BRAIN. Broad Research in Artificial Intelligence and Neuroscience
e-ISSN: 2067-3957 | p-ISSN: 2068-0473
Covered in: Web of Science (ESCI); EBSCO; JERIH PLUS (hkdir.no); IndexCopernicus; Google Scholar; SHERPA/RoMEO; ArticleReach Direct; WorldCat; CrossRef; Peeref; Bridge of Knowledge (mostwiedzy.pl); abcdindex.com; Editage; Ingenta Connect Publication; OALib; scite.ai; Scholar9; Scientific and Technical Information Portal; FID Move; ADVANCED SCIENCES INDEX (European Science Evaluation Center, neredataltics.org); ivySCI; exaly.com; Journal Selector Tool (letpub.com); Citefactor.org; fatcat!; ZDB catalogue; Catalogue SUDOC (abes.fr); OpenAlex; Wikidata; The ISSN Portal; Socolar; KVK-Volltitel (kit.edu)
2025, Volume 16, Special Issue 1 (April 2025), pages: 16-26.
Special Issue 1: *Neuroscience, Artificial Intelligence, and Innovation in Education*
Submitted: January 25th, 2025 | *Accepted for publication:* March 5th, 2025

Examining an Interdisciplinary Interaction of Educational Components as a Prerequisite for Developing Professional Competences in Art Students: Neuroeducational Factors

Tetiana Rastruba
PhD in Pedagogy, Docent, Associate Professor of the Department of Vocal and Choral Skills of the Nizhyn Mykola Gogol State University, Nizhyn, Ukraine.
rastruba_1510@ukr.net
https://orcid.org/0000-0003-2232-1190

Larysa Huseinova
Candidate of Pedagogical Sciences (PhD.), Docent, Associate Professor of the Department of Instrumental and Performing Training Nizhyn Mykola Gogol State University, Nizhyn, Ukraine.
larisa.guseynova@gmail.com
https://orcid.org/0000-0001-8734-1518

Olena Koval
Candidate of Pedagogical Sciences (Ph.D.), Docent, Associate Professor of the Department of Music Pedagogy and Choreography, Nizhyn Mykola Gogol State University, Nizhyn, Ukraine.
koval.olenav@gmail.com
https://orcid.org/0000-0001-9207-4469

Oleksii Pavlenko
Candidate of Pedagogical Sciences (PhD.), Docent, Associate Professor of the Department of Instrumental and Performing Training Nizhyn Mykola Gogol State University, Nizhyn, Ukraine.
pavlenkoaleksei1@gmail.com
https://orcid.org/0000-0001-5164-6504

Tetiana Liashenko
Candidate of Art History, Docent, Associate Professor of the Department of Instrumental and Performing Training Nizhyn Mykola Gogol State University, Nizhyn, Ukraine.
ltv.140268@gmail.com
https://orcid.org/0000-0003-3841-5415

Abstract: *The article deals with the problem of cross-disciplinary links among components in the educational process and education informatisation. Emphasis is placed on using IT to resolve various social and educational problems. It encompasses developing cultural skills and open-mindedness in students so that they can navigate today's multicultural world. In turn, ICTs play a powerful role in enhancing the quality of education and promoting creativity and, thus, strengthening intellectuality and humanism worldwide. Even though teaching strategies involving computer technologies are effective tools, it is still important to study the mechanisms of integrating IT in the development of cultural competence in art students. While computer didactics is one effective method, the full potential of IT in shaping students' cultural competences and tolerance within art education is not fully revealed today. Therefore, the article emphasises the importance of ICT in developing educational competencies and highlights how the interaction of educational components fosters professional growth in art students. It underscores the role of neuropedagogical factors in this process and delves into the neurological foundations of creativity and cultural competence. Finally, it examines the role of AI in assessing creativity and enabling adaptive learning for art students.*

Keywords: *education informatisation; IT; neuropedagogy; art education; multimedia technologies; artificial intelligence; neurological principles for developing creativity.*

How to cite: Rastruba, T., Huseinova, L., Koval, O., Pavlenko, O., Liashenko, T., & Dvornyk, Y. (2025). Examining an interdisciplinary interaction of educational components as a prerequisite for developing professional competences in art students: Neuroeducational factors. *BRAIN. Broad Research in Artificial Intelligence and Neuroscience*, *16*(Sup1), 16-26. https://doi.org/10.70594/brain/16.S1/2

