

IMPROVING THE METHODOLOGY OF TEACHING THE KOTLIN PROGRAMMING LANGUAGE IN THE DIGITAL PEDAGOGICAL ENVIRONMENT

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Abstract

This article examines modern approaches to teaching programming within the framework of digital pedagogy. Special attention is given to the use of innovative methods, interactive technologies, and digital tools in teaching the Kotlin programming language. The article also discusses the development of algorithmic thinking, the support of independent learning, and the individualization of the educational process. The findings have practical significance for improving teaching methodologies in programming education.

Keywords: Digital pedagogy, Kotlin, programming education, innovative technologies, methodology, interactive learning.

Introduction

Today, the process of digital transformation is radically changing the educational system. In the Republic of Uzbekistan, a number of important documents on the development of digital education, the implementation of modern information and communication technologies in the educational process have been adopted. Introduction. Today, the process of digital transformation is radically changing the educational system. In the Republic of Uzbekistan, a number of important documents on the development of digital education, the implementation of modern information and communication technologies in the educational process have been adopted. In particular, the decree of January 28, 2022 PD-60 “on the development strategy of New Uzbekistan”, the Strategy “Digital Uzbekistan-2030” and the resolution of the Cabinet of Ministers of December 30, 2020 No. 824 laid the legal foundations for the introduction of digital technologies into the educational process. On the basis of these documents, increasing the digital competence of teachers, the use of electronic resources in the educational process and updating the methodology of teaching programming languages have become an urgent issue. Among programming languages, the Kotlin language has come to attention in recent years as a tool in Android application development, widely used in modern software projects. Therefore, teaching it in a digital pedagogical environment — requires not only a technical, but also a pedagogical approach.



The concept of digital pedagogy and its importance

Digital pedagogy is a new direction that harmonizes the traditional educational process with modern digital technologies, interactive methods, online platforms and artificial intelligence tools. This concept takes the connection between the student and the teacher to a new level, encourages individualization of Education, independent learning and a creative approach. The principles of digital pedagogy include Digital pedagogy is a new direction that harmonizes the traditional educational process with modern digital technologies, interactive methods, online platforms and artificial intelligence tools. This concept takes the connection between the student and the teacher to a new level, encourages individualization of Education, independent learning and a creative approach. The principles of digital pedagogy include:

- Interactivity and visualization — enriching the learning process through multimedia tools;
 - Flexibility-each student learns at his own pace and depending on his interest;
 - Cooperation-to exchange ideas and gain experience through collective projects;
 - Reflection and analysis — the possibility of monitoring and analyzing the results of training.
- These aspects are especially important in teaching programming subjects, as students must develop practical skills in addition to theoretical knowledge.

The educational capabilities of the Kotlin programming language now make the process of teaching programming one of the most important areas of modern education. Because in the context of the digital economy, every professional is required to have the skills to be able to work in at least one programming language. In this context, the Kotlin programming language provides new opportunities in the learning process. Kotlin is a programming language developed by JetBrains, operating on a Java virtual Machine (JVM), characterized by being modern, secure, and simple. Kotlin's suitability for learning in the educational process is explained by its following characteristics:

- Simplicity and compactness of syntax. For students who are just starting programming, the process of understanding, writing and analyzing the code becomes easier.
- Full compatibility with Java. This feature allows readers to continue existing Java projects in Kotlin.
- Mobile programming orientation Kotlin's suitability for learning in the educational process is explained by its following characteristics:
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- Full compatibility with Java. This feature allows readers to continue existing Java projects in Kotlin.
- Mobile programming orientation. Kotlin is the main language for developing Android applications. This increases students' motivation to achieve practical results.
- Open-source ecosystem. Students have access to free online resources, video lessons, documentation, and code samples. In addition, Kotlin's syntax is consistent with the learning process, an automatic error detection system, and the compiler's intelligent suggestions provide both teacher and student comfort. With this language, the following results can be achieved in the teaching process:



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- Development of logical and systematic thinking skills of programming;
- Develop students' ability to analyze and solve practical problems;
- Connecting the learning process with creative activities by creating a mobile application;
- Develop collaborative programming (collaborative coding) skills. The introduction of the Kotlin programming language into the educational process is a methodological process that serves not only to give technical knowledge, but also to develop digital thinking and creatives. The use of interactive and innovative techniques in teaching Kotlin in order to effectively teach the Kotlin programming language, it is necessary for the teacher to organize the course process, harmonizing modern pedagogical technologies, interactive methods and innovative approaches. Because today's digital learning environment requires the teacher not only to give knowledge, but also competency in the design and management of the educational process.

