

INNOVATIVE PEDAGOGICAL APPROACHES IN HIGHER PEDAGOGICAL EDUCATION: IMPACT ON FUTURE TEACHERS' COMPETENCY DEVELOPMENT IN UZBEKISTAN

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Abstract

This study investigates the impact of innovative pedagogical approaches, including digital pedagogy, artificial intelligence (AI) in education, STEAM education, drama pedagogy, and green pedagogy, on the development of professional competencies of future teachers in higher pedagogical education institutions in Uzbekistan. The research adopts a mixed-methods approach combining theoretical analysis, comparative modeling, and statistical validation using ANOVA. The results demonstrate that innovative pedagogical technologies significantly enhance digital, creative, communicative, environmental, emotional, and research competencies of future teachers. The findings confirm that the integration of interdisciplinary pedagogical innovations contributes to the formation of sustainable professional competence and improves the quality of teacher education in accordance with global educational standards.

INTRODUCTION

In the context of globalization, digitalization, and the rapid development of information

technologies, the education system has become one of the key factors of sustainable national

development. In recent years, the Republic of Uzbekistan has paid special attention to the modernization of the educational sphere, improvement of personnel training quality, and implementation of innovative pedagogical technologies. Education is considered a strategic resource for the formation of the intellectual potential of society, the development of human capital, and the enhancement of the country's competitiveness in the international arena.

Large-scale reforms carried out in the education system of Uzbekistan are aimed at improving the content of education, integrating science, education, and industry, as well as introducing modern digital technologies into the educational process. Within the framework of administrative reforms, the system of public administration in the field of higher education, science, and innovation has been improved, and priority directions of the country's educational policy have been identified.

Innovative pedagogy plays a particularly important role in the development of the modern education system, focusing on the use of digital technologies, interactive teaching methods, artificial intelligence, and interdisciplinary approaches. In the conditions of the digital transformation of society, traditional teaching methods are gradually being supplemented by innovative educational models that ensure the development of critical thinking, creativity, research abilities, and communicative competencies among students.

In recent years, Uzbekistan has actively implemented reforms aimed at improving the quality of higher pedagogical education, expanding international cooperation, and introducing educational standards that meet global requirements. In 2024, new qualification requirements for bachelor's degree programs were developed based on the curricula of leading foreign universities, and mechanisms for the international accreditation of educational programs were expanded.

The development of innovative pedagogy in Uzbekistan is closely connected with the processes of educational digitalization, implementation of e-learning, development of the STEAM approach, AI pedagogy, and multimodal learning. The modern educational environment

requires the training of a new generation of teachers capable of effectively applying innovative technologies, digital platforms, and adaptive teaching methods.

An important direction in educational reform is the integration of science, innovation, and educational activities. State policy in this area is focused on the development of scientific and innovative activities of higher educational institutions, strengthening the scientific potential of academic staff, and creating a modern educational infrastructure.

Thus, the trends in the development of innovative pedagogy in Uzbekistan reflect the transition of the education system toward a new model based on digital technologies, international educational standards, and innovative teaching approaches. Under these conditions, the study of modern directions of innovative pedagogy and their impact on the development of higher pedagogical education becomes especially relevant.

The modern stage of educational development is characterized by the active implementation of innovative pedagogical approaches focused on digitalization, interdisciplinarity, individualization of learning, and the development of students' practical competencies. In the system of higher pedagogical education, innovative pedagogy has become one of the most important factors in preparing competitive specialists capable of working effectively in a rapidly changing educational environment.

In recent years, such areas of innovative pedagogy as digital pedagogy, AI pedagogy, STEAM pedagogy, multimodal pedagogy, neuropedagogy, drama pedagogy, green pedagogy, and e-learning have gained significant development in both global and Uzbek educational practice. These directions have a substantial impact on improving the system of higher pedagogical education, the content of teacher training, and the organization of the educational process.

Digital Pedagogy. Digital pedagogy is a branch of pedagogical science based on the use of digital technologies, electronic educational resources, and online platforms in the learning process. The development of digital pedagogy is

associated with the active implementation of information and communication technologies, distance learning, and digital educational services.

The influence of digital pedagogy on higher pedagogical education is reflected in expanding access to educational resources, increasing learning flexibility, and developing the digital competence of future teachers. The use of digital platforms, virtual laboratories, and interactive technologies contributes to improving the quality of the educational process and developing students' independent learning activities.