Yurii Dvornyk
Candidate of Pedagogical Sciences (PhD), Docent, Associate Professor of the Department of Instrumental and Performing Training Nizhyn Mykola Gogol State University, Nizhyn, Ukraine.
dvornik_uriy@ukr.net
https://orcid.org/0000-0002-7497-0515

©2025 Published by EduSoft Publishing. This is an open-access article under the CC BY-NC-ND license

1. Introduction

Humanity has transcended the boundaries of the familiar environment into a fundamentally new dimension and a new space of life. In this new sphere, the vital role is currently attributed to the Internet, leading to expanded connections, altered world perceptions, as well as the fusion of real and virtual spaces.

Penetrative information, particularly of an artistic and educational kind, can have a strong effect on the mind and how one thinks, altering values, abilities, and the social space of existence and functioning. This can create a multi-layered system of relationships and form the natural-cultural environment, referred to as the "information civilisation."

From another perspective, one can witness civilisation transforming into an information society, within a rapidly shifting world, with a dissolution of intergenerational and cultural boundaries. Some researchers associate this transition with significant changes of a staged nature. The most crucial consequence and, simultaneously, an indicator of this transition is the fundamentally new possibilities, positions, and abilities of individuals who find themselves in a qualitatively new information world today.

Arystova (2017) claims that modernising art education requires informatisation, which is the process of furnishing the educational world with requisite theoretical and practical data. Education informatisation is seen as a process of using information technologies (IT) to accomplish social, psychological, and pedagogical goals of education. Nowadays, it is customary to contemplate the value aspects of human perspectives, the truth of the imaginative aspect of human action that enables personal growth, and the "self-creation" of participants engaged in this activity, founded on the true conditions of a swiftly evolving world (Oleksiuk et al., 2019).

After all, the integration of science and art education can and should create and offer meanings, images, and ideals essential to humanity, individual nations, and every individual. Understanding the significance of the humanities knowledge sphere has long been inherent to humankind.

Waluga (2012) therefore highlights the importance of maximising the use of IT for developing cultural competences and tolerance among art students. This acts as a way to involve students in the values of world and national cultures and teach them to recognise the country's historical background and current realities, all while being a novel method of conveying the finest regional and national customs to the current society, impacting the development of the spiritual domain both for individuals and for the overall society.

Dietrich (2007) examines the neurological processes underlying creativity, highlighting the critical role of the prefrontal cortex in creative thinking. Runco and Jaeger (2012) offer foundational insights into creativity, which can inform the development of AI models for assessing creative abilities.

Today's realities necessitate the extensive application of IT in educational settings. Given the changes that have taken place, the transformation of the educational process in terms of its organisational foundations is unavoidable, taking into account the current educational paradigm and the roles of the teacher and the student in the "teacher-IT-student" system. There is a rise in individual and group independent work, with practical and extra-curricular activities expanding. Students avoid simply accepting pre-existing facts, laws, and rulings and instead take an active role in seeking answers to problem-based assignments. At the same time, information technologies are not responsible for carrying out the educational process but serve as a tool for its realisation.

Thus, this article aims to: 1) emphasise the importance of using ICT in developing educational competences among art students, 2) demonstrate how educational components interact in fostering professional competences among art students and shed light on neuro pedagogical factors within this interaction, 3) identify the neurological principles of developing creativity and cultural competence, and 4) examine the role of AI in assessing creativity and enabling adaptive learning for art students.

2. Investigating Educational Components of Art Education

The educational components of professional training for art students encompass diverse aspects that contribute to their professional and creative development. Below are the main components of such training (Andrushchenko & Bondar, 2010):

- *Technical proficiency*: Art students learn the practical elements of the field. This can include developing expertise in working with a range of materials, tools, technologies, and methods to express their thoughts without limitation.
- *Theoretical knowledge*: Art students study art history and theory, cultural studies, and other theoretical aspects of art, aiding their understanding of the context and current trends in the field.
- *Creativity and experimentation*: Art students can develop their creativity and capacity for experimentation with new ideas and approaches to art. Additionally, they are encouraged to create their works, participate in exhibitions, and engage in other projects.
- *Critical thinking*: Art students learn to analyse and critically evaluate artworks, both of their peers and renowned artists, developing the ability to express their thoughts and ideas coherently.
- *Communication skills*: Art students learn to express their ideas and concepts eloquently in verbal and visual forms. This skill is vital for presenting their creations and interacting with audiences and other artists.
- *Self-discipline*: Important educational components involve the ability for self-discipline, as the creative process often demands considerable time and effort.
- *Collaboration skills*: Many art projects require collaboration and teamwork. Art students need to be able to collaborate with other artists, designers, directors, and other professionals.
- *Artistic identity enhancement*: Art students need to cultivate their unique artistic identity and style, setting them apart from other artists.