The use of interactive methods interactive methods attracts students as an active participant, forming in them the skills of independent thinking, analysis and creative approach to the problem. The following interactive methods justify themselves when teaching Kotlin:

- Code analysis - students read the given code, find errors and analyze them.
- Programming in pairs (Pair programming) — two students develop a project together. He use of interactive methods interactive methods attracts students as an active participant, forming in them the skills of independent thinking, analysis and creative approach to the problem. The following interactive methods justify themselves when teaching Kotlin:
- Code analysis - students read the given code, find errors and analyze them.
- Programming in pairs (Pair programming) — two students develop a project together. This method develops the skills of communication, analysis, and joint error correction.
- Case study - analysis of a real-life problem and finding a solution using Kotlin.
- Blitz questions is a system of short — time answers to improve students' ability to think quickly.

The implementation of innovative technologies the use of the following innovative tools in the training of Kotlin makes the educational process more effective:

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- Online learning platforms: JetBrains Academy, Stepik, Codecademy — these platforms allow you to learn through practical assignments.
- Gamification elements: increase motivation through scoring, ratings, stages.



- Code analysis using artificial intelligence: with tools like ChatGPT, GitHub Copilot, readers get recommendations by checking their code.
- Flipped classroom (reverse class) model is an online study of theory, and problem solving in class.
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Methods aimed at practical activity strengthen their knowledge in the process of studying Kotlin by completing the following practical tasks:

- create a simple calculator or daily program;
- development of user data input and processing application;
- create mini-projects based on random numbers or digital games;
- work with the user interface (Compose, XML layout).

Thus, the combination of interactive and innovative techniques makes the teaching process more practical, motivational and creative.

Directions for improving the methodology of teaching Kotlin in order to effectively organize the educational process in a digital pedagogical environment, it is necessary that the teacher not only has technical knowledge, but also develops pedagogical design, work with digital resources and reflective analysis skills. Improving the methodology of teaching the Kotlin programming language is an important milestone in this regard.

Updating the pedagogical design of the teaching process in the context of digital education, each educational process should be built on the principles of pedagogical design. This means that when organizing a lesson, the specific goal, result, tool and evaluation criteria are predetermined. When teaching Kotlin, it is advisable to use the following stages:

1. Analysis stage: determination of the existing level of knowledge of students (by survey, mini-test, diagnostics).
2. Updating the pedagogical design of the teaching process in the context of digital education, each educational process should be built on the principles of pedagogical design.

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1. Analysis stage: determination of the existing level of knowledge of students (by survey, mini-test, diagnostics).
2. Design phase: planning learning materials, code samples, visual presentations.
3. Practical stage: laboratory training, mini-projects, independent code writing.
4. Assessment and reflection: at the end of each lesson, the student analyzes his activities, and the teacher assesses achievements and shortcomings.

This process makes teaching systematic, result-oriented and tailored to the student.

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The integration of digital platforms in the course process increases the efficiency of using various online platforms and digital environments in teaching Kotlin. The following tools have proven themselves in practice:

- JetBrains Academy-the perfect platform for learning Kotlin through step-by-step assignments;
- Kotlin Playground-allows you to view the result by typing the code directly in the browser;
- Moodle and Google Classroom — convenient for posting, discussion and evaluation of assignments;
- GitHub-trains students to work cooperatively on software projects;
- Canva or Figma — applied to develop mobile interface designs and connect with Kotlin.

With these platforms, the reader gains not only theoretical knowledge, but also real project experience. This approach brings the result of training closer to practice.