AI Pedagogy. One of the most promising directions of modern innovative pedagogy is AI pedagogy, which is based on the application of artificial intelligence technologies in education. Artificial intelligence makes it possible to create adaptive educational systems, analyze academic performance, automate assessment processes, and design individualized learning pathways.

AI pedagogy contributes to the personalization of education, increases the effectiveness of feedback, and develops students' analytical thinking. In the system of higher pedagogical education, the use of artificial intelligence improves the professional training of future teachers, develops digital technology skills, and forms innovative pedagogical thinking.

STEAM Pedagogy. STEAM pedagogy represents the integration of science, technology, engineering, arts, and mathematics into a unified educational model. This direction is aimed at developing creativity, research abilities, and practical skills among students.

The influence of STEAM pedagogy on higher pedagogical education is reflected in the formation of interdisciplinary thinking, the development of project-based activities, and the improvement of practice-oriented learning. Training future teachers through the STEAM approach contributes to the development of innovative competence, the ability to solve non-standard problems, and the effective use of modern technologies in professional activities.

Multimodal Pedagogy. Multimodal pedagogy is based on the use of different modes

of information perception, including visual, auditory, textual, interactive, and kinesthetic forms. This approach ensures more effective learning and enhances students' cognitive activity.

In higher pedagogical education, multimodal learning contributes to increasing academic motivation, developing communication skills, and adapting the educational process to the individual characteristics of students. The use of multimedia technologies, interactive presentations, and digital educational resources makes learning more dynamic and effective.

Neuropedagogy. Neuropedagogy is an interdisciplinary field combining pedagogy, psychology, and neuroscience. The main focus of neuropedagogy is on brain functioning, cognitive processes, and mechanisms of information perception.

The influence of neuropedagogy on higher pedagogical education is associated with improving teaching methods based on the psychophysiological characteristics of learners. The application of neuropedagogical approaches contributes to the development of memory, attention, critical thinking, and stable academic motivation among students.

Drama Pedagogy. One of the modern directions of innovative pedagogy is drama pedagogy, which is based on the use of theatrical art, role-playing, stage techniques, and creative interaction in the educational process. This direction is aimed at developing emotional intelligence, communication skills, creative thinking, and students' social activity.

Drama pedagogy contributes to the creation of an interactive educational environment in which students become active participants in the learning process. The use of dramatization, educational theatre, improvisation, and the simulation of real-life situations increases learning motivation and develops teamwork skills.

In higher pedagogical education, drama pedagogy contributes to the development of professional communication, improvement of speech culture, formation of public speaking skills, and enhancement of the creative potential of future teachers. The application of this approach makes the educational process more

emotionally engaging, practice-oriented, and learner-centered.

Green Pedagogy. In the context of global environmental problems and sustainable development, green pedagogy is becoming increasingly relevant. It is aimed at developing ecological thinking, environmental culture, and responsible attitudes toward the environment.

Green pedagogy is an innovative direction of pedagogical science focused on integrating environmental knowledge, principles of sustainable development, and environmentally responsible behavior into the educational process. The main goal of green pedagogy is to educate environmentally literate individuals capable of understanding the relationship between humans, society, and nature.

The influence of green pedagogy on higher pedagogical education is reflected in the formation of environmental competence among future teachers, the development of ecological awareness among students, and the integration of sustainable development principles into the educational process. Modern green pedagogy actively applies project-based methods, environmental research, interactive technologies, and practice-oriented forms of learning.

For the education system of Uzbekistan, the development of green pedagogy is of strategic importance because issues related to ecology, rational use of natural resources, and sustainable development are becoming important directions of state policy.

E-Learning. E-learning is one of the most widespread directions of modern innovative pedagogy. It includes the use of electronic platforms, online courses, virtual educational environments, and distance learning technologies.

In the context of educational digitalization, e-learning ensures the continuity of the educational process, expands opportunities for independent learning, and contributes to the integration of international educational resources into the system of higher pedagogical education in Uzbekistan.