These components foster a deep and diverse development among art students, preparing them for careers in the art and cultural sphere.

3. Using ICT to Shape Educational Competences in Art Students

Information technologies are an indispensable part of education. In industrially developed nations, education is highly regarded for its use of ICT such as computers, the Internet, instructional programs, as well as various multimedia tools (Oleksiuk, Rebrova & Mikulinska, 2019).

Applying ICT to develop educational competences in art students can significantly improve the quality of education and nourish creative skills. Some methods aid in integrating ICT in teaching art courses. Current learning platforms, such as Moodle, Blackboard, or Google Classroom, enable the uploading of lectures, videos, interactive exercises, and assignments. They facilitate convenient communication between teachers and students and encourage self-paced learning. Art students can use video and multimedia materials to study art, music, dance, theatre, and other creative areas. This includes watching exhibitions, listening to music, and creating video tutorials.

The Internet hosts numerous online courses and workshops that can assist students in developing their creative skills. They can learn new techniques and methods, learn from renowned artists, and engage with colleagues from around the world (Sacher, 2013).

Specialised programs for graphic design, audio and video processing, and other tools assist students in creating their art projects, editing videos, and processing photos and audio recordings.

The use of virtual reality (VR) and augmented reality (AR) can serve as powerful tools for art education. They enable the generation of immersive interactive environments where students can experiment with perception and art creation. Creating electronic portfolios allows students to document their achievements and creative works, which they can showcase to prospective employers or universities.

Crucially, ICT enables students to communicate and collaborate with both their peers and teachers, regardless of the distance between them.

Finally, the use of ICT in art education helps expand students' opportunities by providing access to diverse resources and tools. However, it is crucial to ensure that these technologies are integrated into the educational process in a way that supports achieving fundamental learning objectives and fosters both creativity and innovation.

4. Studying an Interaction of Educational Components as a Prerequisite for Shaping Professional Competences in Art Students

Today, it is crucial to help students achieve expected learning outcomes, especially in the context of art education. The concept of art creation is indeed intricate and somewhat abstract, yet it allows using some innovative technologies to work with different materials (e.g., for editing). Besides, these technologies help students diversify their professional achievements and present them to potential employers in the most effective way. Insights on the Links among Educational Components to Develop Professional Skills in Art Students. Given the accepted application of the competency-based approach, it is imperative to ensure fruitful cooperation between such components as knowledge, abilities, and skills. All curricula should aim to enable this cooperation. As noted by Uchyla-Zroski (2013), the most crucial elements include:

- *Theoretical training*: Students acquire theoretical knowledge about the history, theory, and concepts in art, forming the basis for understanding artistic activities and their context.
- *Practical training*: Engaging in practical sessions and workshops enables students to develop the skills necessary for working in the art field.
- *Creativity and experimentation*: Students should be able to express their creativity and capacity for experimentation with various artistic techniques and materials, fostering their creative thinking and innovation.
- *An interdisciplinary approach*: The interaction with other subjects such as history, psychology, cultural studies, and design contributes to a deeper understanding of art and its place in society.
- *Critical thinking and analysis*: Developing skills for critical analysis and evaluation of artistic works promotes the intellectual competence of students.
- *Collaboration and communication*: Artistic activities often require collaboration with other artists and performers. Consequently, developing communication and collaboration skills is an essential component in shaping professional competences.

The interaction of these components creates a conducive environment for shaping professional competences in art students. Balancing theoretical training with practical skills, fostering creativity and innovation, as well as developing analytical and critical thinking, helps students unlock their potential in the art and prepares them for successful careers in this field.

Information technologies, when applied with technical means, are used to create new information aimed at developing intellectual and cultural values for humanity. Several studies have highlighted five directions in which the economy develops through IT − improving living standards through *scientific discoveries, educational advancement, inventions, innovation, and technological development*.

Despite the vast possibilities presented by IT, the goal of implementing these technologies in education is not solely about their use in teaching. It is fundamentally about enhancing the quality of education through their integration and proliferation (Chernyavsky, 2014).

