also determined.

The first major result of the study is the interpretation of epistemic trust as a regulated pedagogical condition. The study demonstrated that trust in generative AI should not be equated with confidence in the correctness of algorithmic output. Generative systems may produce fluent and persuasive responses without possessing human understanding, responsibility or pedagogical intention. Therefore, epistemic trust must be calibrated through verification, comparison of sources, critical judgement and awareness of the limitations of AI-generated content. In this sense, trust becomes not a passive attitude, but an active educational practice.

The second major result is the identification of algorithmic delegation as a key risk for learner agency. The study showed that learners may formally complete educational tasks while internally transferring problem formulation, interpretation, argumentation, verification or authorship to the generative system. This creates the appearance of competence without necessarily forming understanding. At the same time, generative AI may support learner agency when it is used as a tool for questioning, reflection, comparison, revision and intellectual exploration. Thus, the pedagogical value of AI depends not on the system itself, but on the structure of learner participation.

The third result is the development of the concept of responsible co-agency. Within this model, the learner remains the subject of judgement, interpretation, choice and responsibility; the teacher acts as the organiser of pedagogical, epistemic and ethical conditions; and the generative system functions as a cognitive and dialogical tool. Responsible co-agency does not imply equal responsibility between human and machine. Rather, it describes a regulated

educational interaction in which AI may participate in the learning process, but human judgement remains central.

The fourth result is the identification of pedagogical conditions necessary for preserving trust and agency in the age of generative systems. These conditions include epistemic AI literacy, agency-protective task design, explicit distribution of responsibility, dialogical use of AI, teacher-mediated trust calibration and process-oriented assessment. The study showed that education should not respond to generative AI only through prohibition or uncontrolled acceptance. A more productive approach is the design of learning environments in which AI use requires explanation, verification, reflection, justification and transparent responsibility.

The theoretical significance of the study lies in the development of a philosophical-pedagogical interpretation of generative AI-mediated education. The article expands the conceptual apparatus of digital pedagogy by introducing responsible co-agency as a category that integrates epistemic trust, learner agency, teacher mediation and human responsibility. This makes it possible to analyse generative AI not merely as an educational technology, but as a factor transforming the epistemic structure of learning.

The practical significance of the study consists in the possibility of applying the proposed model in educational design, teacher training, AI literacy programmes, academic integrity policies and assessment practices. The model may help educators distinguish between pedagogically productive AI use and forms of algorithmic delegation that weaken learner agency. It may also serve as a basis for designing assignments that require learners to verify, criticise, revise and justify AI-generated outputs rather than passively reproduce them.

At the same time, the study has several limitations. Its results are theoretical and require empirical verification in real educational environments. Future research should examine how students and teachers understand epistemic trust in generative AI, how different task designs affect learner agency, and how responsible co-agency can be assessed in practice. It is also necessary to develop diagnostic criteria for identifying agency-supporting and agency-reducing forms of AI use across different educational levels and disciplines.

In conclusion, the article demonstrates that the main challenge of generative AI-mediated education is not technological, but philosophical and pedagogical. Generative systems may become valuable educational tools only when they are embedded in a model that preserves the learner as a responsible subject of learning. The future of education in the age of generative systems depends not on replacing human intellectual activity with algorithmic assistance, but on forming responsible co-agency in which trust is calibrated, agency is protected and responsibility remains human.

Conflict of Interests

The author declares that there is no conflict of interests that could have influenced the objectivity of the study, the interpretation of the results or the presentation of the conclusions. The article was prepared independently, without external funding, institutional pressure or the involvement of organisations or individuals with a direct financial, personal or professional interest in the outcomes of the research.

The study is theoretical in nature and is based on the analysis of scholarly literature in the fields of philosophy of education, digital pedagogy, epistemic trust, learner agency, artificial

intelligence in education, generative AI, AI ethics and human–AI interaction. The selection and interpretation of sources were carried out in accordance with the aim, objectives and methodological framework of the article.

The author confirms that there were no financial, institutional or personal circumstances that could be interpreted as influencing the research position, conceptual framework, methodological approach or conclusions of the study. All results presented in the article are based on independent theoretical analysis, conceptual reconstruction and philosophical-pedagogical modelling.

Thus, the present declaration confirms compliance with the principles of academic integrity, publication transparency and ethical standards of scholarly research.

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Anisiia Tomanek [4]

Visual-Project Competence in 2D/3D Graphic Design as a Pedagogical Basis for Training Restorers, Reconstructors and Revitalisation Specialists in Cultural Heritage [4]

Abstract:
This article is devoted to the theoretical substantiation of visual-project competence in 2D/3D graphic design as a pedagogical basis for training restorers, reconstructors and revitalisation specialists in the field of cultural heritage. The relevance of the study is determined by the growing role of graphic design in contemporary heritage practice, where 2D and 3D visual tools are used not only for presentation, but also for documentation, analysis, reconstruction, modelling, interpretation and public communication. The scientific novelty of the study lies in interpreting 2D/3D graphic design not as an auxiliary technical or illustrative skill, but as a core pedagogical mechanism for forming visual-project competence. The object of the study is the educational process in the professional training of restorers, reconstructors and revitalisation specialists in cultural heritage. The subject of the study is the pedagogical mechanisms for forming visual-project competence in 2D and 3D graphic design. The study aims to develop and theoretically substantiate a pedagogical model for integrating 2D and 3D graphic design into cultural heritage education. The study has a theoretical and analytical research design. Its methodological basis includes theoretical analysis, conceptual reconstruction, comparative interpretation, systematisation and pedagogical modelling. The source base consists of scholarly and methodological works on cultural heritage education, graphic design pedagogy, visual communication, design thinking, 3D documentation, digital reconstruction, HBIM, virtual archaeology, digital heritage and revitalisation practices. The article establishes that 2D graphic design forms the analytical language of restoration documentation. It enables students to record, classify and interpret the condition of heritage objects through damage maps, analytical diagrams, restoration charts, typological schemes and project boards. The study also shows that 3D graphic design forms a higher level of visual-project competence by developing spatial modelling, digital documentation, reconstruction hypotheses, simulation of lost elements and visualisation of revitalisation scenarios. The author substantiates visual-project competence as an integrated pedagogical construct that includes analytical, artistic-compositional, technical-digital, reconstructive, communicative and project-based components. On this basis, a pedagogical model is proposed that integrates 2D and 3D graphic design through three functional levels: analytical-documentary, reconstructive-digital and communicative-revitalisation. The author concludes that the systematic inclusion of 2D/3D graphic design in cultural heritage education makes it possible to overcome the fragmentation of specialist training and to prepare professionals capable of analysing, modelling, reconstructing and revitalising cultural heritage as a complex visual, spatial, historical, technological and social system.

Keywords: solfège, pop singing, professional training of vocalists, vocal performance education, integrative approach, competency-based approach, interdisciplinary integration, musical-auditory competencies, professional competence of the singer.

Introduction

In the context of contemporary transformations in art education, digital technologies and cultural heritage preservation, the role of graphic design is undergoing a significant conceptual expansion. Graphic design is no longer limited to the creation of visual communication products, printed materials, branding systems or digital interfaces. In the field of cultural heritage, 2D and 3D graphic design increasingly functions as an analytical, reconstructive, project-based and communicative tool. It allows specialists to document the condition of heritage objects, visualise losses and structural changes, model hypothetical reconstructions,

present restoration solutions, design revitalisation concepts and communicate heritage values to professional and public audiences.

The relevance of the present study is determined by the growing need to modernise the professional training of restorers, reconstructors and revitalisation specialists. Contemporary work with cultural heritage requires not only historical knowledge, artistic sensitivity and technological competence, but also the ability to operate with complex visual systems. A specialist in this field must be able to read, interpret, produce and critically evaluate 2D and 3D visual materials: drawings, diagrams, damage maps, restoration schemes, reconstruction models, visual scenarios, digital twins, exhibition graphics, navigation systems and project presentations. Therefore, visual-project competence becomes one of the key components of contemporary cultural heritage education.

The problem of the study is associated with the insufficient theoretical and pedagogical development of 2D/3D graphic design as an integrated component of specialist training in the field of cultural heritage. In many educational models, graphic design is still perceived either as a technical means of visualisation or as an auxiliary artistic discipline. Such an approach does not fully reflect the current professional reality, in which graphic design participates in the entire cycle of heritage work: from analysis and documentation to reconstruction, interpretation, revitalisation and public communication. As a result, future specialists may acquire separate historical, restoration or digital skills, but lack an integrated visual-project competence necessary for complex professional decision-making.

The scientific novelty of the study lies in interpreting 2D/3D graphic design not merely as a technical or illustrative skill, but as a core pedagogical mechanism for forming visual-project competence in the training of cultural heritage specialists. The article proposes to consider graphic design as a systemic educational tool that integrates artistic, analytical, technological, reconstructive and communicative functions. Within this approach, 2D and 3D design are understood as complementary visual languages: 2D design provides analytical clarity, graphic structuring and documentation, while 3D design enables spatial modelling, reconstruction, simulation and digital representation of heritage objects.

The object of the study is the educational process in the professional training of restorers, reconstructors and revitalisation specialists in the field of cultural heritage.

The subject of the study is the pedagogical mechanisms for forming visual-project competence in 2D and 3D graphic design as part of professional cultural heritage education.

The aim of the study is to develop and theoretically substantiate a pedagogical model for integrating 2D and 3D graphic design into the training of restorers, reconstructors and revitalisation specialists in cultural heritage.

To achieve this aim, the following research objectives have been defined:

- to analyse the role of 2D and 3D graphic design in contemporary professional activity related to cultural heritage preservation, reconstruction and revitalisation;
- to clarify the concept of visual-project competence in the context of cultural heritage education;
- to identify the main pedagogical functions of 2D/3D graphic design in the training of restorers, reconstructors and revitalisation specialists;

- to determine the structural components of visual-project competence required for work with cultural heritage objects;
- to develop a theoretical pedagogical model for integrating 2D and 3D graphic design into cultural heritage curricula;
- to substantiate the educational significance of digital visualisation, 3D modelling and project communication in the formation of contemporary heritage specialists.

The theoretical significance of the study lies in the development of a pedagogical interpretation of graphic design as a professional and methodological component of cultural heritage education. The article expands the conceptual apparatus of heritage pedagogy by introducing visual-project competence as an integrated educational category. This makes it possible to analyse the training of restorers, reconstructors and revitalisation specialists not only through the prism of historical, technical or conservation-related knowledge, but also through the formation of visual thinking, spatial modelling, graphic analysis and project-based communication.

The practical significance of the study consists in the possibility of applying the proposed model in the design of educational programmes, university courses, professional training modules and interdisciplinary curricula in cultural heritage. The results may be used in programmes related to restoration education, heritage reconstruction, museum design, digital heritage, architectural heritage, exhibition design, urban revitalisation and cultural project management. The proposed approach may also support the development of practical assignments, project-based learning tasks, digital portfolios, 2D/3D visual documentation systems and assessment criteria for visual-project competence.

Thus, the present study addresses the need for a more systematic integration of 2D and 3D graphic design into cultural heritage education. By interpreting graphic design as a pedagogical basis for visual-project competence, the article seeks to demonstrate that contemporary restorers, reconstructors and revitalisation specialists must be trained not only to preserve heritage objects, but also to analyse, model, interpret and communicate them through advanced visual and digital means.

Methods

The present study has a theoretical and analytical research design and is aimed at developing a pedagogical model for integrating 2D and 3D graphic design into the professional training of restorers, reconstructors and revitalisation specialists in the field of cultural heritage. In accordance with the nature of the research problem, the study does not include empirical measurement, experimental procedures or quantitative data collection. Instead, it is based on theoretical analysis, conceptual reconstruction, comparative interpretation and pedagogical modelling.

The methodological logic of the study is determined by the interdisciplinary nature of the topic. The formation of visual-project competence in cultural heritage education requires the integration of several fields: pedagogy, graphic design, digital art, restoration theory, heritage reconstruction, architectural visualisation, museum communication, digital heritage and revitalisation studies. Therefore, 2D and 3D graphic design are analysed not as isolated artistic or technical disciplines, but as components of a broader educational system aimed at preparing

specialists capable of analysing, modelling, interpreting and communicating cultural heritage objects.

The research material consists of scholarly works and methodological sources devoted to cultural heritage education, restoration training, graphic design pedagogy, visual communication, 3D modelling, digital reconstruction, heritage visualisation, digital twins, museum interpretation and revitalisation practices. Particular attention is paid to sources that make it possible to interpret graphic design as an analytical, reconstructive and communicative instrument in the professional activity of cultural heritage specialists.

The criteria for selecting sources were as follows: relevance to cultural heritage education; connection with 2D and 3D visualisation practices; significance for restoration, reconstruction and revitalisation training; applicability to the development of visual-project competence; and representativeness for contemporary interdisciplinary research in art education, digital heritage and professional design pedagogy. Sources were selected in order to provide a conceptual basis for analysing graphic design not only as a means of presentation, but also as a method of professional thinking and project-based work with cultural heritage.

The analytical procedure included several consecutive stages. At the first stage, contemporary approaches to cultural heritage education and the professional training of restorers, reconstructors and revitalisation specialists were analysed. At the second stage, the functions of 2D and 3D graphic design in restoration documentation, reconstruction modelling and heritage revitalisation were identified. At the third stage, the concept of visual-project competence was reconstructed as an integrated pedagogical category. At the fourth stage, the structural components of this competence were classified. At the fifth stage, pedagogical conditions for its formation were determined. At the final stage, the obtained results were integrated into a theoretical pedagogical model.

The methodology of the study includes general scientific methods and specialised pedagogical methods. General scientific methods include analysis, synthesis, comparison, generalisation and classification. These methods were used to identify the main conceptual categories of the study, compare different theoretical approaches and systematise the functions of 2D/3D graphic design in cultural heritage education. Specialised methods include conceptual reconstruction, interpretative analysis and pedagogical modelling. Conceptual reconstruction was used to clarify the meaning of visual-project competence. Interpretative analysis made it possible to reveal the educational significance of graphic design in the training of heritage specialists. Pedagogical modelling was applied to develop a structured model for integrating 2D and 3D graphic design into cultural heritage curricula.

Within the framework of the study, visual-project competence is understood as an integrated professional ability that combines visual thinking, graphic analysis, spatial modelling, design interpretation, digital visualisation and project communication. This competence includes the ability to document the condition of heritage objects, represent material losses and structural transformations, model reconstruction hypotheses, visualise revitalisation scenarios and communicate project decisions to professional and public audiences.

The study proceeds from the assumption that 2D and 3D graphic design perform different but complementary pedagogical functions. 2D graphic design supports analytical clarity, visual classification, restoration documentation, schematic representation and professional

communication. It is especially important for damage maps, restoration charts, object passports, typological schemes, infographics, exhibition graphics and project presentations. 3D graphic design supports spatial analysis, hypothetical reconstruction, digital modelling, simulation of lost elements, visualisation of revitalisation scenarios and the creation of digital heritage environments. Together, these forms of design create a visual-project language necessary for contemporary heritage practice.

The proposed pedagogical model was developed through the identification of several interrelated components of visual-project competence: analytical, artistic-compositional, technical-digital, reconstructive, communicative and project-based components. The analytical component reflects the ability to interpret the condition, structure and transformation of a heritage object through visual means. The artistic-compositional component concerns the ability to organise visual material according to principles of graphic clarity, hierarchy and aesthetic coherence. The technical-digital component includes skills in working with digital design tools, 3D modelling software, visualisation systems and digital documentation. The reconstructive component reflects the ability to model lost, damaged or hypothetical elements of cultural heritage. The communicative component is connected with the presentation of restoration, reconstruction and revitalisation concepts to specialists, institutions and the public. The project-based component ensures the integration of visual decisions into broader heritage preservation and revitalisation strategies.

The validity of the study is ensured by the logical consistency between the research aim, methodological procedure and proposed pedagogical model. It is also supported by the interdisciplinary comparison of sources from cultural heritage studies, graphic design pedagogy, restoration education and digital heritage research. The reliability of the study is achieved through the transparent description of the analytical stages, the consistent application of selected methods and the clear differentiation between theoretical interpretation, conceptual reconstruction and model construction.

The limitations of the study are associated with its theoretical character. The proposed pedagogical model has not yet been empirically tested within a specific educational programme. Therefore, the results should be regarded as a conceptual basis for further research and practical implementation. Future studies may include expert evaluation of the model, comparative analysis of educational curricula, pilot implementation in restoration or heritage design courses, assessment of students' visual-project competence and empirical analysis of project-based learning outcomes.

Thus, the chosen methodology corresponds to the aim of the study and makes it possible to analyse 2D and 3D graphic design as a pedagogical basis for forming visual-project competence. The combination of theoretical analysis, conceptual reconstruction and pedagogical modelling provides a foundation for interpreting graphic design as an integrated professional language of restoration documentation, heritage reconstruction and cultural revitalisation.

Literature Review

The problem of forming visual-project competence in 2D/3D graphic design for restorers, reconstructors and revitalisation specialists in cultural heritage is situated at the intersection of

several research fields: cultural heritage education, graphic design pedagogy, digital heritage, 3D documentation, virtual archaeology, HBIM technologies and design thinking. The reviewed literature demonstrates that contemporary cultural heritage training can no longer be limited to historical, conservation-related or technological knowledge. It increasingly requires the formation of a visual and project-based mode of professional thinking that enables future specialists to analyse, document, model, reconstruct and communicate heritage objects through integrated 2D and 3D visual systems.

A general educational framework for this transformation is provided by contemporary approaches to culture and arts education. The UNESCO framework for culture and arts education emphasises the need to integrate culture, creativity, critical thinking, digital literacy and professional competencies into educational processes (*UNESCO, 2024*). This position is important for the present study because it confirms that cultural heritage education should not be reduced to the passive transmission of historical knowledge. It should develop the learner's capacity to interpret, create, design, communicate and act in complex cultural environments. In relation to the training of restorers, reconstructors and revitalisation specialists, this means that visual competence must be regarded as an essential component of professional preparation rather than as an optional artistic skill.

The pedagogical significance of visual-project competence can also be substantiated through design thinking. Cross (*2011*) interprets design thinking as a specific way of understanding and solving problems through visualisation, modelling, iterative reasoning and project-based decision-making. This approach is directly relevant to cultural heritage education, since restoration, reconstruction and revitalisation are not linear technical procedures. They involve the interpretation of incomplete data, the comparison of hypotheses, the modelling of possible solutions and the communication of project decisions to different audiences. Therefore, the training of heritage specialists should include not only knowledge of materials, styles and historical periods, but also the ability to think visually and projectively.

The foundations of 2D visual communication are important for understanding the first layer of visual-project competence. Lupton and Phillips (*2015*) show that graphic design is based on principles of hierarchy, composition, scale, rhythm, structure, contrast, modularity and visual organisation. These principles are relevant not only to general graphic design, but also to restoration and heritage documentation. In the context of cultural heritage, 2D graphic design provides the language for damage maps, restoration charts, object passports, analytical diagrams, typological schemes, explanatory infographics, exhibition graphics and project boards. It allows complex information about an object's condition, structure, losses, historical layers and proposed interventions to be organised in a clear and professionally communicative form.

However, the reviewed literature shows that contemporary heritage work increasingly requires transition from 2D representation to 3D documentation and modelling. Remondino and Rizzi (*2010*) analyse reality-based 3D documentation of natural and cultural heritage sites, showing that digital recording technologies make it possible to produce accurate spatial representations of heritage objects. Their work is significant because it demonstrates that 3D visualisation is not merely an illustrative tool. It serves as a method of documentation, analysis and preservation. For educational purposes, this means that future specialists should be trained

to understand how three-dimensional data are generated, interpreted and used in restoration and reconstruction processes.

This line of research is further developed by Stylianidis and Remondino (*2016*), who systematise methods of 3D recording, documentation and management of cultural heritage. Their work demonstrates that 3D technologies are becoming a core element of professional heritage practice, including surveying, modelling, monitoring, conservation planning and public presentation. In the context of the present study, this supports the conclusion that 3D graphic design should be included in cultural heritage curricula not as a narrow technical module, but as part of an integrated visual-project competence. Students must learn not only how to produce 3D models, but also how to evaluate their accuracy, interpret their cultural meaning and use them in professional decision-making.

A specific technological direction within digital heritage education is represented by Historic Building Information Modelling. Murphy et al. (*2013*) introduce the concept of Historic Building Information Modelling as an approach that adds semantic and historical intelligence to laser- and image-based surveys. This is important because HBIM combines geometry, historical information, materials, construction logic and conservation data within a structured digital model. López et al. (*2018*), in their review of heritage building information modelling, further demonstrate that H-BIM has become an essential tool for the documentation, management, conservation and analysis of historic buildings. These studies are directly relevant to the formation of visual-project competence, since they show that future heritage specialists must be able to work not only with visual form, but also with data-rich digital models.

In pedagogical terms, HBIM changes the status of 3D design in heritage education. A 3D model is no longer simply a visual representation of an object. It becomes an analytical environment that connects geometry, chronology, material data, structural information and conservation decisions. This requires students to develop a combined competence: spatial thinking, digital modelling, historical interpretation, data structuring and project communication. Therefore, the integration of HBIM into cultural heritage education supports the shift from isolated digital skills to systemic visual-project training.

