O1/A5 – SKILL DEVELOPMENT REQUIREMENTS FOR SECONDARY EDUCATION TEACHERS ON BUILDING LEARNER'S PROGRAMMING SKILLS; O1 – METHODOLOGICAL LEARNING FRAMEWORK

Elaborated by SWU (Bulgaria) and all project partners

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1. GENERAL OVERVIEW

1.1 Necessity of vocational training for Informatics/Computer Science teachers

The professional training of computer science teachers is a key point in the introduction and implementation of computer science education. Teachers should have competencies in the fields of computer science, pedagogy, implementation of modern information technologies in the teaching process, classroom management, and psychology. For the last ten years these issues have been actively discussed at various levels - national and international, by policymakers, researchers, teachers and all other stakeholders.

In 2011, UNESCO published the UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS, outlining the key competencies required for teachers to apply ICT in the teaching and learning process. *„The Framework is arranged in three different approaches to teaching and learning (three successive stages of teacher development). The first is Technology Literacy, enabling students to use ICT in order to learn more efficiently. The second is Knowledge Deepening, enabling students to acquire in-depth knowledge of their school subjects and apply it to complex, real-world problems. The third is Knowledge Creation, enabling students, citizens and the workforce they become, to create the new knowledge required for more harmonious, fulfilling and prosperous societies."* (UNESCO, 2011).

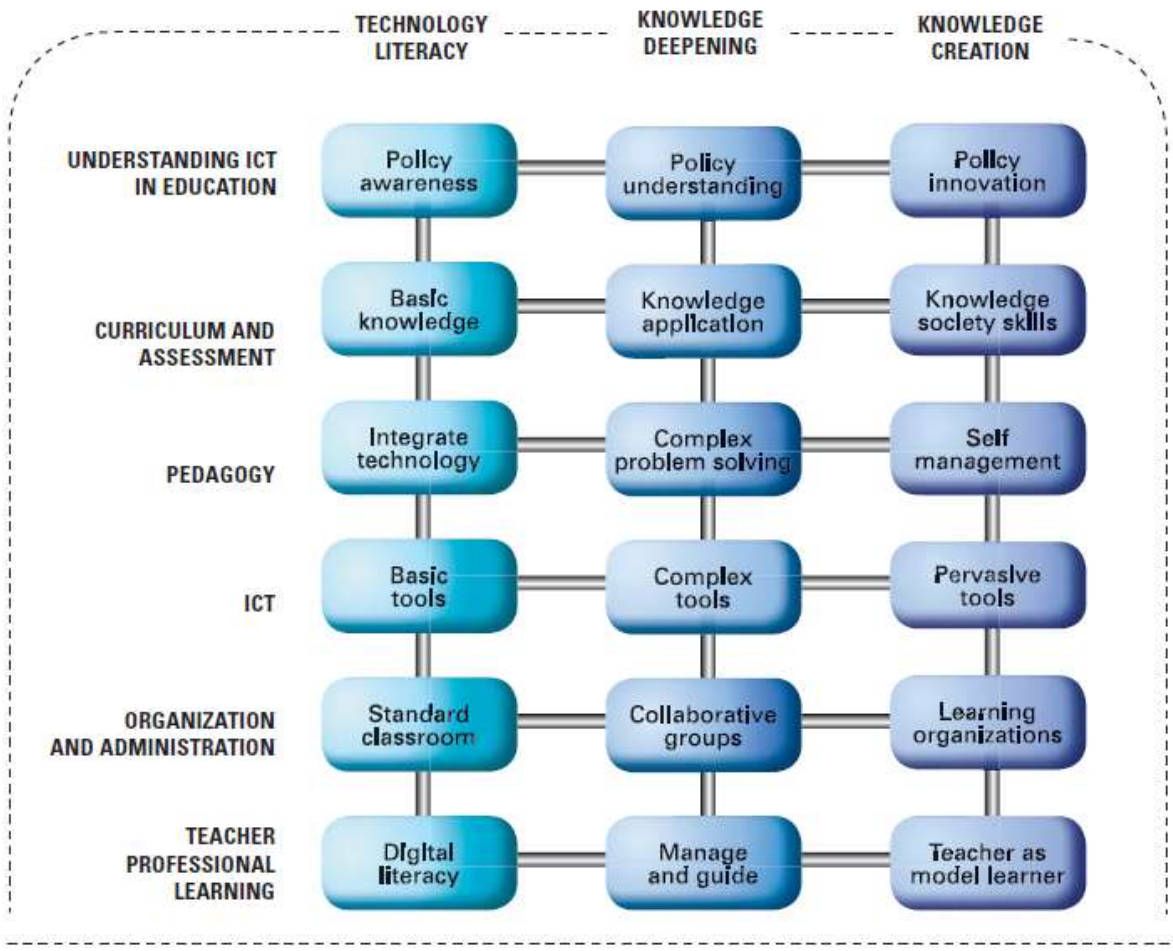

Figure 1. UNESCO ICT Competency Framework for Teachers (UNESCO, 2011)