The emergence of computers as a new element in the educational system has significantly altered its functions, offering the opportunity to achieve a new educational impact. Findings from psycho-pedagogical research on computer integration in education emphasise the essential teaching conditions for using computers in education, laying the conceptual groundwork, applying information technologies, and examining the potential of computers in cultivating creative attributes for both students and teachers.

According to Shulgina and Ryabinko (2017), informational technologies act as a process that helps one generate novel methods in teaching and learning, as well as effective technical tools. Information technologies can be integrated into teaching and corresponding training in their context-related application. It must be noted that information education requires teachers to carefully consider their teaching organization, including changes to training content and methods of delivery. In turn, it prepares an open landscape of thought for students and helps them develop a wide range of abilities and skills, not only in terms of their future profession (Nerubasska, Palshkov & Maksymchuk, 2020).

Importantly, the application of IT, including multimedia, demands an understanding of the didactic specifics related to the educational material. The software and hardware elements form a continuous unity, where the former serves as an educational and medical tool. Computer programs or presentation materials can range from open to closed (in various degrees in between), therefore interacting with teaching methods and work formats. Computers and the Internet serve as essential didactic and pedagogical supplements among the broader spectrum of media tools. However, their use, from an educational and methodological perspective, is not an independent method but can be integrated into all possible educational and extracurricular models.

As noted by Kosinska (2017), the use of multimedia tools aims to purposefully engage students in the learning process, improve their academic success, and make complex educational content more accessible. Working with computers and the Internet expands the spectrum of educational and extracurricular activities. Moreover, it erases conventional boundaries between personal qualifications, percentage-based activities, and homework. To illustrate, during individual at-home preparation using the Internet, exchanges of thoughts, mutual explanations, and collective discussions are possible among participants in a particular course or group of students, as well as involving others (external participants) from around the world. Also, webinars can be organised over the Internet, allowing students to participate in the presentation process remotely and ask questions.

Thus, virtual exchanges play a key role in fostering cultural competence. For example, the European educational platform *eTwinning* connects schools from various countries, allowing them to collaborate on shared projects (European Commission, 2024). Through these interactions, students gain valuable insights into different cultures, enhancing their cultural awareness and intercultural communication skills. Research indicates that participants in such programs develop a stronger understanding of cultural diversity and greater tolerance.

Digital tools such as Canva and Adobe Spark encourage creativity in students through creative projects, where they design infographics, videos, and multimedia presentations for final projects. This fosters the development of creative thinking and multimedia skills.

Meanwhile, in secondary school projects, students use Google Docs and Google Meet to collaborate on assignments. They work in teams, some of which include members from different cities or even countries. At the same time, using Google Workspace for collaboration improved communication skills and teamwork effectiveness by 30% (Ali, 2021).

As part of the “Global Classroom” initiative, sixth-grade students collaborated in international teams using Zoom and Padlet to address environmental issues. They exchanged ideas, conducted joint research, and presented solutions at an international virtual summit. Furthermore, 85% of participants reported an improved ability to work in multicultural teams. The initiative helped students develop digital competences and collaboration skills, and teachers observed increased motivation among students to engage in such projects (UNICEF Canada, 2024).

These case studies not only demonstrate the tangible impact of ICT on learning but also emphasise the importance of integrating these tools to enhance cultural competence, creativity, and collaboration in today’s educational environment.

This provides participants with significant freedom in organising and coordinating their educational processes. Competence in Internet usage is demonstrated through systematic interaction with a vast amount of information (information management) and in building trust in social aspects

during network communication (e.g., social interactions in chatrooms and emotional states in email contacts) (Kosinska, 2017).

Thus, employing virtual enterprises and remote access as a means of simulating productive activities adequately nurtures significant personal and professional qualities. Specifically, it fosters tolerance as a factor for one's resilience against adverse external influences. By organising independent work for university students via webinars, a more qualitative comprehension of theoretical training can be achieved, facilitating student consultations, hearing the perspectives of other course members, and developing cultural and professional competences. For teachers, webinars enable scientific, pedagogical, and methodological support for students' independent work.

One must emphasise the advantages of using new media tools for education. It promotes independence in the educational process, straying from inflexible spatial and temporal limits, taking advantage of visual aids through multimedia, and affording the possibility of modelling.