Another important research line is associated with virtual archaeology and the principles of digital reconstruction. The Seville Principles define methodological and ethical requirements for virtual archaeology, including scientific transparency, documentation of sources, differentiation between evidence and hypothesis, and the need for intellectual and technical rigour in virtual reconstructions (*ICOMOS, 2017*). These principles are particularly significant for the present study because they demonstrate that 3D reconstruction in cultural heritage is not a free artistic fantasy. It is a research-based visual hypothesis that must be grounded in evidence, clearly documented and critically interpreted. This has direct pedagogical implications: students must learn to distinguish between documented reconstruction, hypothetical modelling and interpretative visualisation.

The broader theoretical field of digital cultural heritage also provides an important basis for the study. Cameron and Kenderdine (*2007*) analyse digital cultural heritage as a field requiring critical reflection on representation, interpretation, authenticity, mediation and user experience. Their work shows that digital heritage is not limited to the technical digitisation of objects. It involves the transformation of the ways in which heritage is perceived, accessed and

communicated. Kalay et al. (*2007*) similarly emphasise that new media create new forms of heritage interpretation and engagement, changing the relationship between cultural objects, digital environments and audiences. These approaches are important because they allow 2D/3D graphic design to be understood as part of a broader communicative and interpretative system.

For the training of revitalisation specialists, this digital and communicative dimension is especially important. Revitalisation requires not only the preservation or reconstruction of an object, but also the restoration of its social, cultural, educational or public function. In this context, graphic design becomes a tool of cultural reactivation. 2D design may support visual identity, navigation, interpretation panels, educational materials and public communication. 3D design may support future-use scenarios, spatial simulations, virtual exhibitions, immersive environments and public presentation of revitalisation concepts. Therefore, the visual-project competence of revitalisation specialists should include the ability to connect heritage analysis with contemporary forms of cultural communication.

A comparison of the reviewed sources shows that each research field explains a specific aspect of the problem. UNESCO (*2024*) provides the general educational framework for integrating culture, creativity and digital literacy. Cross (*2011*) substantiates design thinking as a mode of project-based reasoning. Lupton and Phillips (*2015*) clarify the principles of 2D visual communication. Remondino and Rizzi (*2010*), as well as Stylianidis and Remondino (*2016*), demonstrate the professional significance of 3D documentation in cultural heritage. Murphy et al. (*2013*) and López et al. (*2018*) reveal the potential of HBIM as a data-rich model for heritage analysis and management. ICOMOS (*2017*) establishes methodological principles for responsible virtual reconstruction. Cameron and Kenderdine (*2007*), together with Kalay et al. (*2007*), provide a critical framework for understanding digital cultural heritage and new media interpretation.

At the same time, the literature reveals a research gap. Existing studies provide substantial theoretical and methodological foundations for design thinking, graphic design, digital heritage, 3D documentation, HBIM and virtual reconstruction. However, these approaches are often developed separately. Graphic design pedagogy is rarely integrated systematically with restoration education. 3D modelling is frequently treated as a technical skill rather than as part of a broader visual-project competence. HBIM is usually discussed in relation to documentation and management, but not always in relation to the pedagogical formation of future specialists. Digital heritage studies focus on interpretation and mediation, but they do not always define the educational structure required for training restorers, reconstructors and revitalisation specialists.

This gap determines the need for the present study. A pedagogical model is required that would integrate 2D graphic design, 3D modelling, restoration documentation, digital reconstruction, HBIM logic and revitalisation communication into a unified educational framework. Within such a framework, visual-project competence can be understood as an integrated professional ability that includes analytical observation, graphic structuring, spatial modelling, reconstruction reasoning, digital documentation and communicative presentation. This competence is essential for preparing specialists who are capable not only of preserving cultural heritage, but also of interpreting, reconstructing and revitalising it through contemporary visual and digital means.

Thus, the reviewed literature confirms the relevance of studying visual-project competence in 2D/3D graphic design as a pedagogical basis for training restorers, reconstructors and revitalisation specialists. The theoretical synthesis of the selected sources makes it possible to move from a fragmented understanding of visual tools to a systemic pedagogical model in which graphic design becomes a professional language of heritage analysis, reconstruction and cultural revitalisation.

Results

1. 2D Graphic Design as an Analytical Language of Restoration Documentation

The study established that 2D graphic design performs a fundamental analytical function in the professional training of restorers, reconstructors and revitalisation specialists. In cultural heritage education, 2D design should not be regarded merely as a means of visual presentation or aesthetic formatting. It functions as a professional language through which the condition, structure, damage, historical layers and transformation potential of a heritage object can be documented, classified and interpreted.

The results show that the formation of visual-project competence begins with the ability to translate complex information about a cultural heritage object into clear graphic systems. These systems include damage maps, restoration diagrams, typological schemes, material charts, chronological layers, object passports, analytical drawings, explanatory infographics and project boards. Such visual materials make it possible to organise information about the object in a structured and communicative form. In this sense, 2D graphic design contributes to the development of analytical clarity, visual hierarchy and professional accuracy.

The pedagogical significance of 2D graphic design lies in the fact that it teaches students to see a heritage object not only as an artistic or historical artefact, but also as a system of visible and hidden relations. Through graphic analysis, students learn to identify structural elements, distinguish between original and later layers, visualise losses, mark interventions, explain deterioration processes and present restoration logic. This corresponds to the general principles of visual communication, in which hierarchy, contrast, composition, modularity and clarity are central to the organisation of meaning (*Lupton & Phillips, 2015*).

The study also showed that 2D visualisation supports the transition from descriptive knowledge to professional interpretation. A student who creates a damage map or restoration diagram is not simply reproducing the external appearance of an object. They are making analytical decisions: what should be highlighted, what should be classified, how information should be structured, and how the visual material should communicate the professional logic of intervention. Thus, 2D graphic design becomes a pedagogical tool for developing observation, classification, visual thinking and professional responsibility.

Therefore, the first result of the study is the substantiation of 2D graphic design as an analytical language of restoration documentation. It forms the basic level of visual-project competence by developing students' ability to record, organise, interpret and communicate information about cultural heritage objects in a visually structured form.

2. 3D Graphic Design as a Tool for Reconstruction, Spatial Modelling and Digital Heritage Analysis

The second result of the study concerns the role of 3D graphic design in the training of cultural heritage specialists. The analysis showed that 3D modelling should be understood not merely as a technical skill or illustrative instrument, but as a method of spatial analysis, reconstruction reasoning and digital heritage interpretation. In contrast to 2D visualisation, which primarily structures information on a plane, 3D design allows students to work with volume, scale, spatial relations, geometry, materiality and hypothetical reconstruction scenarios.

The importance of 3D design is especially evident in the fields of reconstruction and restoration education. Cultural heritage objects are often preserved in a damaged, fragmented or transformed state. In such cases, 3D modelling enables students to test reconstruction hypotheses, compare historical sources, reconstruct lost elements, analyse proportions, simulate visual integrity and evaluate possible restoration or revitalisation solutions. This makes 3D design a powerful pedagogical instrument for connecting historical knowledge, spatial thinking and project-based decision-making.

Reality-based 3D documentation has become one of the central directions in contemporary cultural heritage practice. Remondino and Rizzi (*2010*) demonstrate that 3D documentation technologies make it possible to create accurate spatial records of heritage objects, while Stylianidis and Remondino (*2016*) emphasise the importance of 3D recording, documentation and management for conservation and heritage practice. These approaches confirm that future specialists must be trained not only to produce digital models, but also to understand their methodological status, accuracy, limitations and interpretative function.

The results also indicate that 3D graphic design contributes to the development of reconstructive thinking. Reconstruction in heritage education is always connected with uncertainty. Students must learn to distinguish between documented elements, probable reconstructions and hypothetical visualisations. This is especially important in accordance with the principles of virtual archaeology, which require transparency, evidence-based modelling and a clear distinction between scientific data and interpretative assumptions (*ICOMOS, 2017*). Therefore, 3D design in cultural heritage education should not encourage arbitrary visual fantasy, but should develop disciplined visual reasoning based on sources, measurements, analogies and professional argumentation.

The use of Historic Building Information Modelling further expands the educational potential of 3D design. Murphy et al. (*2013*) show that HBIM adds semantic and historical intelligence to laser- and image-based surveys, while López et al. (*2018*) demonstrate that H-BIM is increasingly used for documentation, analysis and management of historic buildings. In pedagogical terms, this means that the 3D model becomes not only an image, but also a structured information environment. Students learn to connect geometry with materials, chronology, construction logic, conservation data and restoration decisions.

Thus, the second result of the study is the substantiation of 3D graphic design as a tool for reconstruction, spatial modelling and digital heritage analysis. It forms a higher level of visual-project competence by developing students' ability to work with spatial data, reconstruction hypotheses, digital models and evidence-based visualisation of cultural heritage.

3. Visual-Project Competence as an Integrated Pedagogical Construct

The third result of the study is the definition of visual-project competence as an integrated pedagogical construct required for the training of restorers, reconstructors and revitalisation specialists. The analysis showed that this competence cannot be reduced either to artistic ability, technical digital skills or knowledge of design software. It represents a complex professional ability that combines visual thinking, analytical observation, spatial modelling, graphic structuring, digital visualisation, project communication and heritage interpretation.

The structure of visual-project competence includes several interrelated components. The analytical component reflects the ability to observe, classify and visually interpret the condition of a heritage object. The artistic-compositional component concerns the ability to organise visual material clearly, coherently and aesthetically. The technical-digital component includes proficiency in digital tools for 2D graphics, 3D modelling, visualisation and documentation. The reconstructive component reflects the ability to model lost, damaged or hypothetical elements on the basis of evidence. The communicative component is connected with the presentation of restoration, reconstruction or revitalisation concepts to specialists, institutions and public audiences. The project-based component ensures the integration of visual decisions into broader heritage preservation and revitalisation strategies.

This structure shows that visual-project competence is interdisciplinary by nature. It combines pedagogy, graphic design, digital art, restoration theory, heritage studies, architectural visualisation and cultural communication. This corresponds to the logic of design thinking, in which visualisation, modelling and iterative reasoning are regarded as ways of understanding complex problems and developing project solutions (*Cross, 2011*). In cultural heritage education, such thinking is especially important because specialists must work with incomplete evidence, damaged objects, historical uncertainty and the need to justify professional decisions.

The study established that the formation of visual-project competence requires a gradual pedagogical sequence. At the first stage, students should master 2D analytical tools: drawing, diagramming, mapping, visual classification and documentation. At the second stage, they should develop 3D spatial competence: modelling, reconstruction, digital recording and visualisation. At the third stage, they should integrate 2D and 3D tools into project-based tasks connected with restoration, reconstruction or revitalisation. At the fourth stage, they should learn to communicate their project decisions through professional presentations, digital portfolios, exhibition materials and public interpretation.

The results also showed that visual-project competence changes the role of graphic design in cultural heritage curricula. Graphic design should not be placed at the periphery of training as an auxiliary discipline. It should become one of the core methodological components of professional education, since it connects analysis, modelling, communication and project thinking. In this sense, 2D/3D graphic design becomes an educational mechanism for forming a specialist capable of working with cultural heritage as a complex visual, spatial, historical and social system.

Thus, the third result of the study is the development of visual-project competence as an integrated pedagogical category. This competence provides the conceptual basis for uniting 2D design, 3D modelling, restoration documentation, digital reconstruction and revitalisation communication within a single educational model.

4. Pedagogical Model for Integrating 2D/3D Graphic Design into Cultural Heritage Training

The fourth result of the study is the development of a pedagogical model for integrating 2D and 3D graphic design into the training of restorers, reconstructors and revitalisation specialists. The proposed model is based on the principle that graphic design should be included in the educational process not as a separate technical skill, but as a professional visual language accompanying all stages of work with cultural heritage.

The model includes three main functional levels. The first level is analytical-documentary. At this level, 2D graphic design is used for visual analysis, classification, documentation and explanation of the object's condition. Students learn to prepare drawings, diagrams, damage maps, analytical schemes and visual reports. The aim of this level is to form the ability to see, distinguish, structure and explain the heritage object through graphic means.

The second level is reconstructive-digital. At this level, 3D graphic design is used for spatial modelling, reconstruction hypotheses, digital documentation and simulation of lost or transformed elements. Students work with 3D models, photogrammetry, point clouds, HBIM logic, virtual reconstruction and digital visualisation. The aim of this level is to form the ability to analyse heritage in space, test hypotheses and develop evidence-based visual reconstructions.

The third level is communicative-revitalisation. At this level, 2D and 3D design are used for public communication, museum interpretation, exhibition design, navigation, identity systems, digital storytelling, virtual environments and revitalisation concepts. The aim of this level is to train students to present heritage not only to experts, but also to communities, visitors, institutions and broader audiences. This is particularly important because revitalisation requires the return of cultural, social and educational meaning to heritage objects.

The model demonstrates that restoration, reconstruction and revitalisation require different but interconnected types of visual work. Restoration requires precise documentation and explanation of intervention logic. Reconstruction requires spatial modelling and evidence-based visual hypotheses. Revitalisation requires communicative design, scenario modelling and public interpretation. Therefore, the same visual-project competence functions differently depending on the professional task, but its core structure remains unified.

The proposed model also corresponds to contemporary digital heritage discourse. Cameron and Kenderdine (*2007*) and Kalay et al. (*2007*) show that digital heritage changes the ways cultural objects are represented, interpreted and communicated. This confirms that future specialists should be trained not only to preserve heritage, but also to present it responsibly in digital and hybrid environments. At the same time, the model retains the importance of traditional 2D analytical graphics, since digital technologies do not eliminate the need for visual clarity, graphic discipline and professional documentation.

The study established several pedagogical conditions for implementing the model. The first condition is interdisciplinarity: courses in graphic design, restoration, heritage studies, digital modelling and project communication should be coordinated rather than taught separately. The second condition is project-based learning: students should work on real or modelled heritage cases. The third condition is evidence-based visualisation: all reconstruction and revitalisation proposals should be justified through sources, measurements and analytical reasoning. The fourth condition is digital and ethical literacy: students should understand both the possibilities and limitations of digital representation. The fifth condition is public communication: students

should learn to translate professional visual materials into accessible forms for non-specialist audiences.

Thus, the fourth result of the study is the development of a pedagogical model that integrates 2D and 3D graphic design into cultural heritage training through analytical-documentary, reconstructive-digital and communicative-revitalisation levels. This model makes it possible to overcome the fragmentation of educational content and to form specialists capable of analysing, modelling, reconstructing and revitalising cultural heritage through contemporary visual and digital means.

Discussion

The results of the study demonstrate that visual-project competence in 2D/3D graphic design should be considered one of the key pedagogical foundations for the contemporary training of restorers, reconstructors and revitalisation specialists in cultural heritage. This conclusion is significant because it changes the status of graphic design in cultural heritage education. Graphic design is no longer interpreted as an auxiliary artistic discipline or as a technical means of presenting already formulated decisions. Instead, it appears as an integrated professional language through which future specialists analyse, document, model, reconstruct, interpret and communicate cultural heritage objects.

The first important result concerns the analytical function of 2D graphic design. The study showed that 2D design provides the basic visual language for restoration documentation and professional communication. Damage maps, restoration diagrams, chronological schemes, typological tables, object passports and analytical drawings allow students to translate complex information about a heritage object into structured visual form. This finding is consistent with the principles of visual communication described by Lupton and Phillips (*2015*), who emphasise the importance of hierarchy, composition, contrast, modularity and clarity in the organisation of visual meaning. However, the present study extends this understanding to the field of restoration and cultural heritage education by showing that graphic clarity is not only an aesthetic requirement, but also a professional condition for accurate analysis and communication.

The second result concerns the role of 3D graphic design as a tool for reconstruction, spatial modelling and digital heritage analysis. The findings confirm that 3D modelling is not merely a means of visual illustration. It functions as a research and project instrument that enables the modelling of lost elements, testing of reconstruction hypotheses, analysis of spatial relations and simulation of revitalisation scenarios. This corresponds to the position of Remondino and Rizzi (*2010*), who demonstrate the importance of reality-based 3D documentation for cultural heritage, and to the work of Stylianidis and Remondino (*2016*), who consider 3D recording and documentation as essential components of heritage management. The present study develops these approaches in the pedagogical direction by showing that 3D design should be taught as a component of professional reasoning rather than as a purely technical software skill.

The results also confirm the importance of Historic Building Information Modelling for the training of heritage specialists. Murphy et al. (*2013*) show that HBIM adds semantic and historical intelligence to laser- and image-based surveys, while López et al. (*2018*) demonstrate

the significance of H-BIM for the documentation, conservation and management of historic buildings. The present study supports these conclusions and specifies their pedagogical meaning. In the educational process, HBIM logic makes it possible to connect geometry, materials, chronology, construction data, conservation decisions and visual communication. Therefore, students must learn not only to create digital models, but also to understand the informational, historical and analytical structure behind them.

The third major finding is the definition of visual-project competence as an integrated pedagogical construct. This competence includes analytical, artistic-compositional, technical-digital, reconstructive, communicative and project-based components. Such a structure corresponds to the logic of design thinking, in which visualisation, modelling and iterative project reasoning are considered fundamental forms of professional problem-solving (*Cross, 2011*). In the context of cultural heritage education, this means that future specialists should be trained to work with uncertainty, incomplete data, damaged objects, historical hypotheses and public interpretation. Visual-project competence allows students to connect observation, analysis, modelling and communication into a single professional process.

The fourth result concerns the proposed pedagogical model for integrating 2D and 3D graphic design into cultural heritage training. The model includes three functional levels: analytical-documentary, reconstructive-digital and communicative-revitalisation. This structure reflects the logic of professional work with cultural heritage. At the analytical-documentary level, students learn to document and interpret the existing condition of an object. At the reconstructive-digital level, they model lost or transformed elements and develop evidence-based reconstruction hypotheses. At the communicative-revitalisation level, they use visual means to present heritage meanings, design public interpretation and support the return of cultural, social or educational function to heritage objects.

This model corresponds to contemporary research on digital cultural heritage. Cameron and Kenderdine (*2007*) argue that digital heritage requires critical reflection on representation, mediation, authenticity and user experience. Kalay et al. (*2007*) similarly emphasise that new media transform the ways in which cultural heritage is interpreted and communicated. The present study develops this position by showing that digital and visual technologies should be incorporated into the educational process not only as instruments of presentation, but also as tools of professional thinking. In this respect, 2D/3D design becomes a pedagogical bridge between restoration knowledge, digital modelling and public communication.

The results are also consistent with the principles of responsible virtual reconstruction. The Seville Principles underline the need for transparency, scientific validity and clear differentiation between documented evidence and hypothetical reconstruction in virtual archaeology (*ICOMOS, 2017*). The present study confirms the pedagogical importance of these principles. Students should understand that 3D reconstruction in cultural heritage is not free artistic speculation. It is a visual hypothesis that must be based on evidence, documented sources, measurements, analogies and transparent interpretation. Therefore, training in 3D graphic design must include methodological and ethical components.

The theoretical contribution of the study lies in the development of the concept of visual-project competence as an educational category in cultural heritage pedagogy. Existing studies discuss graphic design, digital heritage, 3D documentation, HBIM and virtual reconstruction as

important but often separate areas. The present study integrates these areas into a single pedagogical construct. It demonstrates that visual-project competence can serve as a conceptual basis for organising the training of restorers, reconstructors and revitalisation specialists. This contributes to the development of heritage education by shifting attention from separate digital or graphic skills to the formation of an integrated professional mode of thinking.

The practical significance of the study lies in the possibility of applying the proposed model in educational programmes related to restoration, reconstruction, museum design, digital heritage, architectural heritage and urban revitalisation. The model may be used for curriculum development, course design, project-based learning and assessment of student competencies. For example, educational programmes may include modules on 2D restoration documentation, 3D modelling of heritage objects, HBIM-based analysis, virtual reconstruction, exhibition graphics, heritage navigation, digital storytelling and visual presentation of revitalisation concepts.

The proposed approach is also useful for designing learning outcomes. Instead of describing student achievements only in terms of knowledge of restoration theory or proficiency in software, programmes may define outcomes through visual-project competence. Such outcomes may include the ability to analyse the condition of heritage objects visually, prepare professional documentation, distinguish between evidence and hypothesis in reconstruction, create digital models, communicate restoration decisions and design revitalisation scenarios for different audiences.

The study has several limitations. The first limitation is its theoretical character. The proposed model is based on conceptual analysis, comparative interpretation and pedagogical modelling, but it has not yet been empirically tested in a specific educational programme. Therefore, the results should be considered as a theoretical framework requiring further verification. Future studies should include pilot implementation of the model in restoration, reconstruction or heritage design courses.

The second limitation concerns the selected source base. The study uses key works on design thinking, graphic design, digital heritage, 3D documentation, HBIM and virtual reconstruction. However, the inclusion of a broader range of empirical studies on student learning, design pedagogy, professional restoration training and digital competency assessment would allow the model to be further refined. In particular, future research should examine how students actually acquire visual-project competence and which pedagogical methods are most effective.