Modulating and adapting learning materials is more effective when the Kotlin learning course is organized on the basis of a modular system. Each module must contain a goal, theoretical information, code sample, practical assignment, and reflection questions. For example With these platforms, the reader gains not only theoretical knowledge, but also real project experience. This approach brings the result of training closer to practice.

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- * Module 1: Kotlin syntax and variables.
- * Module 2: conditional operators and cycles.
- * Module 3: functions and Object-Oriented Programming (OOP).
- * Module 4: Android app access.
- * Module 5: independent project and final evaluation.

Such a modular system allows the reader to learn in stages, develop according to their own speed.

Improving the system of assessment and monitoring of results in the training of Kotlin, the assessment system should not be limited to traditional testing and written work. In the context of digital pedagogy, the following competency-based assessment criteria should be introduced

Evaluation criterion	Description	Assessment method
Theoretical knowledge	Knowing the basics and syntax of Kotlin	Online testing, Q & A
Practical skills	Coding, programming, debugging	Project assignment
Creative approach	Create a program based on an independent project or new idea	Project presentation
Collaboration	Working in a group, analyzing the code together	Observation, evaluation table
Reflexia	The student analyzes their learning process.	Portfolio, online survey



Through this system, the teacher can see not only the result, but also the dynamics of the development of the student.

In personality-oriented and differential education Kotlin teaching, it is important to differentiate students according to their level of preparation, direction of interest, and learning style. For example:

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In personality-oriented and differential education Kotlin teaching, it is important to differentiate students according to their level of preparation, direction of interest, and learning style. For example:

- for beginners-visual and simplified codes (for example, "Hello World " and simple computing programs);
- for intermediate level — programs that interact with the user (input/output, conditional operators);
- for advanced-create a mobile application or game project.

This approach increases the success of the student, prevents lagging or boredom.

The effectiveness of the methodology to increase the digital competence of the teacher largely depends on the teacher's digital literacy and the ability to control educational technologies.

Therefore:

- Training courses, webinars and online training should be organized for teachers
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The effectiveness of the methodology to increase the digital competence of the teacher largely depends on the teacher's digital literacy and the ability to control educational technologies.

Therefore:

- Training courses, webinars and online training should be organized for teachers;
- Educators should be involved in international platforms such as the JetBrains Teacher Program and Google for Education;
- The use of artificial intelligence, automatic analysis tools and software projects in classes increases the innovative potential of the teacher.

Through these directions, the teacher becomes a methodological leader who meets the requirements of the digital age.

Scientific and methodological cooperation and exchange of experience establishing a system of exchange of experience between higher educational institutions of Uzbekistan and international organizations will enrich the methodology of teaching Kotlin. For example

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Scientific and methodological cooperation and exchange of experience establishing a system of exchange of experience between higher educational institutions of Uzbekistan and international organizations will enrich the methodology of teaching Kotlin. For example:



- hold inter-university seminars and hackathons;
- creating open-source project (open source) platforms for teachers and students;
- joint development of local methodological manuals, video textbooks and teaching modules.

Through these initiatives, the quality of education increases, teachers learn among themselves, and students experience an increased creative environment and competitiveness.

In conclusion, improving the methodology of teaching programming in the environment of digital pedagogy is an important requirement of the modern educational system. The Kotlin programming language is a convenient tool for application in the educational process due to its simplicity, functional capabilities and compatibility with Android applications. Studies conducted have shown that the use of interactive methods in teaching — project-based teaching, programming in pairs, problematic education and gamification elements-significantly increases the quality of Education. Students learn to apply their knowledge in practice, teamwork skills are formed and digital competencies are strengthened. Teaching the Kotlin programming language on the principles of digital pedagogy also requires teachers to take a new approach, digitization of didactic materials, effective use of artificial intelligence and distance learning platforms in the educational process. Therefore, it is important to implement innovative technologies in teaching programming subjects in the educational system, to retrain teachers in digital methodology, and to modernize educational programs. In the future, it is recommended to further strengthen the independent learning activities of students by introducing adaptive learning systems, AR/VR technologies and coding gamification-based modules into the educational process in this direction.

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