Still, the potential of IT is not fully used for the effective development of cultural competences and tolerance among art students. Acquiring experience through harmonious engagement in a multicultural setting is essential for fostering these competences and promoting tolerance, which is pivotal for personal and professional growth. Also, it is crucial to establish an educational setting that assimilates diverse methodologies, positioning students as central participants. This transition shifts them from merely subordinate objects to proactive contributors in an environment where social experiences, creativity, emotional connections, dialogue, the exchange and absorption of information, and cultural values evolve. This facilitates adept personal adjustment, particularly in professional engagements within a multicultural environment.

5. Employing IT to Develop Cultural Competences and Tolerance in Art Education

In light of the above, this article proposes the following IT complex to develop cultural competences and tolerance among art students. This complex consists of the following stages:

- *Employing educational monitoring programs, testing systems, and educational information complexes.*
- *Incorporating various pedagogical tasks:* For instance, in the context of art history, students can be assigned to research the Contribution of Ethnoculture to World Culture Development and create a website route for a virtual tour (Lotsman, 2015).
- *Using computer-based educational systems that simulate production activities or learners' lives in general*: A variety of software products are widely employed and accepted around the world, including Adobe Photoshop, CorelDraw, AutoCAD, Autodesk, and others, which have become integral and traditional tools for artists and designers. These are one-of-a-kind virtual centres of learning where students can take a "trial run" of their creative skills for upcoming professional activities. IT simulation of production activities should include not only tackling production assignments but also the conditioning of behaviours in a variety of situations and one's social environment.
- *Creating an accessible informational and educational atmosphere for students* (e.g., educational websites) that contains changeable (updatable) informational and educational resources that are essential for cultivating cultural competences and tolerance in art students. This atmosphere permits virtual conferences, virtual visits, and further.

6. Neuropedagogical Factors in an Interaction of Educational Components as a Prerequisite for Shaping Professional Competences in Art Students

The neuroeducational factors in an interaction of educational components can play a significant role in shaping professional competences in art students.

Neuropedagogy is an educational field that studies how the brain functions during learning and how to optimise the learning process following students' neurological characteristics. Below

are some neuroeducational factors that can be beneficial for this particular process (Merezhko, Petrykova, & Leontiieva, 2017):

- *Active learning*: Using active teaching strategies, such as discussions, group projects, hands-on activities, demonstrations, and creative challenges, can stimulate the active brain engagement of students and facilitate material retention.
- *Connection with real experiences*: Art students should be able to interact with real artists, visit art exhibitions, and participate in cultural events to enrich their artistic experiences and establish a link between theory and practice.
- *Differentiated learning*: Considering diverse individual learning styles and the pace of information absorption, it is important to provide students with the opportunity to choose their learning methods and the level of task complexity.
- *Attention focus*: Using methods to ensure student attention concentration, such as mental breaks, various visualisation tools, and sound effects, is crucial.
- *Positive emotional background*: Creating a positive and motivating atmosphere in the learning process promotes the activation of higher brain functions and facilitates the retention of new material.
- *Memory enhancement*: Implementing methods to enhance information retention, such as rehearsal, associations, and other techniques, helps students effectively store and recreate educational material.
- *Continuous feedback*: Providing students with feedback and assessments regarding their learning progress is essential for self-regulation and improvement of learning outcomes (Oleksiuk, Rebrova & Mikulinska, 2019).

By incorporating these neuropedagogical principles, the quality of art education can be increased, and students' professional competences in this field can be improved.

7. Neurological Principles of Developing Creativity and Cultural Competence in Art Students

Creativity and cultural competence are essential for the professional development of art students. Examining these aspects through neuroscience provides a deeper understanding of the mechanisms that underpin creative thinking and intercultural engagement. Neuroscientific research opens new possibilities for optimising educational practices in the arts by focusing on the brain functions that foster these skills.

Creativity is defined as the ability to generate new and original ideas or solutions to problems. Its development is linked to the activity of several key brain structures and systems. The Default Mode Network (DMN), which is activated during rest or reflective thinking, plays a vital role in imagination, self-reflection, and idea generation. For art students, this network supports the creative process, which often occurs during moments of relaxation.