The third limitation is associated with the diversity of cultural heritage education itself. Training requirements may differ depending on whether the programme focuses on architectural restoration, museum studies, archaeological reconstruction, urban revitalisation, digital heritage or exhibition design. Therefore, the proposed model should not be understood as a rigid universal scheme. It should be adapted to specific institutional, national, disciplinary and professional contexts.

The fourth limitation concerns the rapid development of digital technologies. Tools for 3D modelling, photogrammetry, HBIM, virtual reality, augmented reality and artificial intelligence are changing quickly. This means that the digital component of visual-project competence requires constant updating. Future research should analyse how emerging technologies

transform the structure of professional competencies in heritage education and how curricula can remain flexible without losing methodological rigour.

Further research may develop in several directions. First, empirical studies are needed to evaluate the effectiveness of integrating 2D/3D graphic design into cultural heritage curricula. Such studies may include student portfolios, project assessment, expert evaluation, interviews with educators and comparison of learning outcomes before and after the implementation of the model. Secondly, it would be useful to develop diagnostic criteria for assessing visual-project competence. These criteria may include analytical accuracy, graphic clarity, spatial modelling ability, evidence-based reconstruction, digital literacy, communicative effectiveness and ethical awareness.

Thirdly, future research may focus on project-based learning in cultural heritage education. Since restoration, reconstruction and revitalisation are practical and interdisciplinary fields, educational tasks should be based on real or modelled heritage cases. Students may work with damaged objects, historical documentation, archival images, laser scanning data, photogrammetry materials, museum collections or revitalisation scenarios. Such tasks would make it possible to test how visual-project competence develops in practice.

Fourthly, further research should examine the relationship between visual-project competence and public communication of heritage. Revitalisation specialists must not only analyse and model heritage objects, but also communicate their value to communities, visitors, institutions and decision-makers. Therefore, visual design should be studied as a tool for public engagement, museum interpretation, cultural participation and heritage advocacy.

Overall, the discussion confirms that visual-project competence in 2D/3D graphic design is a necessary component of contemporary cultural heritage education. It allows future restorers, reconstructors and revitalisation specialists to work with heritage objects as complex visual, spatial, historical and social systems. The integration of 2D documentation, 3D modelling, HBIM logic, virtual reconstruction and communicative design makes it possible to overcome the fragmentation of specialist training and to prepare professionals capable of analysing, reconstructing and revitalising cultural heritage through contemporary visual and digital means.

Conclusion

The study conducted made it possible to establish that visual-project competence in 2D/3D graphic design is a necessary pedagogical foundation for the contemporary training of restorers, reconstructors and revitalisation specialists in the field of cultural heritage. The increasing complexity of professional work with heritage objects requires specialists to possess not only historical, artistic, technological and conservation-related knowledge, but also the ability to analyse, model, document, reconstruct and communicate heritage through advanced visual and digital means.

The aim of the study, which consisted in developing and theoretically substantiating a pedagogical model for integrating 2D and 3D graphic design into the training of cultural heritage specialists, was achieved. The analysis showed that graphic design should not be considered an auxiliary or purely illustrative discipline. In the context of restoration, reconstruction and revitalisation, it functions as an integrated professional language that connects visual analysis,

spatial modelling, evidence-based reconstruction, digital documentation and public communication.

The research objectives were consistently fulfilled. The role of 2D and 3D graphic design in contemporary cultural heritage practice was analysed. The concept of visual-project competence was clarified as an integrated pedagogical category. The main pedagogical functions of graphic design in the training of restorers, reconstructors and revitalisation specialists were identified. The structural components of visual-project competence were determined. A theoretical pedagogical model for integrating 2D and 3D graphic design into cultural heritage curricula was proposed.

The main result of the study is the substantiation of visual-project competence as a complex professional ability that includes analytical, artistic-compositional, technical-digital, reconstructive, communicative and project-based components. The analytical component enables students to identify, classify and visually interpret the condition of heritage objects. The artistic-compositional component ensures visual clarity, hierarchy and coherence of professional materials. The technical-digital component forms the ability to use contemporary software and digital tools for 2D and 3D visualisation. The reconstructive component develops evidence-based modelling of lost, damaged or hypothetical elements. The communicative component supports the presentation of restoration, reconstruction and revitalisation concepts to professional and public audiences. The project-based component integrates visual decisions into broader strategies of heritage preservation and cultural revitalisation.

The study demonstrated that 2D graphic design forms the basic analytical language of restoration documentation. It is essential for damage maps, restoration schemes, typological diagrams, object passports, explanatory infographics and project boards. Through 2D design, students learn to organise complex information about a heritage object and present it in a clear, structured and professionally meaningful form.

The study also showed that 3D graphic design forms a higher level of visual-project competence. It enables spatial modelling, digital documentation, reconstruction hypotheses, simulation of lost elements and visualisation of revitalisation scenarios. In this sense, 3D modelling is not only a technical instrument, but also a method of professional reasoning that allows future specialists to work with uncertainty, incomplete data and complex spatial structures.

The proposed pedagogical model includes three functional levels: analytical-documentary, reconstructive-digital and communicative-revitalisation. At the analytical-documentary level, students master 2D tools for visual analysis and restoration documentation. At the reconstructive-digital level, they use 3D modelling, digital documentation and evidence-based reconstruction methods. At the communicative-revitalisation level, they apply visual design to museum interpretation, public presentation, digital storytelling, exhibition graphics, navigation systems and revitalisation concepts.

The theoretical significance of the study lies in the development of visual-project competence as a pedagogical category in cultural heritage education. The article expands the understanding of graphic design by interpreting it not as a peripheral technical skill, but as a methodological component of professional training. This approach makes it possible to connect

design thinking, 2D visual communication, 3D modelling, restoration documentation, digital reconstruction and revitalisation into a unified educational framework.

The practical significance of the study consists in the possibility of applying the proposed model in university courses, professional training programmes, interdisciplinary curricula and project-based educational modules. The model may be used in restoration education, heritage reconstruction, museum design, digital heritage, architectural heritage, exhibition design, urban revitalisation and cultural project management. It may also support the development of student portfolios, assessment criteria, practical assignments and digital visualisation tasks.

At the same time, the study has several limitations. Its results are theoretical and require further empirical verification. The proposed model should be tested in educational programmes through pilot courses, student projects, expert evaluation and comparative analysis of learning outcomes. Further research may also focus on diagnostic criteria for assessing visual-project competence and on the influence of emerging technologies, including artificial intelligence, virtual reality, augmented reality and advanced HBIM systems, on the training of cultural heritage specialists.

In conclusion, the article demonstrates that 2D/3D graphic design should be systematically integrated into cultural heritage education as a core pedagogical mechanism for forming visual-project competence. Such integration makes it possible to overcome the fragmentation of specialist training and to prepare restorers, reconstructors and revitalisation specialists capable of working with cultural heritage as a complex visual, spatial, historical, technological and social system.

Conflict of Interests

The author declares that there is no conflict of interests that could have influenced the objectivity of the study, the interpretation of the results or the presentation of the conclusions. The article was prepared independently, without external funding, institutional pressure or the involvement of organisations or individuals with a direct financial, personal or professional interest in the outcomes of the research.

The study is theoretical in nature and is based on the analysis of scholarly literature in the fields of cultural heritage education, graphic design pedagogy, digital heritage, restoration documentation, 3D modelling, HBIM, virtual reconstruction and revitalisation studies. The selection and interpretation of sources were performed in accordance with the aim, objectives and methodological framework of the article.

The author confirms that there were no financial, institutional or personal circumstances that could be interpreted as influencing the research position, methodological approach, analytical procedure or conclusions of the study. All results presented in the article are based on independent theoretical analysis, conceptual systematisation and pedagogical modelling.

Thus, the present declaration confirms compliance with the principles of academic integrity, publication transparency and ethical standards of scholarly research.

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Martin Todorov [5]

Gamification of Spelling Instruction in Primary Education through the Educandy Platform [5]

Abstract:
The article examines the didactic potential of gamification in spelling instruction in primary education through the Educandy platform. The study responds to the need to transform traditional language learning into an interactive process in which pupils are not passive recipients of information, but active participants in constructing spelling knowledge. The research focuses on the digital game "Letter Jumble", an anagram-based resource designed to develop spelling literacy, linguistic reflection and learning motivation among second-grade pupils. The aim is to demonstrate how a simple digital game can transform spelling from a reproductive task into an engaging cognitive challenge supported by visual, auditory and kinaesthetic stimuli.
The methodological framework combines theoretical analysis and synthesis, modelling, anagram analysis, pedagogical survey, visual-symbolic pupil survey, observation and a time stimulus. For the purposes of the research, an original digital resource was created in Educandy. It includes three automatically generated interactive formats — Anagrams, Spell it! and Word search — with the anagram module selected as the main object of approbation. The game requires pupils to decompose jumbled letters and reconstruct words in their correct orthographic form, while the platform provides immediate audio-visual feedback. This supports the automation of spelling habits and reduces the emotional tension associated with mistakes. The empirical study involved 92 second-grade pupils and 16 primary school teachers. The pupil survey showed a very high level of positive emotional response: 95.6% of pupils selected a smiling emoticon after playing the game, while only 2.2% selected a frowning face and 2.2% remained neutral. In terms of perceived cognitive difficulty, 84.8% of pupils reported no difficulty in solving the anagram tasks, 8.7% described them as slightly difficult, and 6.5% experienced clear difficulty. These data indicate that the complexity of the resource is appropriately calibrated to the age characteristics of second-grade pupils. The teacher survey confirmed the methodological relevance of the Educandy resource. A total of 62.5% of teachers assessed the game as extremely effective for consolidating spelling rules, especially because of its visual feedback, while 37.5% regarded it as a good alternative that should be combined with traditional exercises. None of the respondents considered the game distracting or difficult to assess. In addition, 75% of teachers stated that they would gladly integrate similar resources into regular practice. The results prove that gamification through Educandy does not replace classical spelling instruction, but enriches it with an accessible, motivating and methodologically sound digital tool. The "Letter Jumble" model confirms the didactic value of the anagram method and shows that properly structured technology can support spelling accuracy, learner engagement and the development of digital competence in primary education.

Keywords: gamification, spelling instruction, primary education, Educandy, anagram method, Letter Jumble, digital competence, game-based learning, learning motivation, spelling literacy.

Abbreviations:
GBL is Game-Based Learning.

Introduction

In contemporary primary education, there is a growing need to apply innovative methods in which pupils are not merely passive recipients of information, but active participants. Digitalisation requires a transformation of the learning environment, since traditional

approaches often lose their effectiveness. According to Alexieva and Racheva, "digital competences should be developed from an early age through purposeful pedagogical work from the beginning of school education" (*Aleksieva & Racheva, p. 118*).

Linguistic and orthographic competence is a foundation of functional literacy. The new educational paradigm requires the use of interactive methods that place the pupil in an active position. When interactive learning is applied, the nature of the educational process changes "from static and passive to dynamic and interactive" (*Vasilev, 2015, p. 73*). Within this research framework, the Educandy platform transforms the lesson into a space for active communication, since, according to Atanasova, "interaction is a process in which information and social experience are exchanged between subjects… to achieve certain social goals" (*Atanasova, 2011, p. 6*). In the study, this task is the achievement of spelling accuracy through a shared game-based experience. In this context, the didactic game is established as a tool which, according to D. Dimitrova, "produces interest and a positive attitude towards knowledge and develops a number of social, intellectual and practical skills" (*Dimitrova, 2023, p. 133*). The didactic game requires participants to adapt their behaviour to one another, which, according to Veleva, "determines the decisive importance of play for developing social skills" (*Veleva, 2013, p. 24*). When working with the resource in Educandy, this is manifested through the aspiration towards common success in the digital environment.

The scientific novelty lies in the use of the Educandy platform to automate spelling skills through the format of anagrams. Today, digital competence goes beyond technical skills and includes "the ability to critically evaluate and adapt pedagogical practices to an electronic environment" (*Dimitrova, 2025, p. 14*). The game "Letter Jumble" achieves precisely this by transforming spelling into a process of sensory perception and reflection.

The integration of multimedia elements in Educandy follows the "golden rule" of J.A. Comenius that everything should be presented to the senses as far as possible (*Comenius, 1957, p. 187*). Since "there is nothing in the intellect that has not previously been in the senses", the game uses audio-visual stimuli which, according to Arora, "enhance concentration and help more anxious pupils become involved in the process" (*Comenius, 1992*; *Krasnova, 2015*).

The innovation is expressed in the use of game-based learning, which, according to Burov, "combines educational objectives with entertainment, training the ability to apply knowledge in the real world" (*Burov, 2022, p. 21*). Through Educandy, we demonstrate that "pupils' inertia can be overcome quickly if they are given interesting and challenging tasks" (*Vidergor, 2021, p. 75*). According to Shopova and Radev, "through game-based tests, pupils check the knowledge they have acquired, compete in teams and individually, which stimulates their activity, concentration and aspiration to achieve better results" (*Arora, 2013, p. 141*).

The subject of the study is the didactic potential of anagram games on the Educandy platform for improving spelling literacy.

The object of the study is the process of developing spelling skills and increasing learning motivation among second-grade pupils.

The study aims to demonstrate how the digital game "Letter Jumble" transforms spelling from a reproductive task into an engaging challenge that stimulates linguistic reflection.

According to the purpose, the following objectives are:

– to analyse the theoretical foundations of gamification and the role of the didactic game;

– to design and test the "Letter Jumble" resource in Educandy;
– to analyse feedback from teachers and pupils through adapted methods for diagnosing attitudes and achievements.

The article is aimed at primary school teachers and specialists in educational technologies. The model presented is evidence that "games are a good basis for the subjectivisation of significant roles and rules" (*Ivanova, 2023, p. 21*), which makes them an essential element of contemporary pedagogy.

Methods

Method of theoretical analysis and synthesis: This method is used to study the existing pedagogical literature on gamification. It made it possible to define digital competence not merely as a technical skill, but as the "confident, critical and responsible use of technologies for learning" (*Shopova & Radev, 2026, p. 116*). On this basis, the conceptual framework of the game "Letter Jumble" was developed.

Method of modelling: This method was used to design the structure of the anagram game on the Educandy platform. Modelling helped combine spelling rules with visual stimuli, supporting Krasnova's thesis that "people learn better if they have more than one medium to use" (*Nazarenko, 2015, p. 48*).

Method of anagram analysis (decomposition and reconstruction): This is the leading methodological tool in "Letter Jumble". It requires pupils to break down the jumbled letters and rearrange them into the correct spelling structure. This process activates linguistic reflection by transforming a dry rule into a logical ordering task.

Pedagogical survey of teachers: This method is applied to diagnose the methodological applicability of the Educandy resource. The survey focuses on two main indicators:

1. Effectiveness in consolidating knowledge: The extent to which, according to the teacher's observations, the game-based model helps pupils practically master spelling rules.
2. Technological sustainability and autonomy: The teacher's readiness to integrate similar resources in the future without the need for additional technical assistance.

Visual-symbolic survey of pupils (for Grade 2): Taking into account the age-specific characteristics of the respondents, a non-verbal feedback method was applied, including:

- Identification of emotional state: Self-assessment through three types of emoticons—smiling, neutral and frowning faces—reflecting the experience during the digital game.
- Assessment of cognitive difficulty: A direct question concerning the difficulty of the language task —Yes/No/A little—adapted for easy understanding by second-grade pupils.

Method of time stimulus (timer): This method is applied in Educandy's competitive mode. Its aim is to examine the influence of time pressure on pupils' ability to spell words correctly and on their level of concentration when solving anagrams.

Observation: This method is used to monitor pupils' direct reactions while working with the platform and the way in which they apply spelling rules in a dynamic environment.

For the purposes of the study, an original digital resource was developed in the cloud-based Educandy platform. The process of constructing the resource is characterised by a high degree

of intuitiveness and efficiency. After entering a list of target words, the platform automatically generates several interactive formats, which enables the teacher to vary the methods of practice:

1. Anagrams: The main module selected for the present study under the title "Letter Jumble". It requires the pupil to reconstruct the word by correctly arranging jumbled letters.
2. Spell it!: A module in which the pupil has to spell the word letter by letter, while the platform provides immediate feedback for each correct or incorrect step.
3. Word search: A classic "crossword" format in which children have to find hidden words in a grid of symbols, thereby stimulating visual recognition of the graphic form of the word.

The game "Letter Jumble" functions through the drag-and-drop movement of letters. The interface provides dynamic audio-visual feedback: when the word is arranged correctly, it is visualised in a different colour and accompanied by an encouraging sound signal. The generation of a unique code or link gives pupils immediate access to the three versions of the game without the need for registration, which facilitates work at the primary stage of education.

Literature Review

The literature review shows that the problem of gamifying spelling instruction in primary education is situated at the intersection of digital competence, interactive learning, didactic play and game-based learning. Aleksieva and Racheva (*2024*) provide a detailed analysis of curricula and emphasise the need to integrate digital skills across all school subjects. Their study is used to substantiate the interdisciplinary nature of spelling instruction through digital technologies (*Aleksieva & Racheva, 2024*). Atanasova (*2011*) clarifies the etymology and pedagogical origins of interactive methods, and her work provides a basis for defining the technology of the systematic use of games in the primary grades. Vasilev (*2015*) argues that interactive technologies change the role of the pupil from that of a passive listener to an active subject of the educational process; this approach is embedded in the design of the game presented in the article.

A significant theoretical foundation for the present study is provided by research on didactic play and its role in the development of cognitive, practical and social skills. Veleva (*2013*) focuses on play as a driver of social intelligence, and her work is used to analyse team interaction in anagram-based tasks. D. Dimitrova (*2023*) examines interactivity and the development of practical skills through conditional situations, supporting the thesis that game-based tools can generate a positive attitude towards knowledge. Ivanova (*2023*), within a research project of Shumen University devoted to didactic-methodological technologies and the competence-based approach, considers play as a universal form for structuring social relations and demonstrates its capacity to "dress" learning tasks in a form attractive to children.

The methodological basis of game-based learning is further developed in Burov's work (*2022*), which examines the methodology of GBL as an innovation in contemporary education. Burov defines GBL not merely as entertainment, but as an environment that enables pupils to train memory and transform theoretical knowledge into practical skills applicable to real-world situations. This work is essential for substantiating the effectiveness of digital games in the formation of key competences (*Burov, 2022*). Shopova and Radev (*2026*) demonstrate that the combination of an experimental-research approach, gamification and visual programming leads to increased motivation and the development of mathematical thinking among pupils. Their

study is used as a parallel practice related to the application of gamification in education (*Shopova & Radev, 2026*).

The digital and multimedia aspects of the study are supported by works that examine the role of sensory perception, technological formats and digital competence in learning. Comenius (*1957*; *1992*) substantiates the principle of visualisation and sensory perception as a source of knowledge; his ideas are fundamental to the multimedia approach adopted in the article. Arora (*2013*) explains why a multimedia environment combining sound and image enhances concentration, and this study is used to justify the audio-visual design of the Educandy resource. Krasnova (*2015*) shows that the variety of digital formats contributes to more durable memorisation, which is important for structuring spelling exercises in the game. Nazarenko (*2015*) examines the response of the "digital native" generation to interactive stimuli, and this source is central to the motivational aspect of the present study.

The professional and competence-related context of the research is supported by studies on digital competence and the changing role of the teacher in a technology-rich educational environment. K. Dimitrova (*2025*) highlights the role of the teacher as a moderator and the importance of cybersecurity; her work is key to defining the professional profile of the teacher using the Educandy platform. Vuorikari et al. (*2022*) present the European DigComp 2.2 framework, which is used to define digital competence as a key competence of the twenty-first century. Vidergor (*2021*) empirically demonstrates how digital games improve collaboration and motivation among elementary school pupils, and this work serves as a methodological basis for the experimental orientation of the present study.

Thus, the analysed literature confirms that the use of Educandy in spelling instruction can be theoretically grounded through several complementary perspectives: the development of digital competence, the application of interactive methods, the pedagogical value of didactic play, the methodology of game-based learning, and the motivational potential of multimedia digital environments. These sources collectively justify the use of the anagram game "Letter Jumble" as a tool for improving spelling literacy and increasing learning motivation among primary school pupils.

Results

The empirical study covers a sample of 92 second-grade pupils who took part in the trial implementation of the digital game "Letter Jumble" on the Educandy platform, followed by a self-assessment survey of their experience.

The first question in the survey examines the emotional state of the respondents through the selection of a graphic symbol, namely an emoticon. The data show that 95.6% of the pupils, or 88 pupils, coloured in a "smiling face", which is an indicator of a high degree of satisfaction and positive experience. Only 2.2%, or 2 children, chose a "frowning face", while another 2.2%, or 2 children, remained indifferent to the game-based process (*Figure 1*). The high percentage of positive emotional reactions proves that the gamified model successfully transforms the learning task into a source of enjoyment, while at the same time supporting the improvement of the spelling competences embedded in the curriculum.

Thus, it is established that the digital game creates a stimulating emotional environment which neutralises barriers to learning and transforms spelling assessment into a desirable and motivating process for pupils.