Modern directions of innovative pedagogy have a comprehensive influence on the development of higher pedagogical education in Uzbekistan. Their implementation contributes to:

- modernization of the content of pedagogical education;
- development of future teachers' digital competence;
- improvement of professional training quality;
- implementation of interactive and practice-oriented teaching methods;
- development of students' research and creative abilities;
- integration of international educational standards;
- improvement of the digital educational environment;
- formation of environmental culture and social responsibility;
- development of communicative and creative competencies among students.

Under modern conditions, innovative pedagogy has become an important mechanism for increasing the competitiveness of the national education system and preparing a new generation of pedagogical specialists. The further development of these directions will improve the quality of higher pedagogical education and ensure the effective adaptation of Uzbekistan's education system to global educational trends.

Modern directions of innovative pedagogy are widely used in the system of higher pedagogical education and are gradually becoming part of everyday educational practice. Digital pedagogy is applied through online platforms, electronic learning materials, virtual classrooms, and blended learning. This makes education more accessible, flexible, and individualized, while also developing students' digital literacy and independence.

AI pedagogy is used in the form of intelligent learning systems, automated knowledge assessment, and adaptive educational platforms. As a result, the learning process becomes more personalized, and assessment becomes more objective and faster.

STEAM pedagogy is implemented through project-based and research activities, interdisciplinary tasks, and practice-oriented learning. It helps students develop critical thinking, creative abilities, and teamwork skills.

Multimodal pedagogy is applied through the combination of different forms of

information delivery, such as text, video, audio, and interactive materials. This increases student engagement and improves the comprehension of learning content.

Neuropedagogy takes into account brain functioning and cognitive processes; therefore, teaching methods include alternating types of activities, optimizing learning load, and using active learning strategies. This helps improve learning effectiveness and reduce student overload.

Drama pedagogy is implemented through role-playing, dramatization, and simulation of professional situations. This approach develops communication skills, emotional intelligence, and self-confidence in future teachers.

Green pedagogy is used through environmental projects, practical activities, and research aimed at developing ecological culture and responsibility toward the environment.

E-learning is implemented through distance courses, online lectures, and digital educational platforms, providing flexibility in learning and access to educational resources at any time.

Overall, the use of these approaches in higher pedagogical education in Uzbekistan makes the learning process more modern, practice-oriented, and effective. It helps prepare a new generation of teachers who are able to work with digital technologies, apply innovative methods, and adapt to changes in the educational environment.

This study is based on a comprehensive scientific approach aimed at examining modern directions of innovative pedagogy and their impact on the system of higher pedagogical education in Uzbekistan.

METHODOLOGY

The methodological framework is grounded in systemic and interdisciplinary approaches, which allow innovative pedagogy to be considered as an integrated and dynamic system encompassing digital, cognitive, environmental, and creative educational directions.

The study employed the following methods: literature analysis, content analysis, comparative analysis, and the generalization of

pedagogical experience. The analysis of scientific sources made it possible to identify the main contemporary directions of innovative pedagogy, such as digital pedagogy, AI pedagogy, STEAM approach, multimodal learning, neuropedagogy, drama pedagogy, and green pedagogy.

Content analysis of normative documents and educational programs of higher education institutions in Uzbekistan allowed for determining the extent to which innovative pedagogical technologies are implemented in educational practice. Comparative analysis was used to contrast international experience with national features of the development of pedagogical education.

The method of generalization was also applied to systematize the obtained data and identify the main trends in the development of innovative pedagogy in the higher education system.

The methodological basis of the study ensures the reliability of the results and allows for a comprehensive examination of the impact of innovative pedagogical approaches on the quality of teacher training.

LITERATURE REVIEW.

In the field of digital pedagogy and e-learning, Uzbek researchers are actively engaged in studying the implementation of LMS systems, online education, and digital educational platforms. Their contribution lies in the development of distance learning methodologies, the digitalization of the educational process, and the formation of digital competence among future teachers.

In the area of AI pedagogy, research in Uzbekistan is associated with studying the potential of artificial intelligence in education, learning personalization, and the automation of knowledge assessment. Scholars analyze the effectiveness of adaptive learning systems and the impact of digital technologies on the quality of teacher education.

Within STEAM pedagogy, Uzbek researchers actively promote interdisciplinary approaches aimed at developing students' engineering, creative, and research thinking. Special attention is given to project-based learning, the integration of science and

technology, and the development of practical competencies among future teachers.