The Central Executive Network (CEN) is responsible for evaluating and analysing ideas. In creative work, it helps students assess the appropriateness of specific concepts or techniques. The successful development of creativity depends on the dynamic interaction between the DMN and CEN. Runco and Jaeger (2012) claim that students who have refined abilities in the fields of art or music demonstrate enhanced coordination among these networks. It allows them to actualize their ideas effectively. Dopaminergic systems within the brain urge one to look for innovative methods and techniques, as well as experiment with them. Given that cultural skills imply one's fruitful and friendly communication with the representatives of other cultures, it is important to highlight the role of amygdala. As noted by Hanna (2015), it is a special structure of the brain that deals with emotions and identifies cultural cues (e.g., gestures or expressions). Special attention should be given to the prefrontal cortex since it stimulates the flexibility of thought and helps one adjust to different cultural standards.

Zatorre and Salimpoor (2013) argue that mirror neurons cultivate empathy, which is an important detail of cultural skills. Therefore, it is recommended that curricula rely on neurological research to improve professional training of future specialists in art. This involves exercises that cultivate creativity through an interactive mode by stimulating the DMN and the CEN. At the same time, multimedia can showcase examples of cultural diversity and, thus, improve students' cultural skills through the engagement of mirror neurons and the amygdala.

Besides, Zatorre and Salimpoor (2013) believe that it is necessary to nurture students' creativity and cultural mindset using a comprehensive approach. This approach considers one's traits, as well as social peculiarities. Unfortunately, its application may be limited due to the considerable costs linked to today's tools that follow neurological patterns.

Understanding the neurological foundations of creativity and cultural competence in art students enables the integration of current scientific advances into traditional teaching methods. This understanding helps create conditions that foster students' creative potential and their ability to engage in intercultural interactions, which is increasingly vital in today's globalised world.

8. AI Tools for Assessing Creativity and Adaptive Learning in Art Education

The integration of artificial intelligence (AI) into education provides new opportunities to enhance the learning experience of art students. With adaptive algorithms and assessment tools, AI facilitates personalised learning that promotes creativity and deepens knowledge.

AI allows for flexible creativity assessments tailored to individual student needs and abilities. Platforms that analyse creative projects use neural networks to evaluate art, music, or design work based on key criteria such as originality, flexibility, and skill level. To illustrate, Google's DeepDream system analyses artworks to identify the creator's style and unique approach, providing teachers with detailed progress reports (Runco & Jaeger, 2012).

Adaptive learning tools such as Coursera and Edmentum employ AI to design personalised learning pathways. In the arts, these tools analyse students' past work and suggest tasks to enhance specific skills. Artbreeder, an interactive platform, lets students experiment with visual effects by adjusting style and form parameters, fostering creativity. Adobe Sensei evaluates graphic designs, assessing their composition, colour harmony, and how well they meet the given task. This allows students to refine their work based on automatic suggestions.

Programs such as AIVA (Artificial Intelligence Virtual Artist) help students compose music using AI algorithms that analyse classical music. Teachers can then assess the originality of compositions through automated reports.

In the same way that Duolingo supports language learning, there are equivalents in the arts. For instance, Picasso, an e-learning system, aids students in refining their painting techniques through step-by-step recommendations based on their work analysis (McCormack, Gifford, & Hutchings, 2019).

While AI tools offer significant benefits, there are also challenges. The development and integration of AI platforms require substantial financial investment, and using these technologies demands retraining for teachers. Moreover, AI systems may struggle to accurately assess unique creative approaches that do not fit predefined algorithms (Zatorre & Salimpoor, 2013).

Despite these challenges, AI tools hold immense potential to enhance art education by fostering creativity and supporting adaptive learning. They help personalise the learning process, provide objective evaluations of creative skills, and assist teachers. However, for these benefits to be fully realised, challenges related to cost, technical limitations, and teacher training must be addressed. Integrating AI into art education should be part of a broader strategy to modernise the field and prepare students to be competitive professionals.

9. Conclusion

This article is pivotal in highlighting the significance of using ICT to develop educational competences in art students. Educational components for students in this field can encompass diverse aspects that contribute to their professional and creative development. They are as follows: technical proficiency, theoretical knowledge, creativity, capacity for experimentation, critical thinking, communication skills, self-discipline, collaboration skills, and artistic identity improvement. These components foster profound and multifaceted growth among art students, helping them to prepare for careers in art and culture.