The second aspect of the survey focuses on the subjective perception of cognitive difficulty in solving the language tasks ("Was it difficult to solve the language task?"). The analysis of the responses shows that the majority of pupils, 84.8%, or 78 children, did not experience difficulties when working with the anagrams in Educandy. Around 8.7%, or 8 pupils, defined the tasks as "slightly difficult", which may be due to external factors such as the influence of the timer or the individual pace of work. Only 6.5%, or 6 children, reported clear difficulty in solving the spelling game. These data confirm that the level of complexity of the resource is appropriately calibrated to the age-specific characteristics of second-grade pupils.

Thus, the low proportion of pupils who experienced difficulties indicates the accessibility of the Educandy interface and the effectiveness of the anagram method as a tool that makes spelling norms easy to perceive and apply.

The study also includes 16 primary school teachers who applied the digital game "Letter Jumble" in their practice. The first aspect of the survey examines the extent to which the game-based model supports the consolidation of spelling rules. The results show that 62.5%, or 10 teachers, define the resource as "extremely effective", emphasising visual feedback as a factor that facilitates memorisation. The remaining 37.5%, or 6 teachers, regard the game as a good alternative which, however, must necessarily be combined with traditional exercises (*Figure 2*). It is important to note that none of the respondents expressed the opinion that the digital resource distracts pupils or is difficult to assess.

Thus, the hypothesis is confirmed that gamification through Educandy does not replace but rather enhances the classical methodology, providing the teacher with a powerful tool for visual stimulation and the consolidation of spelling norms.

The second question analyses teachers' readiness to integrate similar resources in the future, as well as their technological autonomy. The data indicate that 75%, or 12 teachers, would gladly include the game in their regular practice. A total of 12.5%, or two respondents in each case, would use it only in revision lessons or if more detailed instructions were available. An extremely positive indicator is the fact that 0% of the respondents prefer only classical methods, which demonstrates the openness of contemporary teachers to digital innovations.

Thus, it is established that the Educandy platform offers a high degree of accessibility and pedagogical applicability, removing technological barriers and encouraging teachers to use interactive educational resources systematically.

Discussion

The high levels of emotional satisfaction (95.6%) and spelling effectiveness established in the study correspond directly to the concept of digital competence as a key factor in social participation. The results obtained prove that when technology is properly didactically structured, it ceases to be an end in itself and becomes a "confident and responsible means of learning".

The survey data confirm Krasnova's thesis (*2015*) that the use of more than one medium—in this case, anagrams, sound and colour in Educandy—has a significant impact on the

acquisition of knowledge. This explains why 84.8% of the pupils did not experience difficulties: the multimedia environment supports the cognitive processing of spelling information.

The fact that teachers recognise the game as effective, while at the same time seeking a balance with traditional methods, is consistent with Vidergor's research (*2021*). Although her work focuses on escape rooms, the conclusions regarding the "gameful experience" as a driver of motivation are fully applicable here as well. The present study expands this framework by demonstrating that even simpler game-based forms, such as anagrams, can achieve a similar motivational effect.

Conclusion

On the basis of the conducted study, the following general conclusions can be drawn.

The gamification of spelling instruction through the Educandy platform is a highly effective strategy which successfully transforms the passive acquisition of language norms into an active process of cognitive construction. The integration of interactive tools in the primary grades leads to a significant increase in pupils' motivation and creates a positive attitude towards the acquisition of written culture, regardless of the specific language environment.

The aim of the study was achieved by demonstrating the universal didactic value of the anagram method. It was established that the digital environment effectively reduces the stress associated with making mistakes and enables pupils to automate their spelling habits in the context of enjoyment and healthy competition. This model is applicable in different educational systems, as it is based on universally valid principles of sensory perception and the logical arrangement of letter structures.

The fulfilment of the research tasks confirmed that contemporary teachers are ready for digital transformation when they have access to intuitive and methodologically sound tools. The "Letter Jumble" model is established as a sustainable pedagogical innovation which successfully combines academic standards of literacy with the digital needs of 21st-century pupils, preparing them for successful communication in the global world.

Conflict of Interests

The author declares that there is no conflict of interests that could have influenced the objectivity of the study, the interpretation of the empirical results, or the presentation of the conclusions. The article was prepared independently, without external funding, institutional pressure or the involvement of organisations or individuals with a direct financial, commercial or personal interest in the outcomes of the research.

The study is based on theoretical analysis, pedagogical modelling, the design and approbation of an original digital educational resource, pupil feedback, teacher survey data and classroom observation. The use of the Educandy platform is considered exclusively from a didactic, methodological and technological perspective, namely as a tool for gamifying spelling instruction and supporting the development of spelling literacy, learning motivation and digital competence among primary school pupils.

The Educandy platform and the digital game "Letter Jumble" are mentioned in the article only as the technological environment and practical resource used for the purposes of pedagogical modelling and empirical approbation. The author declares that there is no financial,

commercial, advertising or institutional relationship with the developers, owners or distributors of the Educandy platform. The inclusion of this platform in the study is determined solely by the research aim: to demonstrate how an anagram-based digital game can transform spelling instruction from a reproductive task into an interactive, motivating and cognitively meaningful learning activity for second-grade pupils.

The author confirms that the choice of the platform did not affect the independence of the analysis, the interpretation of the survey data or the formulation of the conclusions. The results concerning pupils' emotional response, perceived cognitive difficulty and teachers' assessment of methodological effectiveness are interpreted within the framework of primary education, game-based learning, interactive methods and digital competence, rather than as promotion of a specific commercial digital product.

The study does not promote any platform, software, digital service or technological solution as universally superior or exclusively necessary for spelling instruction. Educandy is analysed as one possible accessible tool that can enrich traditional methodology when it is used in a pedagogically justified, age-appropriate and methodologically balanced way. The article emphasises that gamification does not replace classical spelling instruction, but supplements it with visual feedback, immediate response, game-based motivation and opportunities for more active pupil participation.

The involvement of pupils and teachers in the empirical part of the study did not create any personal, financial or institutional dependency that could influence the research conclusions. Their responses were used only for pedagogical analysis of the effectiveness, accessibility and motivational potential of the digital resource.

Thus, the declaration confirms compliance with the principles of academic integrity, transparency of scholarly publication, independence of research interpretation and ethical standards of academic work in the field of primary education, spelling instruction, game-based learning and educational technologies.

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Appendix

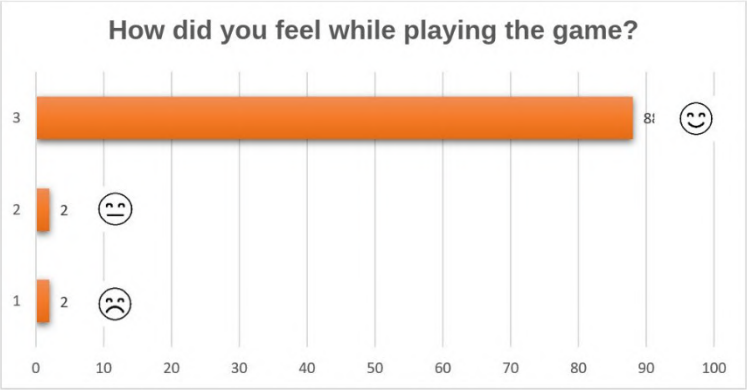

Figure 1. Diagram "Emotional State of Pupils during the 'Letter Jumble' Game" (based on the selection of emoticons) (author's work)

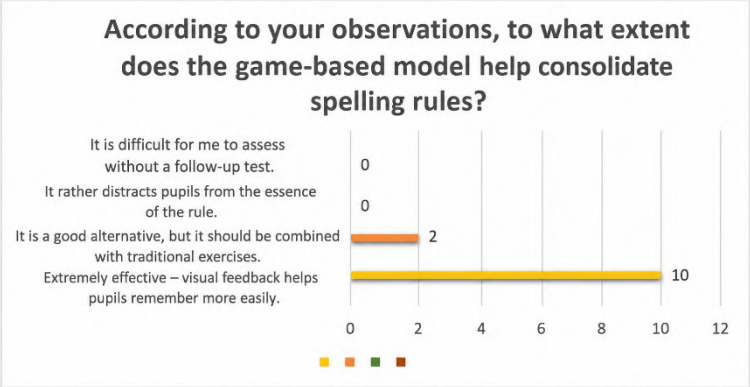

Figure 2. Diagram "Teachers' Assessment of the Methodological Effectiveness of the Educandy Platform for Consolidating Spelling Rules" (author's work)

Kateryna Favorova [6]

Psychological Mechanisms of Individual Adaptation to Chronic Stress under Conditions of Social Instability [6]

Abstract:
This article is devoted to a theoretical analysis of the psychological mechanisms of individual adaptation to chronic stress under conditions of social instability caused by contemporary socio-political and economic processes. The relevance of the study is determined by the need for a systematic understanding of adaptation processes under the prolonged influence of stressors. The research problem is associated with the absence of an integral theoretical model that would allow adaptation to chronic stress to be considered as an integrative psychological process. The scientific novelty of the study lies in the theoretical reconstruction of adaptation as a multilevel system of interrelated cognitive, emotional and behavioural mechanisms. The object of the study is the processes of individual adaptation to chronic stress. The subject of the study is the psychological mechanisms of this adaptation under conditions of social instability. The aim of the work is to identify, systematise and theoretically substantiate the psychological mechanisms of individual adaptation to chronic stress. The methodological basis of the study consists of methods of theoretical analysis, generalisation, classification and comparative analysis of psychological concepts. The theoretical framework of the study is based on the works of Hans Selye, Richard Lazarus and Ann Masten. As a result of the study of the material on this topic, it has been established that individual adaptation to chronic stress is a multilevel process that includes cognitive mechanisms, such as reappraisal and interpretation of the situation; emotional mechanisms, such as regulation of emotional states; and behavioural mechanisms, such as coping strategies. It is shown that the interaction of these mechanisms ensures the stability of the mental system under conditions of prolonged stress. It is substantiated that psychological resilience acts as an integrative factor ensuring the coherence of adaptation processes. The article concludes that adaptation to chronic stress should be considered as a systemic multilevel process rather than as a set of separate reactions. The results obtained clarify existing theoretical models of adaptation and expand their interpretative potential. The practical significance of the study lies in the possibility of applying its conclusions in psychological counselling, educational programmes and social practice.

Keywords: psychological adaptation, chronic stress, social instability, coping strategies, psychological resilience, resilience, emotional regulation, cognitive mechanisms.

Introduction

In the context of contemporary social instability caused by economic, political and military transformations, the problem of individual adaptation to chronic stress acquires particular scholarly significance. Prolonged exposure to stressogenic factors generates persistent psycho-emotional tension, which requires not only situational responses but also complex mechanisms of psychological adaptation that ensure the preservation of an individual's internal stability.

Contemporary research in the psychology of stress demonstrates considerable attention to the study of coping strategies, emotional regulation and psychological resilience. The works of Hans Selye (*1976*), Richard Lazarus (*1984*) and Ann Masten (*2001*) reveal key aspects of stress responses and coping mechanisms. However, existing approaches predominantly consider adaptation either through separate psychological components or through specific models of response to stress.

In this regard, a research gap can be identified, namely the absence of a holistic theoretical model that would make it possible to interpret individual adaptation to chronic stress as an

integrative multilevel process comprising interrelated cognitive, emotional and behavioural mechanisms.

The scientific novelty of the study lies in the systematisation and theoretical substantiation of adaptation as a complex psychological system within which different mechanisms function not in isolation, but in interaction, thereby ensuring individual resilience under conditions of prolonged stress.

The research question is formulated as follows: how exactly do psychological mechanisms ensure individual adaptation to chronic stress under conditions of social instability?

The object of the study is the processes of individual adaptation under conditions of chronic stress, while the subject is the psychological mechanisms that ensure this adaptation.

The study aims to identify, systematise and theoretically substantiate the psychological mechanisms of individual adaptation to chronic stress.

To achieve this aim, the following objectives have been defined:

- to analyse theoretical approaches to understanding chronic stress and individual adaptation;
- to clarify the conceptual field of the key categories of the study;
- to identify and classify the psychological mechanisms of adaptation;
- to systematise coping strategies under conditions of social instability;
- to interpret adaptation as an integrative psychological process.

The theoretical significance of the study lies in clarifying the conceptual apparatus of the psychology of stress and in developing an interpretative model of adaptation as a systemic process.

The practical significance of the study consists in the possibility of applying the results obtained in psychological counselling, educational programmes for training specialists in the helping professions, and the development of adaptation strategies under conditions of social instability.

The results of the study are addressed to psychologists, researchers, specialists in social work and interpersonal interaction, and may also be used in further scholarly research.

Methods

The study has a theoretical and analytical design and is aimed at a systemic understanding of the psychological mechanisms of individual adaptation to chronic stress under conditions of social instability. Within this approach, adaptation is considered as a complex multilevel process requiring the integration of various theoretical models and conceptual approaches.

The research material consists of scholarly publications in the field of stress psychology, coping theory, and studies of psychological resilience. The analysis is based on the works of classical and contemporary authors, including Hans Selye (*1976*), Richard Lazarus (*1984*) and Ann Masten (*2001*), which makes it possible to ensure continuity in scholarly analysis and to situate the study within the current academic discourse.

The criteria for selecting sources included the theoretical significance of the works, their contribution to developing the problems of stress and adaptation, and their representativeness for various areas of contemporary psychological science. The analysis includes studies reflecting both classical concepts and contemporary interpretations of adaptation processes. The

limitations of the material are related to the focus on theoretical sources and the absence of empirical data within the framework of the study.

The chronological scope of the study covers the development of stress theory from the classical works of the mid-20th century to contemporary research, which makes it possible to trace the evolution of scholarly views on adaptation mechanisms.

The analytical procedure involves the sequential application of theoretical analysis, comparative analysis and the systematisation of scholarly data. At the first stage, existing approaches to understanding stress and adaptation are analysed and generalised. At the second stage, different concepts are comparatively examined in order to identify their similarities and differences. At the third stage, the psychological mechanisms of adaptation are classified and integrated into a unified theoretical model.

The methodology of the study includes general scientific methods, such as analysis, synthesis, generalisation and classification, as well as specialised methods, namely comparative and interpretative analysis. This corresponds to the theoretical nature of the work and makes it possible to identify the structural and functional characteristics of adaptation processes.

The validity of the study is ensured by reliance on recognised scholarly concepts, the systematic comparison of different theoretical approaches, and the logical consistency of the stages of analysis. Reliability is achieved through the consistent application of the selected methods and the transparency of the research procedure.

The limitations of the study are associated with its theoretical nature and the absence of empirical testing of the proposed model, which defines the prospects for further research aimed at its empirical verification.

Literature Review

The contemporary research field of the psychology of stress and adaptation is characterised by considerable diversity of theoretical approaches, which may be conventionally divided into several key methodological strands: the physiological, cognitive-appraisal, coping-resource, emotion-regulatory, resilience-oriented and socio-ecological lines of research. Each of these directions contributes to the understanding of individual adaptation to chronic stress, while at the same time demonstrating certain limitations when considered in isolation.

The classical physiological strand, represented by the works of Selye (*1976*), considers stress primarily as a physiological response of the organism to external influences, emphasising the universality of stress processes and their biological determination. This approach laid the foundation for further research by conceptualising stress as a general adaptive response. However, its limitations are manifested in its insufficient consideration of psychological, social and cognitive factors that influence individual adaptation. The further development of this line can be observed in McEwen's work on the physiology and neurobiology of stress, which demonstrates that stress and adaptation are associated with complex neurobiological processes affecting cognition, emotion and behaviour (*McEwen, 2007*). This perspective makes it possible to understand chronic stress not only as a physiological burden, but also as a factor that transforms the functioning of the whole psychological system.

The development of a psychological understanding of stress is associated with the cognitive-appraisal model proposed by Lazarus and Folkman (*1984*). Within this paradigm,

stress is interpreted as the result of the subjective appraisal of a situation and of the resources available to the individual. This approach is particularly important because it shifts the focus from the external stressor itself to the individual's interpretation of the situation. Folkman (*2013*) further emphasises that appraisal and coping are interrelated processes through which individuals evaluate demands, available resources and possible strategies of response. Thus, cognitive appraisal becomes a central mechanism linking external stressors with emotional and behavioural reactions.

A separate line of research is associated with coping theory and the analysis of coping resources. Carver and Connor-Smith (*2010*) demonstrate that coping strategies are closely connected with personality characteristics and may take different forms, including problem-focused coping, emotion-focused coping and avoidance-oriented responses. Taylor and Stanton (*2007*) also underline the importance of coping resources and processes, showing that adaptation to stress depends not only on situational responses, but also on the availability of psychological, social and personal resources. These approaches are significant for understanding how individuals attempt to manage chronic stress; however, when considered separately, they do not fully explain how coping strategies interact with emotional regulation, resilience and broader social conditions.

The resource-based interpretation of stress is further developed in Hobfoll's conservation of resources theory. According to Hobfoll (*1989*), stress arises when individuals experience the threat of resource loss, actual resource loss or insufficient resource gain following resource investment. This theory is particularly relevant to the analysis of chronic stress under conditions of social instability, since economic, political and social uncertainty may be perceived as a continuous threat to personal, social and material resources. From this perspective, adaptation is not limited to psychological adjustment, but also includes the preservation, restoration and redistribution of resources necessary for maintaining functioning.

The emotion-regulatory strand of research provides another important perspective on adaptation to chronic stress. Gross (*2015*) conceptualises emotion regulation as a set of processes through which individuals influence the intensity, duration and expression of emotional states. This approach is significant because chronic stress is accompanied not only by cognitive appraisal and behavioural coping, but also by prolonged emotional activation. Effective emotional regulation may reduce the intensity of negative emotional states, support psychological stability and prevent the development of maladaptive responses. At the same time, difficulties in emotional regulation may intensify stress reactions and reduce the effectiveness of coping strategies.

Contemporary research in psychological resilience focuses on the individual's capacity to maintain or restore functioning under adverse conditions. Masten (*2001*) conceptualises resilience as "ordinary magic", thereby emphasising that adaptive functioning under adversity is based not on exceptional qualities, but on ordinary psychological and social processes. Bonanno (*2004*) also demonstrates that resilience may be understood as a relatively common response to loss and trauma, rather than as a rare or exceptional outcome. These approaches expand traditional understandings of adaptation by showing that individuals may preserve psychological functioning even under conditions of significant stress.

Further development of resilience research is represented by studies that conceptualise resilience as a dynamic and multidimensional process. Southwick and Charney (*2012*) emphasise that resilience is shaped by the interaction of biological, psychological and social factors. Kalisch et al. (*2015*) propose a conceptual framework for resilience research that focuses on the mechanisms enabling individuals to maintain mental health despite stress exposure. These approaches are important because they make it possible to consider resilience not as an isolated personality trait, but as an integrative process that coordinates cognitive, emotional and behavioural mechanisms of adaptation.

The socio-ecological perspective further expands the understanding of adaptation and resilience. Ungar (*2011*) argues that resilience should be analysed not only at the level of individual psychological characteristics, but also in relation to the social and cultural environment. This approach is especially relevant under conditions of social instability, where the availability of social support, institutional resources and cultural meanings may significantly influence adaptation. Thoits (*2010*), analysing the relationship between stress and health, also shows that social conditions, social roles and support systems play an important role in shaping the consequences of stress. These studies demonstrate that adaptation to chronic stress cannot be adequately understood without considering the social context in which stressors emerge and are processed.

The conceptual basis of the present study also requires clarification of the category of adaptation itself. The APA Dictionary of Psychology defines adaptation as a process of adjustment to environmental conditions, which allows an individual to maintain functioning in changing circumstances (*APA Dictionary of Psychology, 2020*). This definition is important because it makes it possible to interpret adaptation not as a single reaction, but as a continuous process of psychological adjustment involving cognitive, emotional, behavioural and social components.

An analysis of the literature shows that existing approaches to the study of adaptation to stress develop predominantly within separate research directions. Physiological theories explain the biological foundations of stress; cognitive-appraisal theories reveal the role of subjective interpretation; coping theories describe behavioural and psychological strategies of response; resource-based theories focus on the preservation and loss of resources; emotion-regulation theories explain the management of affective states; and resilience-oriented theories analyse the capacity to maintain functioning under adversity. Each of these approaches has considerable explanatory value, but none of them alone provides a complete understanding of individual adaptation to chronic stress under conditions of social instability.

Thus, a lacuna can be identified in the research field, associated with the absence of a comprehensive theoretical model that would make it possible to consider individual adaptation to chronic stress as a multilevel process comprising interrelated cognitive, emotional, behavioural, resource-based and socio-contextual mechanisms. The existing fragmentation of scholarly knowledge indicates the need for theoretical systematisation and integration. It is precisely this circumstance that determines the necessity of the study, which is aimed at developing a holistic interpretation of adaptation as a systemic psychological process.

Results

1. Cognitive Mechanisms of Adaptation to Chronic Stress

The analysis established that cognitive mechanisms of adaptation play a key role in the interpretation of a stressogenic situation and in the formation of the subjective perception of threat. The main cognitive mechanisms include cognitive reappraisal, interpretation of the significance of the stressor, and the formation of semantic constructs that make it possible to integrate stressful experience into the system of personal representations.

It was found that cognitive processing of the situation determines the intensity of the emotional response and the choice of behavioural strategies. Under conditions of chronic stress, particular importance is attached to the capacity for flexible reappraisal, which makes it possible to reduce the subjective significance of negative factors and to form adaptive interpretations of ongoing events.