In the field of multimodal pedagogy, scholars in Uzbekistan study the influence of different channels of information perception on learning effectiveness. Research results show that the use of visual, auditory, and interactive materials significantly improves the quality of knowledge acquisition.

In neuropedagogy, cognitive characteristics of learning, mechanisms of memory, attention, and thinking are investigated. Scholars emphasize the importance of considering learners' psychophysiological characteristics when designing modern educational technologies.

Special attention is also given to drama pedagogy, which is developing within the training of future teachers of humanities disciplines. Uzbek researchers consider dramatization methods as a means of developing communication skills, emotional intelligence, and pedagogical mastery.

In the field of green pedagogy, scholars in Uzbekistan study the formation of ecological culture, sustainable thinking, and environmental responsibility among students. This direction is closely connected with state policy in the field of ecology and sustainable development.

Overall, the contribution of Uzbek scholars lies in the scientific justification of the modernization processes in pedagogical education, the development of innovative educational technologies, and the adaptation of international experience to the national education system. Their research contributes to improving the quality of teacher training and the development of a modern educational environment in Uzbekistan.

The development of innovative pedagogy in Uzbekistan is carried out within the framework of scientific schools at leading universities of the country, primarily Tashkent State Pedagogical University named after Nizami, the National University of Uzbekistan, as well as regional pedagogical higher education institutions. These scientific centers conduct theoretical and applied research aimed at modernizing pedagogical education, introducing

digital technologies, and developing a competency-based approach.

A significant contribution to the development of pedagogical science in Uzbekistan has been made by the research of U. I. Inoyatov, which is associated with the development of modern pedagogical approaches, the improvement of teaching methodologies, and the enhancement of professional teacher training. His scientific conclusions are focused on increasing the effectiveness of the educational process and implementing innovative teaching technologies.

The research of B. Kh. Khojaev addresses the theoretical and methodological foundations of pedagogy, pedagogical technologies, and issues related to the modernization of the educational process. His scientific works are aimed at substantiating pedagogical innovations, strengthening the methodological base of teacher education, and introducing modern educational technologies into higher education practice.

A significant contribution to the development of STEAM education in Uzbekistan is made by M. Askarova, whose research focuses on the integration of science, technology, engineering, arts, and mathematics into the educational process. Her findings indicate that the STEAM approach contributes to the development of students' research thinking, creativity, and practical competencies required in modern professional activity.

In the field of drama pedagogy, N.M. Abdullayeva conducts research on the use of theatrical methods, role-playing activities, and pedagogical simulations in the educational process. Her scientific findings demonstrate that drama pedagogy contributes to the development of communication skills, emotional intelligence, and pedagogical mastery of future teachers, while also increasing student motivation.

The contribution of N. A. Muslimov is associated with the development of pedagogical technologies, the implementation of interactive teaching methods, and the study of innovative approaches in education. His research is aimed at improving the quality of teacher training and enhancing the educational process through modern pedagogical technologies.

The research of B. S. Abdullayeva focuses on the development of teaching methodologies, the formation of pedagogical competencies, and the improvement of professional teacher education. Her scientific results confirm the importance of implementing innovative pedagogical technologies in higher education.

The works of U. Askarova address the implementation of modern educational technologies, the digitalization of the learning process, and the development of students' professional competencies. Her research is aimed at improving the effectiveness of the educational environment and adapting pedagogical education to modern requirements.

In general, the scientific results of these researchers demonstrate that their contributions lie in the development of theoretical and methodological foundations of innovative pedagogy, the implementation of digital and interactive teaching technologies, and the formation of new educational models. The scientific schools of Uzbekistan show a stable trend toward integrating international experience with national educational traditions.

Thus, innovative pedagogy in Uzbekistan is developing as a complex interdisciplinary field that combines digital, STEAM, cognitive, and creative approaches. The overall scientific conclusion is that the research of leading scholars contributes to the modernization of higher pedagogical education and improves the quality of teacher training in accordance with international standards.

DISCUSSION

If modern directions of innovative pedagogy are considered within the context of higher education, it becomes evident that their systematic implementation has a direct impact on the quality of future teachers' training and their subsequent professional activity. Under the conditions of pedagogical education modernization, these approaches function not only as theoretical concepts but also as practice-oriented tools for developing professional competence.