Importantly, the article proves the interaction of educational components as a prerequisite for developing professional competences in art students. It also stresses the neuropedagogical factors of this interaction, proving that the employment of active teaching strategies such as discussions, group projects, hands-on activities, demonstrations, and creative challenges can increase students' brain activity and encourage a better understanding of the subject matter. Additionally, art students must engage with real artists, visit art exhibitions, and participate in cultural events to enrich their artistic experiences and bridge the gap between theory and practice. Providing students with feedback and assessments regarding their educational progress is vital as it contributes to self-regulation and enhances learning outcomes. Implementing these neuropedagogical principles in the training of art students can enhance the quality of their education and contribute to the development of professional competences in this field.

Acknowledgement

Tetiana Rastruba described the significance of employing ICT to foster educational competences in art students. Larysa Huseinova demonstrated how educational components interact as a foundation for cultivating professional competences among art students. Olena Koval and Oleksii Pavlenko outlined the neuropedagogical factors involved in this interaction. Tetiana Liashenko investigated the interdisciplinary interaction of educational components as a prerequisite for nurturing professional competences in art students. Yurii Dvornyk outlined the neurological principles of developing creativity and cultural competence in art students, as well as examined the role of AI in evaluating creativity and adaptive learning in this field.

References

Ali, A. (2021). Using Google docs to enhance students' collaborative translation and engagement. *Journal of Information Technology Education, 20*, 503–528. https://doi.org/10.28945/4888

Andrushchenko, V. P., & Bondar, V. I. (2010). Modernizatsiia modeli pedahohichnoi osvity vidpovidno do vyklykiv XXI stolittia [Modernization of the model of pedagogical education according to the challenges of the 21st century]. *Pedahohichnyi dyskurs* [Pedagogical Discourse], *7*, 13−17. http://nbuv.gov.ua/UJRN/peddysk_2010_7_4

Arystova, L. S. (2017). Suchasni pidkhody do vykladannia muzychnoho mystetstva v umovakh yevrointehratsiinoho protsesu [Current approaches to teaching musical art in the context of eurointegration processes]. *Naukovi zapysky Tsentralnoukrainskoho derzhavnoho pedahohichnoho universytetu imeni Volodymyra Vynnychenka. Seriia: Pedahohichni nauky* [Academic Notes of Volodymyr Vynnychenko Central Ukrainian State Pedagogical University. Series: Pedagogical Sciences], *157*, 37−42. http://nbuv.gov.ua/UJRN/Nz_p_2017_157_9

Chernyavsky, B. (2014). Sutnist ta osoblyvosti vykorystannia kompiuternykh tekhnolohii navchannia u khudozhnii osviti [Essence and features using of computer technology in learning artistic education]. *Molod i rynok* [Youth & Market], *12*, 126−130. http://nbuv.gov.ua/UJRN/Mir_2014_12_30

Dietrich, A. (2007). Who's afraid of a cognitive neuroscience of creativity? *Methods, 42*(1), 22–27. https://doi.org/10.1016/j.ymeth.2006.12.009

European Commission. (2024). *About eTwinning*. Retrieved from: https://school-education.ec.europa.eu/en/etwinning/about

Hanna, J. L. (2015). *Dancing to learn: The brain's cognition, emotion, and movement*. Rowman & Littlefield Publishers. Retrieved from: https://www.amazon.com/Dancing-Learn-Cognition-Emotion-Movement/dp/1475806051

Kosinska, N. L. (2017). Formuvannia stsenichnoho obrazu maibutnikh uchyteliv muzychnoho mystetstva u protsesi vokalno-vykonavskoi pidhotovky [Constructing a stage image of future music art teachers through vocal and performance coaching]. *Naukovi zapysky Tsentralnoukrainskoho derzhavnoho pedahohichnoho universytetu imeni Volodymyra Vynnychenka. Seriia: Pedahohichni nauky* [Academic Notes of Volodymyr Vynnychenko Central Ukrainian State Pedagogical University. Series: Pedagogical Sciences], *155*, 134−138. http://nbuv.gov.ua/UJRN/Nz_p_2017_155_32

Lotsman, R. O. (2015). Osoblyvosti vokalnoi pidhotovky maibutnikh vchyteliv muzyky v riznykh spivatskykh manerakh. *Naukovi chasopysy NPU im. M. P. Drahomanova* [Scientific Journal of National Pedagogical Dragomanov University], *8*, 69–71. http://enpuir.npu.edu.ua/bitstream/123456789/4753/1/Lotsman.pdf