It was established that cognitive mechanisms perform not only the function of appraising the situation but also ensure its semantic structuring, thereby contributing to a reduction in uncertainty and an increase in psychological resilience.

Thus, cognitive mechanisms of adaptation constitute the basic level of processing a stressful situation, determining the subsequent functioning of emotional and behavioural processes.

2. Emotional Mechanisms of Adaptation and the Regulation of Stress States

The results of the analysis show that emotional mechanisms of adaptation ensure the regulation of an individual's psycho-emotional state under conditions of prolonged exposure to stress. The key components of this level are anxiety management, reduction of emotional tension, and the development of tolerance to frustration.

It was established that the effectiveness of emotional regulation directly depends on the cognitive interpretation of the situation; however, under conditions of chronic stress, emotional responses may acquire an autonomous character and require additional control mechanisms.

It was found that stable forms of emotional regulation contribute to the preservation of internal equilibrium and prevent the development of maladaptive states, such as chronic anxiety and emotional burnout.

Thus, emotional mechanisms of adaptation ensure the stabilisation of the mental state and act as a key factor in maintaining an individual's internal equilibrium under conditions of prolonged stress.

3. Behavioural Mechanisms and the Integrative Role of Resilience

The study established that behavioural mechanisms of adaptation are implemented through coping strategies aimed at changing the situation or the individual's attitude towards it. These include active strategies, such as solution-seeking and social support, and passive strategies, such as avoidance and distancing.

It was found that the effectiveness of behavioural strategies is determined by their coherence with cognitive and emotional processes. A mismatch between the levels of adaptation leads to a decrease in the overall effectiveness of adaptation processes.

It is substantiated that psychological resilience acts as an integrative mechanism uniting the cognitive, emotional and behavioural components of adaptation. It is resilience that ensures the coherence of functioning across all levels and enhances the individual's capacity for adaptation under conditions of chronic stress.

Thus, behavioural mechanisms implement adaptation at the practical level, while resilience acts as a system-forming factor ensuring the integrity of the adaptation process.

Discussion

The results obtained are of substantial significance for contemporary psychology of stress and adaptation, since they make it possible to move from a fragmentary consideration of adaptation processes to their systemic interpretation. In contrast to traditional approaches, in which individual mechanisms are analysed in isolation, the present study demonstrates the necessity of considering them comprehensively within a unified model.

Thus, the proposed interpretation of adaptation as a multilevel process contributes to a deeper scholarly understanding of the structure of adaptation mechanisms and expands the research perspective for analysing chronic stress.

The cognitive, emotional and behavioural mechanisms of adaptation identified in the course of the study should be regarded not as autonomous elements, but as interrelated components of a unified system of psychological regulation. Their interaction ensures not only a response to stress, but also the individual's resilience under conditions of prolonged exposure to stress.

Particular importance is attached to the identified integrative role of resilience, which makes it possible to coordinate the functioning of different levels of adaptation. This indicates that individual resilience is formed not through a single mechanism, but as a result of the coordination of various mental processes.

The results obtained correspond to classical and contemporary theories of stress and adaptation, including the concepts of Hans Selye, Richard Lazarus and Ann Masten. At the same time, they refine these approaches by showing that adaptation cannot be reduced exclusively to physiological responses or coping strategies.

The proposed model expands existing theoretical frameworks through the integration of different levels of psychological regulation and makes it possible to consider adaptation as a systemic phenomenon, thereby contributing to the development of the conceptual apparatus of the psychology of stress.

The practical significance of the results lies in the possibility of their application in psychological counselling and in work with individuals experiencing chronic stress. The presented model of adaptation may be used for diagnosing adaptation strategies and developing individualised approaches to psychological support.

In addition, the results of the study may be applied in educational programmes for training specialists in the helping professions, as well as in the development of psychological adaptation programmes under conditions of social instability.

A comparison of the results obtained with existing studies shows that most approaches focus on individual aspects of adaptation, whereas the proposed model is oriented towards their integration. This makes it possible to regard the results as a refinement and further development of existing scholarly views.

At the same time, the study has a number of limitations related to its theoretical nature, the limited scope of the material analysed and the absence of empirical verification of the proposed

model. These limitations determine the boundaries of generalising the results obtained and indicate the need for their further testing.

The conclusions obtained are applicable primarily within the framework of theoretical analysis and cannot be directly extrapolated to all categories of stressful situations without additional empirical confirmation. The limitations of the study are also associated with the choice of conceptual field and the theoretical sources analysed.

Recognition of these limitations makes it possible to clarify the boundaries of applicability of the results and ensures the methodological transparency of the study.

A promising direction for further research is the empirical testing of the proposed model of adaptation using qualitative and quantitative methods, which would make it possible to clarify the role of individual mechanisms in different types of stressful situations.

It would also be appropriate to investigate the specific features of adaptation processes in different social and cultural contexts, as well as in different age groups, which would expand the area of application of the proposed model.

An additional direction is associated with the development of applied psychological support programmes based on the integration of cognitive, emotional and behavioural mechanisms of adaptation.

Conclusion

The study conducted made it possible to establish that individual adaptation to chronic stress under conditions of social instability constitutes a multilevel psychological process that includes cognitive, emotional and behavioural mechanisms. It has been shown that cognitive mechanisms ensure the interpretation of a stressful situation, emotional mechanisms ensure the regulation of the psycho-emotional state, and behavioural mechanisms ensure the implementation of adaptation strategies in practical interaction with the environment. It has been substantiated that psychological resilience acts as an integrative factor ensuring the coherence of functioning across all levels of adaptation.

As a result of the study, a theoretical model of adaptation has been developed, within which adaptation processes are considered as a systemic interaction of various psychological mechanisms rather than as a set of isolated responses. This makes it possible to refine existing scholarly views on the structure of adaptation and to expand the possibilities for its interpretation under conditions of prolonged exposure to stress.

The stated aim of the study—to identify, systematise and theoretically substantiate the psychological mechanisms of individual adaptation to chronic stress—was achieved through the consistent analysis and integration of existing theoretical approaches.

In the course of the study, the main objectives were fulfilled: theoretical approaches to understanding stress and adaptation were analysed; the conceptual field of the key categories was clarified; psychological mechanisms of adaptation were identified and classified; coping strategies were systematised; and an interpretation of adaptation as an integrative psychological process was proposed. Each of these objectives was implemented within the logic of the study and was reflected in the corresponding analytical results.

The author's contribution consists in the theoretical systematisation of disparate approaches to the study of adaptation and in the substantiation of an integrative model that

unites cognitive, emotional and behavioural mechanisms. The interpretation presented makes it possible to consider adaptation as a holistic process, thereby increasing the conceptual clarity of the phenomenon under study.

The overall contribution of the article lies in clarifying the conceptual apparatus of the psychology of stress and adaptation, developing a theoretical model of adaptation processes, and expanding the research perspective for analysing chronic stress. The results obtained may serve as a basis for further theoretical developments and empirical studies, as well as for practical application in psychological counselling and social practice.

Conflict of Interests

The author declares that there is no conflict of interest associated with this study. The work was carried out independently, without any financial, institutional or personal interest capable of influencing the objectivity of the study, the interpretation of the results or the presentation of the conclusions.

The author confirms the absence of any affiliation, sources of funding or other circumstances that could be interpreted as influencing the content or results of the study. The study was conducted in compliance with the principles of academic integrity, transparency and the ethical standards of scholarly publication.

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Olena V. Dolgopolova [7]

Psychological Mechanisms of Interpersonal Communication in Conditions of Emotional Stress [7]

Abstract:
The article is devoted to a theoretical analysis of the psychological mechanisms of interpersonal communication under conditions of emotional tension arising in situations of increased stress load and social instability. The relevance of the study is determined by the need for a systemic understanding of the transformation of communicative processes under the influence of emotional factors. The research problem is associated with the absence of a holistic theoretical model explaining how emotional tension affects the structure and effectiveness of interpersonal communication. The scientific novelty of the study lies in the systematisation of the psychological mechanisms of communication as a multilevel system comprising cognitive, emotional and behavioural components. The object of the study is the processes of interpersonal communication, while the subject of the study is the psychological mechanisms that determine the specific features of communication under conditions of emotional tension. The study aims to identify, systematise and theoretically substantiate these mechanisms. The methodological basis of the study consists of methods of theoretical analysis, generalisation, classification and comparative analysis of psychological concepts. The theoretical framework of the study is based on the works of Paul Watzlawick, Richard Lazarus and Daniel Goleman. As a result of the study, it was established that interpersonal communication under conditions of emotional tension is characterised by the distortion of cognitive interpretations, the intensification of emotional responses and changes in behavioural strategies of interaction. It was found that cognitive mechanisms determine the perception and interpretation of the communicative situation, emotional mechanisms regulate the intensity of responses, and behavioural mechanisms implement communicative strategies. It is substantiated that the interaction of these mechanisms forms the systemic nature of communicative processes. The article concludes that interpersonal communication under conditions of emotional tension should be considered as a dynamic system of interrelated psychological mechanisms. The results obtained clarify existing theoretical approaches and expand their interpretative potential. The practical significance of the study lies in the possibility of applying the results in psychological counselling, communication skills training and the management of interpersonal interactions.

Keywords: interpersonal communication, emotional tension, psychological mechanisms, communicative distortions, emotional regulation, cognitive processes, behavioural strategies.

Introduction

In the context of contemporary social dynamics and the increasing impact of stressogenic factors, the problem of interpersonal communication acquires particular scholarly significance. Emotional tension arising in situations of uncertainty, conflict or increased psychological load substantially affects the nature of interaction between people, changing both the content and the form of communicative processes.

Contemporary research in the psychology of communication and stress demonstrates a wide range of approaches to the analysis of interpersonal interaction. In particular, the works of Paul Watzlawick reveal the structural features of communication as a system of interaction; Richard Lazarus's concept emphasises the role of cognitive appraisal of a stressful situation; and Daniel Goleman's studies underline the importance of emotional regulation in the process of interpersonal interaction. However, existing approaches generally consider these aspects in isolation and do not form a holistic understanding of the mechanisms through which communication is transformed under conditions of emotional tension.

In this regard, a research gap can be identified, namely the absence of an integrative theoretical model explaining the interrelationship between cognitive, emotional and behavioural mechanisms in the process of interpersonal communication under conditions of emotional tension.

The scientific novelty of the present study lies in the systematisation and theoretical substantiation of interpersonal communication as a multilevel process in which different psychological mechanisms function in interrelation, forming a holistic system of interaction.

The research question is formulated as follows: how do psychological mechanisms transform interpersonal communication under conditions of emotional tension?

The object of the study is the processes of interpersonal communication, while the subject of the study is the psychological mechanisms that determine the specific features of communication under conditions of emotional tension.

The study aims to identify, systematise and theoretically substantiate the psychological mechanisms of interpersonal communication under conditions of emotional tension.

To achieve this aim, the following objectives have been defined:

- to analyse theoretical approaches to understanding interpersonal communication and emotional tension;
- to clarify the conceptual field of the key categories of the study;
- to identify and classify the psychological mechanisms influencing communication;
- to systematise communicative strategies and distortions under conditions of emotional tension;
- to interpret interpersonal communication as a systemic psychological process.

The theoretical significance of the study lies in clarifying the conceptual apparatus of the psychology of communication and in developing an interpretative model of interpersonal interaction under conditions of emotional tension.

The practical significance of the study consists in the possibility of applying the results obtained in psychological counselling, communication skills training and the management of interpersonal interactions under stressful conditions.

The results of the study are addressed to psychologists, specialists in the helping professions and researchers in social psychology, and may also be used in educational practice.

Methods

The study has a theoretical and analytical research design and is aimed at identifying and systematising the psychological mechanisms of interpersonal communication under conditions of emotional tension. Within this approach, interpersonal communication is considered as a complex multilevel process comprising cognitive, emotional and behavioural components that function in interrelation.

The research material consists of scholarly publications in the fields of communication psychology, stress theory, emotional regulation and interpersonal interaction. The analysis includes both classical theoretical works and contemporary studies reflecting the development of scholarly views on communicative processes. The theoretical basis is formed, in particular,

by the approaches of Paul Watzlawick (*1967*), Richard Lazarus (*1984*) and Daniel Goleman (*1995*).

The criteria for selecting sources included the theoretical significance of the works, their contribution to the development of the problems of interpersonal communication and emotional tension, and their representativeness for various areas of contemporary psychological science. The analysis includes sources that make it possible to examine communicative processes from different methodological perspectives. The limitations of the material are associated with the theoretical nature of the study and the absence of empirical data.

The chronological scope of the study covers the development of scholarly views on interpersonal communication and stress from the classical concepts of the second half of the twentieth century to contemporary research, which makes it possible to trace the evolution of approaches and identify stable theoretical tendencies.

The analytical procedure involves the sequential application of theoretical analysis, comparative analysis and the systematisation of scholarly data. At the first stage, key concepts of interpersonal communication and emotional tension are analysed. At the second stage, different theoretical approaches are compared to identify similarities and differences in the interpretation of communicative processes. At the third stage, psychological mechanisms are classified and integrated into a unified theoretical model.

The methodology of the study includes general scientific methods, such as analysis, synthesis, generalisation and classification, as well as specialised methods, namely comparative and interpretative analysis. The choice of these methods is determined by the need to identify the structural and functional characteristics of interpersonal communication under conditions of emotional tension.

The validity of the study is ensured by reliance on recognised scholarly concepts and by the logical consistency of the stages of analysis. Reliability is achieved through the consistent application of the selected methods and the transparency of the research procedure.

Literature Review

The study of interpersonal communication and its transformation under conditions of emotional tension occupies a significant place in contemporary psychological science and is developing within several interrelated theoretical directions. An analysis of the scholarly literature makes it possible to identify several key lines of research: the communicative, the stress-cognitive, the coping-resource, the emotion-regulatory and the resilience-oriented lines. Each of them contributes to the understanding of the problem under consideration, while remaining limited in terms of its explanatory completeness when considered in isolation.

The first line of research is associated with the analysis of interpersonal communication as a system of interaction. Within this approach, communication is regarded not only as the transmission of information, but also as a complex process involving the interpretation of messages, the context of interaction and the mutual influence of participants. In the work of Watzlawick et al. (*1967*), it is emphasised that communication possesses structural regularities and that any interaction includes both a content level and a relational level. This approach is important for understanding how communicative acts are embedded in systems of interpersonal

relations and how misunderstandings may arise not only from the content of messages, but also from the relational meaning attributed to them.

This communicative perspective is further developed in broader theories of interpersonal and intercultural communication. Burleson (*2010*) conceptualises interpersonal communication as a multidimensional process involving message production, interpretation, relational coordination and social influence. Gudykunst (*2005*), in turn, demonstrates that communicative interaction is shaped by uncertainty, cultural expectations and the interpretative frameworks through which participants perceive one another. These approaches are significant because they show that communication is always mediated by context, expectations and subjective interpretation. However, they do not fully explain how acute or prolonged emotional tension modifies the internal psychological mechanisms underlying communication.

The second line of research is represented by theories of stress and cognitive appraisal, within which the influence of psychological tension on human perception and behaviour is analysed. According to the approach developed by Lazarus and Folkman (*1984*), the subjective appraisal of a situation plays a key role in the response to stress, determining subsequent cognitive, emotional and behavioural reactions. This model is particularly relevant to the analysis of interpersonal communication, since communicative signals are interpreted through the prism of perceived threat, available resources and expected consequences. Under conditions of emotional tension, neutral or ambiguous messages may therefore be appraised as hostile, critical or threatening.

The physiological and neurobiological foundations of stress also provide an important basis for understanding communicative transformation. McEwen (*2007*) shows that stress and adaptation are associated with complex neurobiological processes that affect cognition, emotional reactivity and behavioural regulation. From this perspective, emotional tension may influence communication not only at the level of conscious appraisal, but also through changes in attention, arousal and self-regulatory capacity. Bryant (*2021*) further demonstrates, in the context of post-traumatic stress, that prolonged exposure to stressors may alter threat perception, emotional processing and interpersonal functioning. These findings are relevant for explaining why communication under conditions of emotional stress may become more defensive, reactive and conflict-prone.

The third line of research concerns coping strategies and resource-based approaches to stress. Carver and Connor-Smith (*2010*) show that coping is closely connected with personality characteristics and determines how individuals respond to stressful situations through problem-focused, emotion-focused or avoidance-oriented strategies. In interpersonal communication, these coping patterns may be manifested in attempts to clarify the situation, seek support, withdraw from interaction or react aggressively. Hobfoll's conservation of resources theory also contributes to this field by interpreting stress as a threat to, loss of or insufficient gain in valued resources (*Hobfoll, 1989*). In communicative situations, emotional tension may therefore be intensified when interaction is perceived as demanding, resource-depleting or threatening to social, emotional or personal resources.

The role of social support is also essential for understanding the adaptive potential of interpersonal communication. Taylor (*2011*) emphasises that social support may reduce the negative impact of stress and contribute to psychological well-being. This indicates that

communication under stress is not only a potential source of tension, but also a mechanism of adaptation and recovery. At the same time, when emotional tension distorts perception and reduces communicative accuracy, the supportive function of interaction may be weakened or transformed into conflict. Studies conducted during the COVID-19 pandemic also demonstrate that stress and coping are strongly shaped by uncertainty, social isolation and the availability of interpersonal resources (*Polizzi et al., 2020*), which further confirms the importance of analysing communication in socially unstable conditions.

The fourth line of research is associated with the study of emotional regulation and emotional intelligence as factors influencing the quality of interpersonal communication. Goleman (*1995*) emphasises the importance of recognising, understanding and managing emotions for successful interpersonal interaction. Gross (*2015*) develops this perspective by analysing emotion regulation as a set of processes through which individuals influence the intensity, duration and expression of emotional states. These approaches are particularly important for the study, since emotional tension directly affects the regulation of communicative behaviour. Insufficient emotional regulation may lead to impulsive responses, escalation of conflict and reduced capacity for constructive dialogue, whereas effective regulation may preserve the stability and functionality of interaction.

The fifth line of research is connected with resilience-oriented approaches. Contemporary resilience studies consider resilience not as a fixed trait, but as a dynamic process involving adaptation under adverse conditions. Southwick et al. (*2022*) emphasise the conceptual complexity of resilience and the need to consider biological, psychological, social and contextual factors. Kalisch et al. (*2021*) propose deconstructing resilience in order to identify specific mechanisms that enable individuals to maintain or restore functioning under stress. Chmitorz et al. (*2021*) also underline the importance of population-based resilience research, showing that resilience should be analysed in relation to social context, exposure to stressors and adaptive functioning. These approaches are relevant because they make it possible to interpret stable communication under emotional tension as an outcome of coordinated cognitive, emotional and behavioural regulation.

A comparison of the analysed sources shows that each theoretical direction explains only a particular aspect of interpersonal communication under emotional tension. Communication theories reveal the structural and relational organisation of interaction; stress and appraisal theories explain how situations acquire subjective significance; coping and resource theories clarify behavioural responses to stress; emotion-regulation theories describe the management of affective reactions; and resilience theories make it possible to understand the preservation of functioning under adverse conditions. However, these approaches are often developed separately and do not provide a fully integrated model of how cognitive, emotional and behavioural mechanisms interact within the communicative process.

Thus, the literature review reveals a research gap associated with the insufficient integration of communicative, stress-cognitive, emotion-regulatory and resilience-oriented approaches. Existing studies provide important theoretical foundations, but they do not fully explain how emotional tension transforms interpersonal communication as a systemic psychological process. This circumstance determines the need for the present study, which aims to systematise the

psychological mechanisms of interpersonal communication under conditions of emotional tension and to interpret them as interrelated components of a dynamic communicative system.

Results

1. Cognitive Mechanisms of the Transformation of Interpersonal Communication under Conditions of Emotional Tension

The study established that, under conditions of emotional tension, interpersonal communication undergoes substantial changes at the level of cognitive information processing. It was found that the key mechanism is the transformation of the processes of perception, interpretation and appraisal of the communicative situation. Under increased emotional tension, there is a tendency towards the selective perception of information, whereby attention is focused primarily on negative or potentially threatening aspects of interaction.

It was established that the cognitive interpretation of communicative signals under conditions of tension becomes distorted: neutral or ambiguous statements are interpreted as critical, hostile or evaluative. This leads to the formation of stable cognitive schemas that intensify the subjective perception of conflict and reduce the accuracy of understanding the interlocutor's intentions.

In addition, it was found that under conditions of emotional tension, the capacity for cognitive flexibility decreases, which is manifested in the limitation of alternative interpretations and a tendency to become fixed on the initial appraisal of the situation. This complicates the correction of communicative behaviour and hinders constructive interaction.

The analysis showed that, in this context, cognitive mechanisms perform not only an interpretative function, but also a function of intensifying emotional tension through the repeated processing of negative stimuli, namely rumination, which creates a closed cycle of cognitive-emotional interaction.

Thus, under conditions of emotional tension, cognitive mechanisms form a distorted interpretative model of communication, reducing its adequacy and creating preconditions for the further destabilisation of interpersonal interaction.