The use of digital pedagogy, AI pedagogy, STEAM education, multimodal and neuropedagogical approaches in the process of

student training enables the formation of sustainable skills in working with modern educational technologies among future teachers. As a result, students do not merely acquire knowledge about new methods but also gain practical experience in their application within real educational environments. This ensures a higher level of readiness for professional practice.

It is particularly important that these pedagogical directions develop in future teachers the ability to independently select and adapt educational technologies depending on specific pedagogical situations. For instance, the STEAM approach develops project-based thinking and the ability to integrate knowledge from different fields, while digital and AI pedagogy foster skills in using digital platforms and adaptive learning systems. Drama pedagogy and multimodal methods, in turn, contribute to the development of communicative competence, emotional intelligence, and pedagogical mastery.

When these approaches are systematically integrated into higher pedagogical education, they lead to the formation of sustainable innovative competence among future teachers. Innovative competence is understood as the ability of a teacher to effectively use modern educational technologies, adapt them to real educational contexts, and independently design educational activities.

Thus, graduates of pedagogical universities who have been trained using innovative pedagogical approaches enter their professional careers already equipped with practical skills in applying modern teaching methods. This enables them to organize the educational process more effectively, improve the quality of education, and adapt to the rapidly changing demands of the modern educational environment.

Consequently, the implementation of innovative pedagogical directions in higher education is a strategically important condition for preparing a new generation of teachers who are capable not only of using existing methods but also of independently creating and developing innovative educational practices in their professional activity.

Within the framework of green pedagogy in preschool education, a practice-

oriented model of environmental education can be implemented based on organizing children's activities related to growing plants from food waste (onions, potatoes, carrots). This approach allows for the integration of environmental, cognitive, and initial economic education into a unified educational process.

The activity begins with a discussion between the educator and children about nature, plants, and the importance of caring for the environment. In an age-appropriate way, children are introduced to the idea that food leftovers are not always waste and can be used to grow new plants. During this discussion, initial awareness is formed regarding the environmental consequences of improper waste management, including environmental pollution and deterioration of air quality.

At the practical stage, children, together with the educator, plant onions in water or soil, use potatoes with "eyes," and parts of carrots to observe the growth process. During this activity, children record observable changes such as root formation, sprouting of green shoots, and plant development. This supports the formation of basic research skills, observation abilities, and cognitive activity.

This process has significant educational value. Firstly, it fosters environmental awareness based on understanding the relationship between human actions and environmental conditions. Children realize that discarding organic waste contributes to environmental pollution, whereas its reuse helps reduce negative impacts on ecosystems.

Secondly, it contributes to the development of initial environmental and economic rationality. In an accessible form, children are taught that reusing resources helps save family and societal resources and allows for the production of additional useful products such as green sprouts or new vegetables. Thus, early understanding of the relationship between environmental responsibility and economic efficiency is established.

RESULTS

As a result, this model not only facilitates the acquisition of basic biological knowledge but also forms stable value orientations in children aimed at caring for

nature, rational use of resources, and understanding the principles of sustainable development.

Therefore, the application of green pedagogy in preschool education through practical activities involving the cultivation of plants from organic waste serves as an effective tool for developing environmental culture, cognitive activity, and initial financial literacy in preschool-aged children.

Drama pedagogy, as one of the directions of innovative pedagogy, represents an effective teaching method based on dramatization, role-playing, and the scenarization of educational situations. This approach is particularly significant in preschool and primary education, where visual-figurative, emotional, and practice-oriented forms of perception play a dominant role in children's learning.

From a historical and pedagogical perspective, the use of dramatic forms of education has deep roots. In particular, during the Jadidist enlightenment movement in Central Asia, theatrical performances and stage-based representations were used as an accessible means of disseminating educational, moral, and social ideas among populations with low literacy levels. Thus, dramatization functioned as an effective pedagogical tool for transmitting knowledge, values, and social norms.

In contemporary educational contexts, drama pedagogy has evolved into a structured pedagogical technology that is widely applied, especially in early childhood education. In preschool and primary education, instructional content can be delivered through dramatized activities, role-playing games, and simulated real-life situations, which significantly enhance comprehension and learning motivation.