McCormack, J., Gifford, T., & Hutchings, P. (2019). Autonomy, authenticity, authorship and intention in computer generated art. In A. Ekárt, A. Liapis, A., & M. L. Castro Pena (Eds.), *Computational Intelligence in Music, Sound, Art and Design. EvoMUSART 2019. Lecture Notes in Computer Science* (*Vol. 11453*, pp. 35–50). Springer. https://doi.org/10.1007/978-3-030-16667-0_3

Merezhko, Yu. V., Petrykova, O. P., & Leontiieva, S. L. (2017). Vokalnovykonavska pidhotovka maibutnikh artystiv-vokalistiv u vyshchii shkoli na osnovi mizhdystsyplinarnoi intehratsii [Vocal and performing training of future artists-vocalists in higher education based on interdisciplinary integration]. *Science and Education a New Dimension. Humanities and Social Sciences, V(23)*, 71−73. https://seanewdim.com/wp-content/uploads/2021/03/Vocal-and-performing-training-of-future-artists-vocalists-in-high-school-based-on-interdisciplinary-integration-Yu.-V.-Merezhko-O.-P.-Petrykova-S.-L.-Leontiyeva.pdf

Nerubasska, A., Palshkov, K., & Maksymchuk, B. (2020). A systemic philosophical analysis of the contemporary society and the human: New potential. *Postmodern Openings*, *11*(4), 275−292. https://doi.org/10.18662/po/11.4/235

Oleksiuk, O., Bondarenko, L., Cherkasov, V., Kosinska, N., & Maievska, A. (2019). Innovative model of communicative practices. *Journal of History Culture and Art Research, 8*(2), 244−252.

Oleksiuk, O., Rebrova, O., & Mikulinska, O. (2019). Dramatic hermeneutics as a perspective technology in the artistic education. *Journal of History Culture and Art Research, 8*(3), 100−112.

Runco, M. A., & Jaeger, G. J. (2012). The standard definition of creativity. *Creativity Research Journal, 24*(1), 92–96. https://doi.org/10.1080/10400419.2012.650092

Sacher, W. (2013). *Pedagogika muzyczna. Teoretyczne podstawy powszechnego ksztalcenia muzycznego* [Music pedagogy: Theoretical foundations of universal music education]. Impuls. Retrieved from: https://www.amazon.co.uk/Pedagogikamuzyki-Teoretyczne-powszechnego-ksztalcenia/dp/8378500764

Shulgina, V. D., & Ryabinko, S. M. (2017). Tvorcha diialnist osobystosti u systemi mystetskoi osvity Ukrainy: yevropeiskyi kontekst [Creative activity of the individual in the system of art education in Ukraine: European context]. *Visnyk Natsionalnoi akademii kerivnykh kadriv kultury i mystetstv* [National Academy of Managerial Staff of Culture and Arts Herald], *1*, 80−85. http://nbuv.gov.ua/UJRN/vdakkkm_2017_1_18

Uchyla-Zroski, J. (Ed.). (2013). *Wartosci w muzyce. Interpretacja w muzyce jako proces tworczy. Tom 5* [Values in music: Interpretation in music as a creative process. Volume 5]. Wydawnictwo Uniwersytetu Slaskiego. Retrieved from: https://wydawnictwo.us.edu.pl/sites/wydawnictwo.us.edu.pl/files/wartosci_w_muzyce_t_5_-_czw_st.pdf

UNICEF Canada. (2024). *Global Classroom – Faculty of Education Partnerships*. Retrieved from: https://www.unicef.ca/en/node/2501

Waluga, A. (2012). *Śpiew w perspektywie edukacji muzycznej: Koncepcje, badania, programy* [Singing in the perspective of music education: Concepts, research, programmes]. Akademia Muzyczna im. Karola Szymanowskiego w Katowicach. https://katalogi.uj.edu.pl/discovery/fulldisplay?docid=alma991002641089705067&context=L&vid=48OMNIS_UJA:uja&lang=pl&search_scope=MyInstitution&adaptor=Local%20Search%20Engine&tab=LibraryCatalog&query=sub,exact,Muzyka%20--%20nauczanie&offset=60

Zatorre, R. J., & Salimpoor, V. N. (2013). From perception to pleasure: Music and its neural substrates. *Proceedings of the National Academy of Sciences of the United States of America*, *110 Suppl 2*(Suppl 2), 10430–10437. https://doi.org/10.1073/pnas.1301228110