2. Emotional Mechanisms of Regulation and Destabilisation of Interpersonal Communication

The results of the study show that emotional mechanisms play a key role in determining the dynamics of interpersonal communication under conditions of tension. It was established that an increase in the level of emotional arousal leads to an intensification of affective responses, which directly affects the content and form of communicative behaviour.

It was found that under conditions of emotional tension, the effectiveness of emotional regulation decreases, which is manifested in difficulties in controlling emotional expression, increased impulsivity and a tendency towards affective responses. This leads to a shift in communication from the rational-cognitive level to the emotional-reactive level, thereby reducing its constructiveness.

It was established that negative emotional states, such as anxiety, irritation and frustration, increase the perceived significance of communicative signals and contribute to their exaggeration. This, in turn, leads to the escalation of communicative tension and the formation of conflictual scenarios of interaction.

In addition, it was found that emotional mechanisms may perform both a destabilising and an adaptive function. In cases where the capacity for emotional regulation is preserved, a reduction in the intensity of negative responses and the maintenance of the relative stability of communication can be observed. Otherwise, interaction becomes disorganised.

Thus, under conditions of tension, emotional mechanisms determine the degree of stability of interpersonal communication, acting either as a factor in its destabilisation or as a condition for preserving its functionality.

3. Behavioural Mechanisms and Communicative Strategies under Conditions of Emotional Tension

The study established that the behavioural level of interpersonal communication under conditions of emotional tension is characterised by changes in interaction strategies and the formation of specific models of communicative behaviour. It was found that these changes are manifested in a transition from constructive forms of interaction to defensive and reactive strategies.

It was determined that, under conditions of tension, the most common strategies are avoidance, aggression and communicative distancing. These forms of behaviour are aimed at reducing subjective tension; however, at the same time, they decrease the effectiveness of interaction and impede the achievement of mutual understanding.

It was established that inconsistency between cognitive interpretations and emotional responses leads to the emergence of contradictory behavioural models, in which external behaviour does not correspond to the internal state. This intensifies communicative distortions and reduces the predictability of interaction.

In addition, it was found that adaptive behavioural strategies based on conscious regulation and an orientation towards constructive interaction are implemented significantly less frequently under conditions of high emotional tension, which indicates a decrease in the overall effectiveness of communicative processes.

A generalisation of the results showed that behavioural mechanisms act as an external manifestation of deeper cognitive and emotional processes, reflecting either their coherence or, conversely, their disintegration.

Thus, under conditions of emotional tension, behavioural mechanisms indicate the degree of disorganisation or adaptiveness of communication, serving as an indicator of the coherence between cognitive and emotional processes.

Discussion

The results obtained are of considerable scholarly relevance in the context of contemporary research on interpersonal communication and the psychology of stress. Under conditions of increasing emotional load and social instability, communication is increasingly considered not only as a process of information exchange, but also as a complex system of psychological interaction subject to internal transformations.

The study conducted shows that the influence of emotional tension on communication is not episodic, but systemic in nature. This makes it possible to expand existing understandings of the nature of communicative disturbances and to regard them not as accidental failures, but as a regular outcome of the functioning of psychological mechanisms under stressful conditions.

The analysis of the results indicates that interpersonal communication under conditions of emotional tension is transformed at all levels of psychological organisation. Cognitive mechanisms distort the perception and interpretation of communicative signals; emotional mechanisms intensify reactivity and reduce control; and behavioural mechanisms implement defensive or maladaptive strategies of interaction.

A key result is the identification of the systemic interrelationship between these mechanisms. Their interaction forms a closed cycle: cognitive distortions intensify emotional tension; emotional responses influence behaviour; and behavioural strategies reinforce the initial interpretations. This makes it possible to consider communication under conditions of tension as a self-sustaining system.

The results obtained make it possible to refine and expand existing theoretical approaches to interpersonal communication and stress. In particular, they develop understandings of cognitive appraisal as a central mechanism in the perception of a communicative situation, showing that its influence is intensified and transformed under the impact of emotional tension.

In addition, the results of the study complement concepts of emotional regulation by demonstrating that emotional processes in communication should be considered not only as internal states of the subject, but also as factors that directly influence the structure of interaction. Thus, the proposed model contributes to the integration of different theoretical directions and to the formation of a more holistic understanding of interpersonal communication.

The practical significance of the study lies in the possibility of applying the results obtained in psychological counselling and communication skills training. Understanding that communicative disturbances are associated with cognitive and emotional mechanisms makes it possible to develop more effective strategies for correcting interpersonal interaction.

The results may also be used in professional fields characterised by a high level of emotional load, such as medicine, education, management and social work. In these contexts, the proposed model may serve as a basis for developing programmes aimed at increasing the stability of communication and reducing the level of conflict.

A comparison of the results obtained with existing studies shows that most scholarly approaches focus on individual aspects of interpersonal communication, whether cognitive, emotional or behavioural. At the same time, the integration of these aspects into a unified model remains insufficiently developed.

In this context, the present study does not refute existing approaches, but complements them by offering a more comprehensive understanding of communicative processes. At the same time, it reveals the problem of the fragmentation of scholarly knowledge, which requires further theoretical and empirical consideration.

The main limitation of the study is its theoretical nature, which does not allow the proposed model to be directly confirmed at the empirical level. The results obtained are interpretative in nature and require further verification using empirical methods.

Additional limitations are associated with the selection of research material and the generalised nature of the analysis. Interpersonal communication may vary substantially depending on the context, which limits the universality of the proposed conclusions and determines the boundaries of their application.

A promising direction for further research is the empirical verification of the identified psychological mechanisms of interpersonal communication under conditions of emotional tension. Of particular interest is the study of their manifestation in different social and professional contexts.

It would also be appropriate to investigate the influence of individual personality characteristics, such as the level of emotional intelligence, stress resistance and communicative competence, on the specific features of the transformation of communication. This would make it possible to refine the proposed model and expand its applied potential.

An additional direction is the development of practice-oriented programmes aimed at developing effective communication skills under conditions of emotional tension, which is of considerable importance for psychological practice and education.

Conclusion

The study conducted made it possible to establish that interpersonal communication under conditions of emotional tension is not merely a more complex form of interaction, but a qualitatively transformed psychological process. The main result is the identification of the systemic nature of the transformation of communication, determined by the interrelated operation of cognitive, emotional and behavioural mechanisms.

It was established that cognitive mechanisms form a distorted interpretation of the communicative situation, emotional mechanisms intensify the strength of responses and reduce the level of their regulation, while behavioural mechanisms consolidate these changes in the form of communicative strategies. Their interaction leads to a decrease in the accuracy of understanding, an increase in tension and a higher probability of communicative failures.

Thus, the key result of the study is the substantiation of the view that interpersonal communication under conditions of emotional tension functions as a dynamic system of interdependent psychological processes, rather than as a linear exchange of information.

The aim of the study, which consisted in identifying, systematising and theoretically substantiating the psychological mechanisms of interpersonal communication under conditions of emotional tension, was achieved. Within the framework of the study, it was possible not only to identify the key mechanisms, but also to demonstrate their interrelationship and functional role in the structure of the communicative process.

The achievement of the aim is confirmed by the fact that the proposed interpretation makes it possible to move from a descriptive level of analysis to an explanatory model that reveals the internal regularities of the transformation of interpersonal interaction.

The research objectives were consistently implemented in the structure of the article. The analysis of theoretical approaches made it possible to identify the existing fragmentation of scholarly views on interpersonal communication and emotional tension. The clarification of the conceptual field ensured the categorical definiteness of the key terms used in the study.

The classification of psychological mechanisms made it possible to structure them according to functional levels and to determine their role in the transformation of communication. The systematisation of communicative strategies and distortions made it possible to identify typical forms of change in interaction under conditions of emotional tension.

The interpretation of interpersonal communication as a systemic process ensured the integration of the results obtained into a unified theoretical model.

Thus, the fulfilment of the research objectives is not only descriptive, but also analytical and synthetic in nature, which confirms the internal logical completeness of the work.

The author's contribution lies in the development of an integrative approach to the analysis of interpersonal communication under conditions of emotional tension, based on the unification of cognitive, emotional and behavioural mechanisms into a single system. Within the framework of the study, a model is proposed that makes it possible to explain not only individual communicative distortions, but also their interrelationship and dynamics.

The author also contributed to the clarification of the conceptual apparatus related to the research problem and to the systematisation of disparate theoretical approaches existing in contemporary psychological science.

The overall contribution of the article consists in the development of a theoretical understanding of interpersonal communication as a psychologically determined process that changes under the influence of emotional tension. In contrast to traditional approaches, the article proposes considering communication not as a static form of interaction, but as a dynamic system in which internal psychological mechanisms determine its structure and effectiveness.

The results obtained expand the interpretative potential of existing theories, create a basis for further research, and may be used in the development of applied models of psychological support and communication skills training. Thus, the article contributes both to the development of scholarly discussion and to the practical application of psychological knowledge.

Conflict of Interests

The author declares the absence of any conflict of interest capable of influencing the objectivity of the study conducted, the interpretation of the results obtained, or the editorial perception of the present work. The study was carried out independently, without external funding and without the involvement of organisations or individuals interested in specific research outcomes.

The author confirms that, in the process of preparing the article, there were no factors of financial interest, institutional dependence, or personal and professional relationships that could have influenced the scholarly position, the choice of research methodology, or the manner in which the results were presented. All conclusions presented in the article are the result of independent theoretical analysis and reflect the author's scholarly interpretation of the research problem under consideration.

Thus, this declaration confirms compliance with the principles of academic integrity, publication transparency and academic ethics, in accordance with the requirements of international editorial practice and the standards of scholarly journals.

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Psychological Mechanisms of Cultural Heritage Attachment and Identity Resilience under Conditions of Heritage Loss and Digital Transformation: A Klironomical Approach [8]

Abstract:
This article is devoted to the theoretical analysis of the psychological mechanisms of cultural heritage attachment and identity resilience under conditions of heritage loss and digital transformation. The relevance of the study is determined by the growing need to understand cultural heritage not only as an object of preservation, restoration or historical representation, but also as a psychological and klironomical resource that supports belonging, symbolic continuity and the stability of individual and collective identity. The scientific novelty of the study lies in the interpretation of cultural heritage attachment as a specific psychological mechanism of identity resilience within the framework of the klironomical approach. The object of the study is the psychological processes of human interaction with cultural heritage under conditions of heritage loss and digital transformation. The subject of the study is the psychological mechanisms of cultural heritage attachment and identity resilience. The study aims to identify, systematise and theoretically substantiate the mechanisms through which attachment to cultural heritage contributes to the preservation and reconstruction of identity resilience. The source base includes scholarly works in the fields of klironomy, cultural heritage studies, cultural memory, identity psychology, place attachment, resilience studies, trauma studies and digital heritage, including the works of the author on klironomy and cultural heritage. The article substantiates that cultural heritage attachment is formed through the interaction of emotional, cognitive, axiological, spatial and symbolic mechanisms. Heritage sites, cultural landscapes, monuments, rituals, artefacts and traditions may function as identity anchors that connect personal experience with collective memory, inherited meanings and cultural values. Such attachment supports symbolic rootedness, belonging and identity continuity, particularly under conditions of social instability, migration, cultural disruption and transformation of the familiar environment. The study also demonstrates that heritage loss may become a factor of identity destabilisation and psychological vulnerability. The destruction, distortion, disappearance or forced inaccessibility of cultural heritage affects not only the material and historical sphere, but also the symbolic structures through which individuals and communities understand themselves. Heritage loss may weaken cultural rootedness, disrupt intergenerational transmission and produce a sense of rupture between the past, present and future. At the same time, under certain conditions, it may activate memory work, cultural mobilisation and processes of identity reconstruction. A further result concerns the ambivalent role of digital heritage. Digital archives, virtual museums, three-dimensional reconstructions, online exhibitions and digital storytelling may support identity resilience by preserving access to cultural memory when physical heritage is damaged, inaccessible or lost. However, digital heritage cannot be regarded as a complete substitute for material and lived heritage. Its psychological value depends on whether it preserves not only visual information, but also cultural meanings, emotional attachment, narrative context and identity-related functions. The author concludes that cultural heritage should be understood as an active psychological resource of identity resilience. Within the klironomical approach, cultural heritage attachment, heritage loss and digital transformation are interpreted as interconnected processes that influence the preservation, disruption and reconstruction of identity continuity.

Keywords: cultural heritage attachment, identity resilience, klironomy, cultural memory, heritage loss, digital heritage, place identity, psychological continuity, symbolic belonging, collective memory, cultural trauma, identity reconstruction.

Introduction

In the context of contemporary social, cultural and technological transformations, the problem of human interaction with cultural heritage acquires particular scholarly significance.

Cultural heritage is no longer perceived only as a set of monuments, artefacts, traditions or historical environments requiring preservation. It increasingly appears as a complex psychological, symbolic and axiological system through which individuals and communities construct identity, maintain cultural continuity and experience belonging to a historical and social space. Under conditions of heritage loss, social instability, forced displacement, military conflicts, urban transformation, climate threats and digitalisation, cultural heritage becomes not only an object of preservation, but also a psychological resource of identity resilience.

The relevance of the present study is determined by the need to understand how cultural heritage participates in the formation and maintenance of psychological continuity. The loss, destruction, distortion or digital replacement of heritage may affect not only the cultural sphere, but also the individual's and community's sense of belonging, stability and symbolic orientation. When heritage sites, cultural practices, historical environments or collective memory structures are damaged or lost, people may experience not only material or historical loss, but also identity destabilisation. In this regard, the psychology of cultural heritage becomes an important interdisciplinary field connecting klironomy, cultural psychology, identity studies, memory studies, trauma studies and digital humanities.

The problem of the study is associated with the insufficient theoretical development of psychological mechanisms through which cultural heritage supports identity resilience under conditions of loss and transformation. Existing research in the field of cultural heritage often focuses on preservation, restoration, museum representation, cultural policy or digital documentation. At the same time, the psychological dimension of cultural heritage remains less systematically conceptualised. In particular, there is a lack of an integrated theoretical model explaining how attachment to cultural heritage is formed, how it supports personal and collective identity, how heritage loss affects psychological stability, and how digital forms of heritage representation may either preserve or transform the experience of cultural continuity.

Within the klironomical approach, cultural heritage may be interpreted not only as a historical and cultural phenomenon, but also as a carrier of psychological meanings. It contains symbolic structures that connect the individual with the past, the community, the territory, collective memory and systems of values. Therefore, cultural heritage attachment can be considered a specific psychological mechanism through which a person experiences continuity, belonging and cultural rootedness. In this sense, heritage performs not only informational, aesthetic or historical functions, but also identity-regulating and adaptive functions.

The digital transformation of cultural heritage adds further complexity to this problem. Digital archives, virtual museums, three-dimensional reconstructions, online exhibitions and artificial intelligence-based tools create new opportunities for preserving and transmitting cultural memory. However, digitalisation also raises questions concerning authenticity, emotional involvement, embodied experience, symbolic presence and the possible substitution of lived heritage by its technological representation. Consequently, it is necessary to analyse not only the technical possibilities of digital heritage, but also its psychological effects on identity, memory and attachment.

The object of the study is the psychological processes of human interaction with cultural heritage under conditions of heritage loss and digital transformation.

The subject of the study is the psychological mechanisms of cultural heritage attachment and identity resilience within the framework of the klironomical approach.

The study aims to identify, systematise and theoretically substantiate the psychological mechanisms through which cultural heritage attachment contributes to preserving and restoring identity resilience under conditions of heritage loss and digital transformation.

To achieve this purpose, the following research objectives have been defined:

- to analyse theoretical approaches to understanding cultural heritage as a psychological and klironomical phenomenon;
- to clarify the concepts of cultural heritage attachment, identity resilience, heritage loss and digital heritage in the context of the study;
- to identify the psychological mechanisms through which cultural heritage supports individual and collective identity;
- to determine the psychological consequences of heritage loss for identity continuity and symbolic stability;
- to analyse the ambivalent role of digital heritage in preserving, reconstructing and transforming cultural attachment;
- to develop a theoretical model of the relationship between cultural heritage attachment, identity resilience, heritage loss and digital transformation.

The theoretical significance of the study lies in the development of a psychological interpretation of cultural heritage within the framework of klironomy. The article expands the conceptual apparatus of cultural heritage studies by introducing cultural heritage attachment and identity resilience as key psychological categories. It also contributes to the interdisciplinary integration of klironomy, psychology of identity, cultural memory studies and digital heritage research. The proposed approach makes it possible to consider cultural heritage not only as an object of preservation, but also as a psychological system that supports continuity, belonging and adaptation under conditions of instability.

The practical significance of the study consists in the possibility of applying its results in cultural heritage preservation, museum education, psychological support, work with displaced communities, post-crisis cultural recovery, digital heritage projects and educational programmes. Understanding the psychological mechanisms of cultural heritage attachment may help specialists design more effective strategies for heritage interpretation, community engagement, cultural rehabilitation and identity support. The results may also be used in developing digital heritage resources that preserve not only visual or documentary information, but also the symbolic, emotional and identity-related meanings of cultural heritage.

Thus, the study addresses the need for a systematic psychological and klironomical understanding of cultural heritage in the conditions of contemporary transformation. By analysing cultural heritage attachment and identity resilience, the article seeks to show that heritage is not only a cultural inheritance from the past, but also an active psychological resource for maintaining identity, restoring continuity and supporting human adaptation in situations of loss, instability and digital change.

Methods

The study has a theoretical and analytical research design and is aimed at identifying, systematising and theoretically substantiating the psychological mechanisms of cultural heritage attachment and identity resilience under conditions of heritage loss and digital transformation. In accordance with the nature of the research problem, the article does not include empirical measurement, experimental procedures or quantitative data collection. Instead, it is based on theoretical analysis, conceptual reconstruction, comparative interpretation and interdisciplinary modelling.

The methodological logic of the study is determined by the need to examine cultural heritage simultaneously as a klironomical, psychological, symbolic and socio-cultural phenomenon. Within this approach, cultural heritage is considered not only as a set of material or intangible objects, but also as a system of meanings that participates in the formation of identity, cultural memory, emotional belonging and psychological continuity. Therefore, the study combines the analytical possibilities of klironomy, cultural psychology, identity studies, memory studies, trauma studies and digital heritage research.

The research material consists of scholarly works devoted to cultural heritage, klironomy, cultural memory, identity, place attachment, psychological resilience, heritage loss and digital heritage. Particular attention is paid to theoretical works that make it possible to interpret cultural heritage as a psychological resource of identity continuity and adaptation. The source base includes Alexander Buychik's works on klironomy and cultural heritage, as well as international studies on heritage theory, cultural memory, identity resilience, collective trauma, attachment to place and digital forms of heritage representation.

The criteria for selecting sources were as follows: relevance to the psychological interpretation of cultural heritage; connection with the concepts of cultural memory, identity, attachment and resilience; significance for the development of klironomical theory; applicability to the analysis of heritage loss and digital transformation; and representativeness for contemporary interdisciplinary research. Sources were selected in order to provide a conceptual basis for analysing both traditional and digital forms of cultural heritage as factors influencing individual and collective identity.

The analytical procedure included several consecutive stages. At the first stage, theoretical approaches to cultural heritage, klironomy, cultural memory and identity were analysed in order to determine the conceptual field of the study. At the second stage, the key categories of the research were clarified, including cultural heritage attachment, identity resilience, heritage loss, psychological continuity and digital heritage. At the third stage, the psychological mechanisms through which cultural heritage supports identity stability and belonging were identified and classified. At the fourth stage, the consequences of heritage loss for individual and collective identity were interpreted. At the fifth stage, the role of digital heritage in preserving, reconstructing and transforming cultural attachment was analysed. At the final stage, the obtained results were integrated into a theoretical model explaining the relationship between cultural heritage attachment, identity resilience, heritage loss and digital transformation.

The methodology of the study includes general scientific methods and specialised interdisciplinary methods. General scientific methods include analysis, synthesis, generalisation, classification and comparison. These methods were used to identify the main conceptual categories, compare different theoretical approaches and systematise the psychological

mechanisms under consideration. Specialised methods include conceptual reconstruction, interpretative analysis, comparative theoretical analysis and model construction. Conceptual reconstruction was used to clarify the meaning of cultural heritage attachment and identity resilience within the klironomical approach. Interpretative analysis made it possible to reveal the psychological significance of heritage as a carrier of memory, belonging and symbolic continuity. Comparative theoretical analysis was applied to correlate klironomical ideas with psychological theories of identity, attachment and resilience. Model construction was used to develop an integrated explanatory framework.

The study proceeds from the assumption that cultural heritage performs several psychological functions. It supports the sense of belonging, strengthens symbolic continuity, provides identity anchoring and may act as a resource of recovery under conditions of loss, displacement or social instability. At the same time, the destruction, distortion or loss of heritage may lead to identity destabilisation, weakening of cultural rootedness and disruption of psychological continuity. Digital heritage is analysed as an ambivalent phenomenon: it may preserve and reconstruct cultural memory, but it may also transform the emotional, embodied and symbolic experience of attachment to heritage.