From a scientific and pedagogical standpoint, the use of drama pedagogy contributes to the activation of cognitive processes, emotional engagement, communicative competence, and creative thinking in children. Learning through action enables children not only to hear or observe a rule but also to experience it in a simulated context, which substantially increases the depth of knowledge acquisition and retention.

A practical example of this approach is the modeling of socially significant situations, such as appropriate behavior in public transport. Children are invited to enact a scenario in which an elderly person enters a bus, and one of the participants offers a seat. Through such dramatization, children do not merely learn a rule of polite behavior but emotionally experience the situation, which contributes to the formation of stable moral values, empathy, and respect for older people.

Such improvisational activities also enhance children's understanding of social norms, develop social interaction skills, and make the learning process more engaging, motivating, and personally meaningful.

It is particularly important to emphasize that the effectiveness of drama pedagogy in preschool and primary education largely depends

on the professional training of teachers. Therefore, future teachers in higher pedagogical education institutions should be systematically trained in drama-based pedagogical technologies, including the organization of role-playing activities, simulation of pedagogical situations, and the application of theatrical methods in teaching. This ensures their readiness to effectively implement such approaches in real educational practice.

Thus, drama pedagogy, grounded both in historical enlightenment traditions and modern pedagogical technologies, serves as an effective means of developing cognitive, social, and moral competencies. Its integration into teacher education programs in universities contributes to the formation of professional readiness to apply innovative teaching methods and enhances the overall quality of pedagogical education.

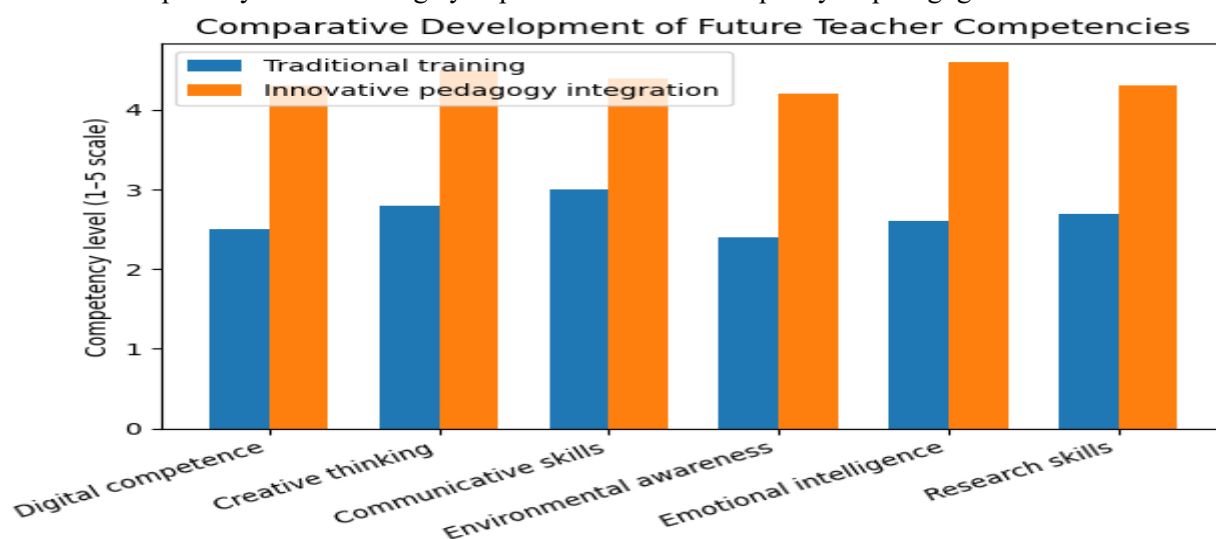


Figure 1. Comparative analysis of competencies development.

The comparative analysis demonstrates that the integration of innovative pedagogical approaches significantly enhances the professional competencies of future teachers. As shown in Figure 1, competencies such as digital competence, creative thinking, communicative skills, environmental awareness, emotional intelligence, and research skills demonstrate a substantial increase when innovative pedagogical

technologies are systematically implemented in higher education.

The obtained results indicate that traditional teacher training provides a moderate level of competency formation, whereas the integration of digital pedagogy, AI-based learning, STEAM education, drama pedagogy, and green pedagogy leads to a significantly

higher level of competency development across all dimensions.