The validity of the study is ensured by the systematic analysis of the selected theoretical corpus, the logical consistency of the research stages, the correspondence between the aim, methods and conclusions, and the interdisciplinary coherence of the proposed model. The reliability of the study is supported by the transparent description of the analytical procedure, the consistent application of selected methods and the clear differentiation between theoretical interpretation, conceptual reconstruction and model development.

The limitations of the study are associated with its theoretical character. Since the article does not include empirical verification, the proposed model should be regarded as a conceptual framework requiring further testing. Future research may include qualitative interviews, case studies of communities affected by heritage loss, comparative analysis of digital heritage projects, psychological assessment of heritage attachment, and empirical investigation of the relationship between cultural heritage, identity resilience and psychological recovery.

Thus, the chosen methodology corresponds to the aim of the study and makes it possible to analyse cultural heritage attachment as a psychological mechanism of identity resilience. The combination of theoretical analysis, conceptual reconstruction and interdisciplinary modelling provides a basis for interpreting cultural heritage as a psychological and klironomical resource under conditions of heritage loss and digital transformation.

Literature Review

The study of psychological mechanisms of cultural heritage attachment and identity resilience requires an interdisciplinary synthesis of several research traditions: cultural memory studies, psychology of place and attachment, trauma and resilience studies, heritage loss research, digital memory studies and klironomy. The selected literature demonstrates that cultural heritage cannot be adequately understood only as a material, historical or institutional phenomenon. It also functions as a psychological and symbolic structure through which individuals and communities maintain continuity, belonging, identity and adaptive stability under conditions of social disruption and cultural transformation.

A fundamental theoretical basis for understanding the relationship between heritage and identity is provided by cultural memory studies. Halbwachs (*1950*) established the idea that memory is not merely an individual psychological process, but is structured by social frameworks. From this perspective, the individual's relationship with the past is mediated by collective representations, shared narratives, spatial contexts and social groups. This idea is essential for the present study because cultural heritage may be interpreted as one of the material and symbolic forms through which collective memory becomes psychologically available to the individual. Heritage sites, monuments, rituals, texts, artefacts and landscapes operate as external supports of memory, enabling individuals to locate themselves within a broader cultural and historical continuum.

Assmann (*1992*) further develops this theoretical line by distinguishing cultural memory as a structured system of symbolic forms, texts, images, rituals and institutions through which societies preserve and transmit meanings across generations. This approach makes it possible to understand cultural heritage as a mechanism of long-term cultural continuity. In psychological terms, such continuity supports the individual's sense of temporal stability and belonging. The destruction, loss or distortion of heritage therefore threatens not only cultural knowledge, but also the symbolic frameworks that sustain identity. In this sense, cultural heritage attachment may be considered a psychological mechanism that connects personal identity with collective memory and historical continuity.

The problem of heritage loss is especially significant in the context of violence, war, displacement and social instability. Bevan (*2016*) shows that the destruction of architecture and cultural memory in wartime is not an accidental consequence of conflict, but may become a deliberate attack on identity, continuity and the symbolic foundations of communities. This position is important for the present study because it demonstrates that heritage loss has psychological consequences extending beyond the physical destruction of objects. When cultural heritage is destroyed, communities may lose visible anchors of identity, historical orientation and collective self-recognition. Thus, heritage loss should be analysed not only within the framework of conservation or cultural policy, but also as a factor of identity destabilisation and psychological vulnerability.

A related civic and ethical perspective is developed by Settis (*2002*), who analyses the threats posed to cultural heritage by neglect, commodification and the weakening of public responsibility. His approach is significant because it shows that heritage is not only a cultural asset, but also a field of social obligation. From the psychological viewpoint, this implies that attachment to heritage is linked to responsibility, participation and the perception of cultural continuity as a shared value. When heritage is treated only as a commodity, tourist resource or administrative object, its psychological and identity-forming functions may be weakened. Therefore, the preservation of heritage involves not only technical conservation, but also the maintenance of the symbolic and emotional relationship between communities and their cultural environment.

The social use of heritage is also emphasised by García Canclini (*1999*), who demonstrates that cultural heritage functions within systems of social practice, power relations, public interpretation and collective participation. This approach is relevant because it prevents the reduction of heritage to a static collection of inherited objects. Heritage becomes meaningful

only when it is socially interpreted, used, transmitted and included in contemporary cultural life. In the context of the present study, this means that cultural heritage attachment is not merely a passive emotional connection with the past; it is formed through practices of recognition, participation, interpretation and social belonging.

The psychological dimension of attachment is developed in environmental psychology and place attachment studies. Low and Altman (*1992*) conceptualise place attachment as an affective, cognitive and behavioural bond between people and meaningful places. This concept is directly applicable to cultural heritage, since many heritage objects and environments function as places of identity, memory and emotional rootedness. Place attachment makes cultural heritage psychologically significant: it transforms physical or symbolic environments into spaces of belonging. When such places are damaged, lost or radically transformed, individuals may experience not only spatial disorientation, but also disruption of identity continuity.

The concept of place identity developed by Proshansky et al. (*1983*) further clarifies this mechanism. Place identity refers to the way in which the physical world becomes incorporated into the self through memories, meanings, values and expectations. Cultural heritage may therefore be understood as a specific form of place identity, especially when heritage objects, landscapes or urban environments are connected with personal and collective narratives. This perspective is crucial for the present study because it explains how cultural heritage becomes psychologically internalised. Heritage attachment is not external admiration for cultural objects; it may become part of the structure of self-understanding. Consequently, heritage loss may affect identity at a deep psychological level.

The relationship between loss, trauma and resilience provides another important theoretical line. Bonanno (*2004*) demonstrates that resilience after loss and trauma is not an exceptional phenomenon, but a relatively common capacity to maintain or restore functioning after adverse events. This approach is important for interpreting identity resilience in the context of heritage loss. If cultural heritage supports continuity, belonging and symbolic stability, then attachment to heritage may become one of the resources that helps individuals and communities maintain identity under conditions of disruption. At the same time, the destruction or loss of heritage may challenge resilience by weakening symbolic anchors of continuity. Therefore, identity resilience should be analysed as a process that depends not only on individual psychological resources, but also on cultural and symbolic supports.

The selected works on klironomy provide a specific conceptual framework for integrating these psychological and cultural dimensions. The author (*Buychik, 2019*) substantiates klironomy as a science of preserving historical and cultural heritage. This position is relevant because it broadens the understanding of heritage preservation beyond technical restoration or museum representation. Within the klironomical approach, cultural heritage is interpreted as a complex system requiring scientific, methodological and philosophical comprehension. This creates a basis for analysing heritage as a phenomenon that includes not only material forms, but also meanings, values, memory and continuity.

Authors's concept of klironomical thinking further expands this framework. The author (*Buychik, 2021*) considers klironomical thinking in relation to the system of social outlook, which makes it possible to interpret heritage not only as an object of study, but also as a factor shaping worldview and cultural consciousness. For the study, this is especially important because

heritage attachment and identity resilience are closely connected with how individuals and communities think about cultural continuity, inherited values and their place within historical time. Klironomical thinking may therefore be understood as a cognitive and axiological mechanism that supports the perception of heritage as a living system of meanings rather than a passive remnant of the past.

In later works, the author (*Buychik, 2024*) systematises klironomy as the science of cultural heritage, while the author (*Buychik, 2025*) interprets cultural heritage as a self-organising system. This theoretical development is significant for the present study because it allows cultural heritage to be analysed as a dynamic phenomenon capable of transformation, adaptation and reproduction of meaning. If heritage is understood as a self-organising system, then psychological attachment to it may also be interpreted dynamically. Attachment is formed, maintained, weakened or reconstructed depending on social conditions, cultural practices, memory structures and modes of representation. This perspective is especially relevant under conditions of heritage loss and digital transformation, where cultural continuity must often be reconstructed rather than simply preserved.

Digital transformation introduces a new dimension into the psychology of cultural heritage. Haux et al. (*2021*) raise the question of cultural memory in the digital age, showing that digital environments transform the ways in which memory is stored, accessed, interpreted and transmitted. This is directly relevant to the present study because digital heritage may function ambivalently. On the one hand, digital archives, virtual museums, three-dimensional reconstructions and online platforms can help preserve endangered or destroyed heritage and maintain access to cultural memory. On the other hand, digitalisation may change the emotional, embodied and spatial experience of heritage attachment. Digital representations may support identity continuity, but they may also produce distance from the material, local and lived dimensions of heritage.

The comparative analysis of the selected literature shows that each research tradition explains an important aspect of the problem, but none of them alone provides a complete model of the psychological mechanisms of cultural heritage attachment and identity resilience. Cultural memory studies explain how societies preserve meanings across generations (*Halbwachs, 1950*; *Assmann, 1992*). Place attachment and place identity studies clarify how environments become psychologically incorporated into the self (*Low & Altman, 1992*; *Proshansky et al., 1983*). Trauma and resilience studies explain how individuals and communities may maintain or restore functioning after loss (*Bonanno, 2004*). Heritage loss studies reveal the destructive impact of attacks on memory, architecture and cultural continuity (*Bevan, 2016*; *Settis, 2002*). Social approaches to heritage show that heritage gains meaning through use, interpretation and participation (*García Canclini, 1999*). Digital memory studies demonstrate the transformation of cultural memory under technological conditions (*Haux et al., 2021*). Klironomy provides a conceptual framework for understanding cultural heritage as a complex system of preservation, continuity and transformation (*Buychik, 2019*; *Buychik, 2021*; *Buychik, 2024*; *Buychik, 2025*).

At the same time, the literature reveals a clear research gap. Existing studies provide substantial theoretical foundations for analysing memory, place attachment, heritage destruction, resilience and digital transformation. However, the psychological mechanisms through which cultural heritage attachment supports identity resilience under conditions of

heritage loss and digital transformation remain insufficiently integrated into a unified theoretical model. In many studies, heritage is analysed primarily as a cultural, historical, spatial or institutional phenomenon, while its role as a psychological resource of identity continuity is not fully systematised. Conversely, psychological studies of attachment and resilience do not always account for the specific symbolic and klironomical functions of cultural heritage.

This gap determines the need for the study. A klironomical approach makes it possible to integrate cultural, psychological and digital dimensions of heritage into a single explanatory framework. Within this framework, cultural heritage attachment may be understood as a psychological mechanism that connects the individual with collective memory, symbolic continuity, place identity and cultural belonging. Identity resilience, in turn, may be interpreted as the capacity to preserve or reconstruct a stable sense of self and community under conditions of heritage loss, displacement, cultural disruption or digital mediation.

Thus, the reviewed literature confirms the relevance of developing a theoretical model that explains cultural heritage not only as an object of preservation, but also as an active psychological resource of identity resilience.

Results

1. Cultural Heritage Attachment as a Psychological Mechanism of Belonging and Identity Continuity

The theoretical analysis made it possible to establish that cultural heritage attachment functions as one of the key psychological mechanisms through which individuals and communities maintain a sense of belonging, continuity and symbolic rootedness. Within the framework of the present study, cultural heritage attachment is interpreted not simply as an emotional appreciation of monuments, traditions or historical objects, but as a complex psychological bond connecting the individual with collective memory, cultural space, inherited meanings and social identity.

This attachment is formed through the interaction of several psychological processes: emotional identification with cultural symbols, cognitive interpretation of heritage meanings, incorporation of heritage into personal and collective narratives, and the experience of continuity between past, present and future. In this sense, cultural heritage operates as an identity anchor. It provides individuals and groups with stable symbolic references that help answer fundamental identity-related questions: who we are, where we come from, what we belong to, and which cultural meanings should be preserved and transmitted.

The concept of collective memory is essential for understanding this mechanism. Halbwachs (*1950*) showed that memory is structured by social frameworks and cannot be reduced to an individual mental process. Assmann (*1992*) further developed this idea by interpreting cultural memory as a system of symbolic forms, texts, rituals, images and institutions through which societies preserve meanings across generations. From this perspective, cultural heritage may be understood as an externalised form of cultural memory that becomes psychologically significant when it is internalised by individuals and communities. A monument, historical building, sacred place, traditional ritual or cultural landscape is not only an object of observation; it may become part of the psychological structure of identity.

The results of the study show that cultural heritage attachment is closely connected with place attachment and place identity. Low and Altman (*1992*) conceptualise place attachment as

an affective, cognitive and behavioural bond between people and meaningful places. Proshansky et al. (*1983*) define place identity as the incorporation of the physical environment into the structure of the self. These approaches make it possible to explain why cultural heritage has deep psychological significance. Heritage sites and cultural environments are not merely spatial locations; they become emotionally and symbolically charged places through which individuals experience stability, rootedness and continuity.

In this context, cultural heritage attachment can be divided into several interrelated psychological dimensions. The first is the emotional dimension, which includes affection, pride, nostalgia, grief, admiration and a sense of belonging associated with heritage. The second is the cognitive dimension, which includes knowledge, interpretation and understanding of the historical and cultural meaning of heritage. The third is the axiological dimension, which reflects the recognition of heritage as valuable and worthy of preservation. The fourth is the identity dimension, through which heritage becomes connected with personal, local, national, ethnic, religious or civilisational self-understanding. The fifth is the behavioural dimension, which is expressed in participation in preservation, commemoration, cultural practices, museum visits, local initiatives or digital forms of heritage transmission.

The analysis also shows that cultural heritage attachment performs a stabilising psychological function. It supports the continuity of identity by linking individual experience with collective narratives and historical time. When a person recognises a place, tradition or cultural object as part of "one's own" heritage, this object becomes a symbolic mediator between the self and the broader cultural world. In this sense, heritage creates a psychological bridge between individual biography and collective history.

This mechanism is particularly important under conditions of social instability, migration, urban transformation or cultural disruption. In unstable contexts, identity may become more vulnerable because familiar social, spatial and symbolic structures are weakened. Cultural heritage can compensate for this instability by providing continuity, orientation and a sense of belonging. It allows individuals and communities to preserve a connection with cultural origins even when the surrounding social environment changes.

Within the klironomical approach, this function of heritage may be interpreted as one of the essential dimensions of cultural preservation. The author (*Buychik, 2019*) substantiates klironomy as a science of preserving historical and cultural heritage, while the author (*Buychik, 2021*) connects klironomical thinking with the system of social outlook. These works make it possible to consider heritage not only as an object of conservation, but also as a psychological and worldview-forming system. Cultural heritage attachment, therefore, may be understood as a psychological expression of klironomical continuity: the individual's internal connection with inherited cultural meanings.

The study established that cultural heritage attachment contributes to identity resilience in several ways. First, it strengthens symbolic stability by preserving meaningful links with the past. Secondly, it supports belonging by connecting the individual with a community, territory or cultural tradition. Thirdly, it provides a framework for interpreting collective experience, including crises, losses and transformations. Fourthly, it creates a value-based foundation for preserving cultural continuity. Fifthly, it may become a resource for psychological recovery when other forms of stability are disrupted.

Thus, the first result of the study is the substantiation of cultural heritage attachment as a psychological mechanism of belonging and identity continuity. Heritage attachment transforms cultural heritage from an external object into an internalised psychological resource. It supports identity by connecting memory, place, value and belonging into a coherent symbolic system.

2. Heritage Loss as a Factor of Identity Destabilisation and Psychological Vulnerability

The second major result of the study is the identification of heritage loss as a factor that may lead to identity destabilisation and psychological vulnerability. Heritage loss should not be understood only as the physical destruction of monuments, artefacts or historical environments. It also includes the loss of access to cultural places, the interruption of cultural practices, the distortion of collective memory, the weakening of intergenerational transmission and the digital or ideological substitution of cultural meanings.

The psychological significance of heritage loss is determined by the fact that cultural heritage performs identity-regulating functions. If heritage provides symbolic stability, belonging and continuity, then its loss may disrupt the structures through which individuals and communities understand themselves. This disruption may manifest as cultural disorientation, weakening of rootedness, loss of symbolic security, emotional grief, collective anxiety and a diminished sense of historical continuity.

Bevan (*2016*) demonstrates that the destruction of architecture and cultural memory in situations of war may function as an attack on identity itself. This is especially important for the present study because it shows that heritage destruction is not only a cultural or architectural problem. It may be a psychological and symbolic form of violence. When heritage is destroyed, communities lose not only material objects, but also visible supports of memory, belonging and collective self-recognition.

The loss of heritage may affect identity on several levels. At the individual level, it may weaken personal connections with meaningful places, family history, local memory or cultural traditions. At the community level, it may disrupt shared narratives, rituals and symbols. At the intergenerational level, it may interrupt the transmission of cultural knowledge and emotional attachment. At the social level, it may reduce cohesion and weaken the sense of common belonging. At the existential level, it may produce a feeling that the continuity between past and future has been broken.

From the perspective of place identity, the destruction or loss of heritage environments may be experienced as a disruption of the self. Proshansky et al. (*1983*) argue that the physical environment is incorporated into self-identity. Therefore, when meaningful environments are damaged or lost, the individual may experience not only external spatial change, but also internal identity disturbance. This is particularly relevant for communities affected by war, forced migration, urban demolition or cultural displacement. A person may physically survive the loss of a place, yet experience the disappearance of part of the symbolic world that supported identity.

The study identified several forms of heritage loss. The first form is physical loss, which includes the destruction, damage or disappearance of monuments, buildings, landscapes, artefacts and cultural environments. The second form is spatial loss, which occurs when individuals or communities are separated from their heritage due to migration, exile,

displacement or restricted access. The third form is symbolic loss, which involves the distortion, reinterpretation or ideological appropriation of cultural meanings. The fourth form is functional loss, when heritage objects remain physically preserved but lose their social, ritual, educational or identity-related function. The fifth form is transmissive loss, which appears when cultural memory is no longer effectively transmitted between generations.

Each of these forms has different psychological consequences. Physical loss produces grief and a sense of irreversible damage. Spatial loss produces longing, nostalgia and detachment from one's cultural environment. Symbolic loss may generate anger, alienation and conflict over meaning. Functional loss may lead to indifference and weakening of attachment. Transmissive loss may result in the gradual erosion of cultural identity and collective memory.

The analysis also shows that heritage loss may activate mechanisms similar to those observed in trauma and bereavement. Bonanno (*2004*) demonstrates that resilience after loss is possible, but it does not eliminate the psychological significance of the loss itself. Applied to cultural heritage, this means that communities may adapt after heritage destruction, but the process requires symbolic reconstruction, narrative integration and the restoration of meaning. Without these processes, heritage loss may remain a source of unresolved cultural grief and identity instability.

In klironomical terms, heritage loss represents a disruption of cultural continuity. The author (*Buychik, 2024*) interprets klironomy as the science of cultural heritage, while the author (*Buychik, 2025*) considers cultural heritage as a self-organising system. If heritage is understood as a self-organising system, then its loss affects not only isolated objects, but also the internal connections between memory, value, identity and transmission. The destruction of one element may weaken the functioning of the entire cultural system. Therefore, the psychological consequences of heritage loss should be analysed systemically.

The results of the study also show that heritage loss may produce identity vulnerability when there are no compensatory mechanisms of memory preservation or cultural reconstruction. Such compensatory mechanisms may include oral history, museum interpretation, commemorative practices, community rituals, digital archives, educational programmes and revitalisation projects. These mechanisms do not fully replace lost heritage, but they may help restore psychological continuity and support identity resilience.

At the same time, heritage loss may become a trigger for identity mobilisation. In some cases, the destruction or threat of loss strengthens community attachment, increases cultural awareness and activates preservation initiatives. Settis (*2002*) emphasises the importance of public responsibility for cultural heritage, while García Canclini (*1999*) shows that heritage gains meaning through social use and participation. This indicates that heritage loss may produce both vulnerability and mobilisation. The psychological outcome depends on whether a community is able to transform loss into collective action, memory work and cultural reconstruction.

Thus, the second result of the study is the theoretical substantiation of heritage loss as a factor of identity destabilisation and psychological vulnerability. Heritage loss disrupts symbolic continuity, weakens belonging and may damage the cultural foundations of identity. However, under certain conditions, it may also stimulate processes of resilience, mobilisation and reconstruction.

3. Digital Heritage and Klironomical Reconstruction of Identity Resilience

The third major result of the study concerns the ambivalent role of digital heritage in the preservation and transformation of cultural heritage attachment. Digital heritage includes digital archives, virtual museums, online exhibitions, three-dimensional reconstructions, digitised collections, multimedia platforms, digital storytelling and artificial intelligence-supported forms of cultural representation. These tools can preserve access to cultural memory when material heritage is damaged, inaccessible or lost. At the same time, they transform the psychological experience of heritage by changing the relationship between memory, place, embodiment, authenticity and emotional involvement.

The analysis shows that digital heritage may support identity resilience by maintaining symbolic continuity in situations of rupture. When a heritage site is destroyed, occupied, inaccessible or physically distant, digital representation may allow individuals and communities to preserve visual, narrative and symbolic contact with it. In this sense, digital heritage can act as a compensatory mechanism. It does not fully replace the lost object or lived cultural environment, but it may help prevent the complete disappearance of memory and meaning.

Haux et al. (*2021*) raise the question of cultural memory in the digital age and demonstrate that digital environments transform the storage, access and transmission of memory. This position is important for the present study because it shows that digital heritage is not merely a technical instrument. It changes the psychological conditions under which cultural memory is experienced. Digital access may expand participation and visibility, but it may also alter the depth, emotional quality and spatial groundedness of heritage attachment.

The study established that digital heritage performs several psychological functions. First, it preserves memory traces by documenting heritage objects, places and practices. Secondly, it provides access to heritage for displaced communities, diasporas and people who cannot physically visit heritage sites. Thirdly, it supports symbolic reconstruction after loss by allowing destroyed or endangered heritage to be represented and interpreted. Fourthly, it enables educational transmission by making heritage available to new generations. Fifthly, it may strengthen identity resilience by preserving links with cultural origins under conditions of mobility, migration or social instability.

However, the psychological effect of digital heritage is ambivalent. Digital representation can preserve information, but it does not automatically preserve attachment. A digital image of a monument, a virtual tour or a reconstructed model may provide knowledge, but it may not fully reproduce the embodied, spatial and emotional experience of being in a heritage environment. Place attachment is formed through sensory experience, repeated interaction, social practices, memory and physical presence (*Low & Altman, 1992*). Therefore, digital heritage may support attachment, but it may also produce a more mediated and less embodied relationship with cultural heritage.

This ambivalence is particularly important in relation to authenticity. Digital reconstruction may help restore a destroyed or inaccessible object in visual form, but it also raises the question of what exactly is being preserved: the object, its image, its historical information, its symbolic meaning, or the emotional relationship to it. If digital heritage focuses only on visual reproduction, it may reduce heritage to an image. If it includes historical narratives, cultural

meanings, community memories and interpretative contexts, it may support deeper psychological continuity.

Within the klironomical approach, digital heritage should therefore be understood not as a substitute for cultural heritage, but as a tool of cultural and psychological mediation. Its task is not simply to reproduce the external form of heritage, but to preserve and transmit meanings, values, memory structures and identity-related functions. Author's interpretation of cultural heritage as a complex and self-organising system (*Buychik, 2025*) supports this conclusion. If heritage is a system of meanings, then digitalisation must preserve not only visual data, but also the internal semantic and axiological structure of heritage.

The study identified several conditions under which digital heritage can strengthen identity resilience. The first condition is contextualisation. Digital representation should include historical, cultural and social explanations that allow users to understand the meaning of heritage. The second condition is emotional engagement. Digital projects should create opportunities for personal and collective connection, not only passive viewing. The third condition is community participation. Heritage communities should be involved in digital documentation and interpretation, since attachment is sustained through participation and recognition. The fourth condition is narrative continuity. Digital heritage should connect past, present and future, helping users integrate heritage into identity narratives. The fifth condition is ethical responsibility. Digital reconstruction should avoid distortion, simplification or commercialisation of traumatic or endangered heritage.

The results also show that digital heritage may become especially important for displaced communities. In situations of migration or forced separation from cultural places, digital access to heritage may support identity continuity and reduce the feeling of cultural disconnection. Virtual museums, online archives and digital memory platforms may allow displaced individuals to maintain symbolic contact with places, traditions and collective narratives. However, this support is effective only when digital heritage preserves meaningful links with community memory rather than presenting heritage as a neutral visual resource.

Digital heritage also plays a role in intergenerational transmission. Younger generations may encounter cultural heritage primarily through digital platforms. This creates both opportunities and risks. On the one hand, digital tools may increase access and engagement. On the other hand, they may produce a fragmented, superficial or decontextualised perception of heritage. Therefore, digital heritage should be integrated with educational and klironomical interpretation in order to form not only awareness, but also attachment, responsibility and identity continuity.

The study established that identity resilience in the digital age depends on the ability to connect digital memory with lived cultural meaning. Digital heritage strengthens resilience when it supports continuity rather than replaces it, when it deepens interpretation rather than simplifies it, and when it connects individuals and communities with cultural meanings rather than merely displaying heritage objects. In this sense, digital heritage becomes a tool of klironomical reconstruction: it helps restore psychological continuity after loss, but only if it is embedded in a broader system of preservation, interpretation and cultural transmission.

Thus, the third result of the study is the substantiation of digital heritage as an ambivalent but potentially significant mechanism of identity resilience. Digital heritage can preserve access to cultural memory, support displaced or affected communities, assist in symbolic

reconstruction and contribute to intergenerational transmission. At the same time, it cannot be regarded as a full replacement for material and lived heritage. Its psychological value depends on its ability to preserve cultural meanings, emotional attachment and identity-related functions.

Overall, the results of the study demonstrate that cultural heritage attachment, heritage loss and digital heritage should be analysed as interconnected psychological and klironomical phenomena. Cultural heritage attachment supports belonging and identity continuity. Heritage loss disrupts symbolic stability and may increase psychological vulnerability. Digital heritage can contribute to the reconstruction of identity resilience, provided that it preserves not only information, but also meaning, value and cultural continuity. These findings make it possible to interpret cultural heritage as an active psychological resource that supports individual and collective identity under conditions of loss, instability and digital transformation.

Discussion

The results of the study demonstrate that cultural heritage attachment should be interpreted as a significant psychological mechanism through which individuals and communities maintain identity continuity, symbolic belonging and resilience under conditions of heritage loss and digital transformation. This conclusion expands the traditional understanding of cultural heritage by shifting the analytical focus from the preservation of objects, monuments and historical environments to the psychological functions that heritage performs in the structure of personal and collective identity. Within this perspective, cultural heritage is not only a cultural, historical or institutional phenomenon, but also a psychological resource that supports orientation in historical time, emotional rootedness and the continuity of self-understanding.

The first important finding concerns the role of cultural heritage attachment as a mechanism of belonging. The analysis showed that cultural heritage becomes psychologically significant when it is internalised as part of the individual's or community's symbolic world. Heritage objects, places, rituals, narratives and cultural landscapes do not function merely as external signs of the past; they become identity anchors that connect personal experience with collective memory. This result is consistent with the concept of collective memory developed by Halbwachs (*1950*), according to which memory is socially structured and mediated by collective frameworks. It also corresponds to Assmann's theory of cultural memory, in which symbolic forms, texts, rituals and institutions preserve cultural meanings across generations (*Assmann, 1992*). The present study develops these approaches by showing that cultural memory is not only transmitted through heritage, but is also psychologically experienced through attachment, belonging and identity continuity.

The findings are also closely related to environmental psychology and place attachment theory. Low and Altman (*1992*) conceptualise place attachment as an affective, cognitive and behavioural bond between individuals and meaningful places, while Proshansky et al. (*1983*) demonstrate that place identity becomes part of the structure of the self. The results of the present study confirm that cultural heritage attachment may be considered a specific form of place and memory attachment. However, the klironomical approach makes it possible to go beyond the spatial interpretation of attachment. Cultural heritage attachment is not limited to attachment to place; it also includes attachment to symbols, traditions, inherited meanings, collective narratives and cultural values. Thus, heritage attachment should be considered a

broader psychological mechanism that integrates spatial, emotional, cognitive, axiological and historical dimensions.

The second important finding concerns the psychological consequences of heritage loss. The study showed that heritage loss may act as a factor of identity destabilisation and psychological vulnerability. This result is particularly significant because heritage loss is often analysed primarily in the context of cultural policy, restoration, conservation or international protection. The present study demonstrates that the loss of heritage also has psychological consequences, since it disrupts symbolic continuity, weakens cultural rootedness and affects the frameworks through which individuals and communities understand themselves. Heritage loss may therefore be interpreted not only as a cultural loss, but also as a disturbance of identity continuity.

This interpretation is supported by Bevan's analysis of the destruction of memory and architecture in wartime. Bevan (*2016*) shows that the destruction of cultural heritage may function as a deliberate attack on identity and collective memory. The present study develops this position by emphasising the psychological mechanisms through which such destruction affects identity resilience. When cultural heritage is destroyed or becomes inaccessible, individuals and communities may lose not only physical objects, but also symbolic supports of belonging, memory and historical orientation. In this sense, heritage loss becomes a form of cultural and psychological rupture.

At the same time, the results show that heritage loss does not always lead only to vulnerability. Under certain conditions, it may also activate processes of mobilisation, memory work and identity reconstruction. This is consistent with Bonanno's concept of resilience after loss and trauma, according to which resilience is not an exceptional response, but a relatively common capacity to maintain or restore functioning after adverse events (*Bonanno, 2004*). Applied to cultural heritage, this means that communities may respond to heritage loss not only through grief and disorientation, but also through commemorative practices, preservation initiatives, digital reconstruction, cultural activism and renewed attachment. However, such resilience requires symbolic reconstruction and the restoration of meaning. Without these processes, heritage loss may remain a source of unresolved cultural grief and identity instability.

The third important finding concerns the ambivalent role of digital heritage. The study established that digital heritage may contribute to identity resilience by preserving access to cultural memory, especially when physical heritage is destroyed, inaccessible or threatened. Digital archives, virtual museums, three-dimensional reconstructions, online exhibitions and digital storytelling can help maintain symbolic continuity and support displaced or affected communities. This finding corresponds to research on cultural memory in the digital age, which shows that digital environments transform the ways in which memory is stored, accessed and transmitted (*Haux et al., 2021*).

However, the study also shows that digital heritage cannot be regarded as a simple substitute for material or lived heritage. Digital representation may preserve visual information and provide access to cultural content, but it may also alter the embodied, spatial and emotional dimensions of heritage attachment. Place attachment is formed through presence, sensory experience, repeated interaction and social practice (*Low & Altman, 1992*). Therefore, digital heritage may support identity resilience only when it preserves not merely the external image of

heritage, but also its cultural meanings, symbolic value, narrative context and connection with community memory.

This conclusion is especially important for contemporary digital heritage projects. The increasing use of digital documentation, virtual reconstruction and artificial intelligence-based tools creates new opportunities for preservation, but also raises methodological and ethical questions. If digitalisation is reduced to visual reproduction, it may transform heritage into a decontextualised image. If, however, digital heritage includes cultural interpretation, community participation, historical explanation and emotional engagement, it may become an effective instrument of klironomical reconstruction. In this sense, digital heritage should be understood not as the replacement of cultural heritage, but as a mediated form of preserving and transmitting cultural continuity.

The klironomical approach provides an integrative framework for interpreting these findings. The author (*2019*) substantiates klironomy as a science of preserving historical and cultural heritage, while he (*2021*) connects klironomical thinking with the system of social outlook. Later works develop the understanding of cultural heritage as a complex and self-organising system (*Buychik, 2024*; *Buychik 2025*). The results of the present study expand this theoretical line by introducing a psychological dimension into the klironomical interpretation of heritage. Cultural heritage is considered not only as an object of preservation, but also as a system of psychological meanings that supports belonging, memory, identity continuity and resilience.

The theoretical contribution of the study lies in developing a model that connects cultural heritage attachment, heritage loss, digital heritage and identity resilience. Existing research traditions explain separate aspects of this problem. Cultural memory studies explain the social organisation of memory (*Halbwachs, 1950*; *Assmann, 1992*). Place attachment studies clarify the psychological bond between individuals and meaningful environments (*Low & Altman, 1992*; *Proshansky et al., 1983*). Trauma and resilience research explains the possibility of adaptation after loss (*Bonanno, 2004*). Heritage loss studies reveal the cultural and symbolic consequences of destruction (*Bevan, 2016*; *Settis, 2002*). Digital memory studies show how digital environments transform memory transmission (*Haux et al., 2021*). The klironomical approach integrates these perspectives and makes it possible to interpret cultural heritage as a psychological resource of identity resilience.

The proposed interpretation also has practical significance. First, it may be applied in cultural heritage preservation and museum practice. If cultural heritage attachment supports identity resilience, then heritage interpretation should focus not only on historical information, but also on emotional involvement, memory, belonging and community participation. Museums, heritage institutions and cultural centres may use this approach to design programmes that strengthen the psychological connection between audiences and heritage.

Secondly, the results may be useful in work with displaced communities, migrants and groups affected by war, forced relocation or heritage destruction. In such contexts, cultural heritage may serve as a resource for restoring identity continuity. Digital archives, community memory projects, oral history initiatives and virtual exhibitions may support people who have lost direct access to heritage places. However, these initiatives should be designed with sensitivity to trauma, loss and cultural meaning, rather than as neutral information platforms.

Thirdly, the findings are relevant for digital heritage projects. The study suggests that digital heritage should be evaluated not only according to technical quality, accessibility or visual accuracy, but also according to its capacity to preserve symbolic meaning, support attachment and maintain cultural continuity. Digital reconstruction should include historical context, narrative depth, community voices and ethical reflection. This is particularly important when digital technologies are used to represent destroyed, endangered or traumatic heritage.

Fourthly, the results may be used in educational programmes in cultural heritage, psychology, museum studies, digital humanities and klironomy. Understanding the psychological mechanisms of heritage attachment and identity resilience can help future specialists develop more responsible approaches to preservation, interpretation and digital representation. Such education should prepare specialists to work not only with objects and data, but also with memory, identity, grief, belonging and cultural recovery.

Despite its theoretical and practical significance, the study has several limitations. The first limitation is its theoretical character. The proposed model is based on conceptual analysis and interdisciplinary interpretation, but it has not yet been empirically tested. Therefore, the conclusions should be regarded as a theoretical framework that requires further verification through qualitative and quantitative research.

The second limitation concerns the scope of the analysed sources. The study integrates works from cultural memory studies, environmental psychology, resilience studies, heritage loss research, digital memory studies and klironomy. However, a broader review of empirical studies on community heritage, migration, post-conflict recovery and digital heritage reception could further refine the proposed model. Future research should include more diverse cultural, geographical and social contexts.

The third limitation is associated with the complexity of the concept of cultural heritage attachment. Attachment to heritage may vary depending on individual experience, cultural background, generation, religious identity, migration history, political context and type of heritage. Therefore, the proposed model should not be interpreted as universal in a rigid sense. It requires contextual adaptation and empirical clarification.

The fourth limitation concerns the ambivalence of digital heritage. The study identifies digital heritage as a potential mechanism of identity resilience, but the psychological effects of digital representation may differ significantly depending on the form of digital mediation, the level of user engagement, the authenticity of interpretation and the participation of heritage communities. Further research is needed to determine when digital heritage strengthens attachment and when it produces distancing, simplification or symbolic substitution.

Future research should therefore focus on empirical verification of the proposed theoretical model. One promising direction is qualitative research involving interviews with individuals and communities affected by heritage loss, displacement or cultural disruption. Such studies could reveal how people describe their attachment to heritage, how they experience its loss and how they use memory practices or digital resources to reconstruct identity continuity.

Another direction is comparative research on different types of heritage. It would be useful to examine whether attachment mechanisms differ in relation to architectural heritage, sacred heritage, intangible traditions, family memory, urban spaces, museum collections and digital

reconstructions. Such comparison would help clarify the structure of cultural heritage attachment and identify its specific psychological forms.

A further direction is the empirical study of digital heritage reception. Researchers may analyse how users emotionally and cognitively respond to virtual museums, digital archives, three-dimensional reconstructions and online memory platforms. This would make it possible to determine whether digital heritage supports identity resilience, under what conditions it becomes psychologically meaningful, and what design principles strengthen heritage attachment.

Finally, future research should further develop the psychological dimension of klironomy. The present study suggests that klironomy can be expanded by analysing heritage as a psychological resource of identity resilience. Further theoretical work may clarify such concepts as klironomical attachment, symbolic continuity, heritage grief, digital reconstruction of memory and klironomical resilience.

In summary, the discussion confirms that cultural heritage attachment, heritage loss and digital transformation should be considered interconnected psychological and klironomical phenomena. Cultural heritage supports identity by providing symbolic continuity, belonging and memory. Heritage loss may destabilise identity by disrupting these structures. Digital heritage may contribute to resilience when it preserves not only information, but also meaning, emotional attachment and cultural continuity. The proposed approach therefore expands the understanding of cultural heritage from an object of preservation to an active psychological system that participates in the maintenance and reconstruction of identity under conditions of loss, instability and digital change.

Conclusion

The study conducted made it possible to establish that cultural heritage attachment is a significant psychological mechanism through which individuals and communities maintain identity continuity, symbolic belonging and resilience under conditions of heritage loss and digital transformation. Cultural heritage should therefore be interpreted not only as an object of preservation, restoration or historical representation, but also as a psychological and klironomical resource that supports the stability of personal and collective identity.

The aim of the study, which consisted in identifying, systematising and theoretically substantiating the psychological mechanisms through which cultural heritage attachment contributes to identity resilience under conditions of heritage loss and digital transformation, was achieved. The analysis made it possible to show that attachment to cultural heritage is formed through the interaction of emotional, cognitive, axiological, spatial and symbolic mechanisms. These mechanisms connect the individual with collective memory, historical continuity, cultural values and meaningful places.

The research objectives were consistently fulfilled. Theoretical approaches to cultural heritage, cultural memory, place attachment, identity resilience, heritage loss and digital heritage were analysed. The key concepts of the study were clarified within the klironomical framework. The psychological mechanisms through which cultural heritage supports individual and collective identity were identified. The consequences of heritage loss for identity continuity and symbolic stability were interpreted. The ambivalent role of digital heritage in preserving and

transforming cultural attachment was also analysed. On this basis, a theoretical model of the relationship between cultural heritage attachment, identity resilience, heritage loss and digital transformation was developed.

The main result of the study is the substantiation of cultural heritage attachment as a psychological mechanism of belonging and identity continuity. It was shown that cultural heritage may function as an identity anchor, linking personal experience with collective memory and inherited cultural meanings. Heritage sites, cultural landscapes, monuments, rituals, artefacts and traditions become psychologically significant when they are internalised as part of individual and collective self-understanding. In this sense, cultural heritage attachment supports symbolic rootedness and helps individuals and communities preserve a sense of continuity in changing social and cultural conditions.

The study also demonstrated that heritage loss may become a factor of identity destabilisation and psychological vulnerability. The destruction, disappearance, distortion or forced inaccessibility of cultural heritage affects not only the material or historical sphere, but also the symbolic structures through which people understand themselves and their belonging to a community. Heritage loss may weaken cultural rootedness, disrupt intergenerational transmission and produce a sense of rupture between the past, present and future. At the same time, under certain conditions, heritage loss may activate processes of memory work, cultural mobilisation and identity reconstruction.

A further result concerns the role of digital heritage. Digital archives, virtual museums, three-dimensional reconstructions, online exhibitions and digital storytelling may support identity resilience by preserving access to cultural memory when physical heritage is damaged, inaccessible or lost. However, the study showed that digital heritage cannot be regarded as a complete substitute for material and lived heritage. Its psychological value depends on whether it preserves not only visual information, but also cultural meanings, emotional attachment, narrative context and identity-related functions. Within the klironomical approach, digital heritage should be interpreted as a tool of mediated cultural continuity rather than as a replacement for heritage itself.

The theoretical contribution of the article lies in the development of a psychological interpretation of cultural heritage within the framework of klironomy. The study expands the conceptual apparatus of cultural heritage research by introducing cultural heritage attachment, identity resilience, heritage loss and digital reconstruction of continuity as interconnected categories. It also demonstrates that klironomy can be developed not only as a science of cultural heritage preservation, but also as an interdisciplinary framework for analysing the psychological functions of heritage.

The practical significance of the results consists in their possible application in cultural heritage preservation, museum education, digital heritage projects, work with displaced communities, post-crisis cultural recovery and psychological support. Understanding the mechanisms of cultural heritage attachment may help specialists design more effective strategies of heritage interpretation, community engagement, cultural rehabilitation and identity support. The results may also be used in the development of digital heritage resources that preserve symbolic and emotional meanings rather than merely documentary or visual information.

At the same time, the study has several limitations. Its results are theoretical and require further empirical verification. The proposed model should be tested through qualitative interviews, case studies, comparative research and analysis of digital heritage reception. Further studies may examine how different communities experience heritage loss, how digital heritage affects emotional attachment, and how cultural heritage contributes to identity resilience in various social, cultural and historical contexts.

In conclusion, the article demonstrates that cultural heritage is not only a legacy of the past, but also an active psychological resource for maintaining and reconstructing identity. Cultural heritage attachment supports belonging and continuity; heritage loss may destabilise identity and increase vulnerability; and digital heritage may contribute to resilience when it preserves meaning, memory and symbolic connection. The klironomical approach makes it possible to integrate these dimensions into a unified theoretical model and to interpret cultural heritage as a dynamic system of cultural, psychological and identity-related continuity.

Conflict of Interests

The author declares that there is no conflict of interests that could have influenced the objectivity of the study, the interpretation of the results or the presentation of the conclusions. The article was prepared independently, without external funding, institutional pressure or the involvement of organisations or individuals with a direct financial, personal or professional interest in the outcomes of the research.

The study is theoretical in nature and is based on the analysis of scholarly literature in the fields of klironomy, cultural heritage studies, cultural memory, identity psychology, place attachment, resilience studies and digital heritage. The inclusion of the author's previous works on klironomy and cultural heritage in the theoretical corpus is openly stated and is determined by the research aim and conceptual framework of the article.

The author confirms that the use of these works did not affect the independence of the analysis and does not constitute a financial, institutional or personal conflict of interests. All conclusions presented in the article are the result of independent theoretical interpretation, conceptual systematisation and interdisciplinary analysis.

Thus, the present declaration confirms compliance with the principles of academic integrity, publication transparency and ethical standards of scholarly research.

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