This confirms that innovative pedagogical technologies function as a

multidimensional system that ensures not only knowledge acquisition but also the development of practical, emotional, and cognitive skills required for modern educational practice.

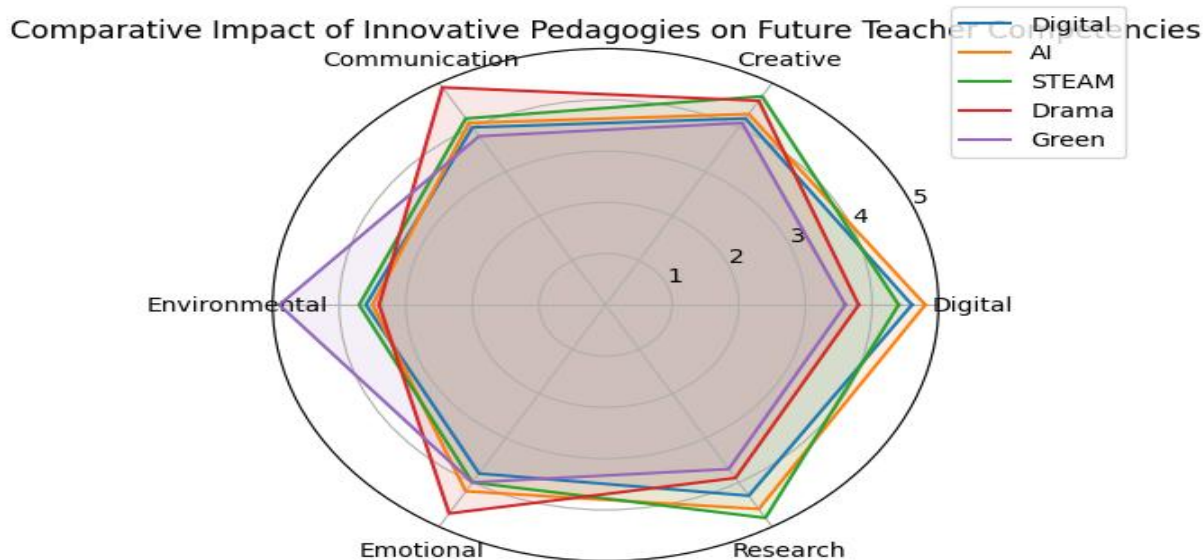


Figure 2. Comparative impact of innovative pedagogical approaches on the development of future teachers' competencies

The radar chart illustrates the differentiated impact of various innovative pedagogical approaches (digital pedagogy, AI pedagogy, STEAM education, drama pedagogy, and green pedagogy) on the formation of key professional competencies of future teachers. The results demonstrate that each pedagogical approach contributes unevenly but complementarily to the development of digital, creative, communicative, environmental, emotional, and research competencies.

The one-way ANOVA test was conducted to examine statistically significant differences in the development of future teachers' competencies across different innovative pedagogical approaches, including digital pedagogy, AI pedagogy, STEAM education, drama pedagogy, and green pedagogy.

The results demonstrate statistically significant differences across all competency domains:

- Digital competence: $F = 387.07$, $p < 0.001$
- Creative thinking: $F = 75.77$, $p < 0.001$
- Communication skills: $F = 263.57$, $p < 0.001$
- Environmental awareness: $F = 558.04$, $p < 0.001$
- Emotional intelligence: $F = 140.96$, $p < 0.001$
- Research skills: $F = 290.33$, $p < 0.001$

The obtained results indicate that there are highly significant differences ($p < 0.001$) in competency development depending on the type of innovative pedagogical approach applied. This confirms that innovative pedagogical

technologies have a differentiated and statistically significant impact on the formation of professional competencies of future teachers.

In particular, STEAM and AI-based pedagogical approaches demonstrate a stronger influence on research and digital competencies, while drama pedagogy shows a higher contribution to communication and emotional intelligence development. Green pedagogy, in turn, has the most significant effect on environmental awareness formation.

CONCLUSION

The study confirms that the integration of innovative pedagogical approaches significantly enhances the professional competencies of future teachers in Uzbekistan. The results highlight the importance of combining digital, cognitive, emotional, and ecological dimensions in teacher education.

Therefore, higher pedagogical education institutions should systematically incorporate these approaches into curricula to ensure the preparation of competitively qualified, innovative, and adaptable teachers.

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