In 2013, the report of a joint group of representatives of Informatics Europe and ACM Europe Working Group (2013) pointed out that "An obstacle to generalizing informatics education is the lack of teachers." The authors of the report formulate several recommendations for the development of computer science training, one of which is aimed at the preparation of computer science teachers: "Recommendation 3. A large-scale teacher training program should urgently be started. To bootstrap the process in the short term, creative solutions should be developed involving school teachers paired with experts from academia and industry."

The UNESCO EDUsummIT 2015 (UNESCO, 2015) report discusses the issues and challenges of informatics/computer science education.

1. *"Lack of clear understanding of Computer science/Informatics as an academic discipline.*

2. *The necessity of introducing Computer Science/Informatics as a distinct subject in school curricula is controversial and poorly understood.*
3. *Computational thinking, a core component of Computer Science/Informatics, is considered to be one of the important 21st century skills, but due to its complexity, it is difficult to implement in schools.*
4. *The development of Computer Science/Informatics school curricula is impeded by insufficient empirical evidence of student learning in order to support content definition and sequencing.*
5. *Previous ICT curricula deliveries poorly prepared students for Computer Science/Informatics in further/higher education or professional employment.*
6. *Integrating Computer Science/Informatics across other subjects in school curricula has been ineffective.*
7. *Teacher professional development in a newly introduced Computer Science/Informatics subject is a challenge in both quality and quantity.*
8. *Identifying and allocating the additional resources for teaching Computer Science/Informatics is a challenge*."

The October 2018 report of the UNESCO / IFIP TC3 Meeting "Coding, Programming and Changing Curriculum for Computing in Schools" identified the two most important challenges: *„Challenge 1, the lack of understanding of Computer Science as an academic discipline, together with Challenge 7, the challenge of providing sufficient teacher professional development*." (UNESCO/IFIP TC3, 2019)

Tim Bell mentioned that *„well-prepared teachers with a good understanding of the purpose of the curriculum are the key to its success*. " (Bell, 2018)

Each country which has introduced the subject of Informatics and Computer Science should be obliged to take action and train teachers in the subject.

1.2. Core competencies required of Informatics/Computer Science teachers

The basic competency requirements that Informatics teachers should meet can be summarized in the following categories:

The teachers in Informatics/Computer science and ICT need the following competences:

- Didactical competences – set-up and analysis of learning objectives, implementation of different interactive teaching and learning methods including game-based activities and design thinking methodology (particularly important for Coding4Girls requirements), implementation of core didactical rules, planning of assessment and evaluation procedures, planning of lessons activities and content.
- Psychological competences – with focus on age group of students, knowledge of psychology characteristics of students and in some cases of parents, psychology of perception of the learning environment and digital technologies.
- Class management – organisational skills for the classroom
- Digital competences - use of different IT tools to support personal and educational activities, ability to choose appropriate tools for implementation in the classroom, evaluation of didactical and technological characteristics of a huge set of educational tools existing in cyberspace, ability for lifelong learning and self-learning in the area of ICT and adaptation to the new emerging technologies.
- School Subject related competences - Deep understanding of concepts of computer science included in school curricula in Informatics, ICT, Computing.

2. COMPUTER SCIENCE TEACHER EDUCATION IN CODIN4GIRLS PROJECT PARTNER COUNTRIES

2.1. Slovenia

2.1.1. National plan for teacher training or/and national standards/requirements for obtaining teacher's qualification

Teachers in Slovenia have to obtain master level degree in order to be allowed to teach in elementary school and high school. Part of their education has to be teacher training, that can be obtained either through studying for teacher or through 60 ECTS additional teacher education program.

2.1.2. Training of the teachers in informatics/computer science

- Pre-Service teacher training: The training of the teachers in computer science is provided by two universities in Slovenia: Faculty of Education, University of Ljubljana and Faculty of natural sciences and mathematics, University of Maribor in Bachelor and Master Degrees. Computer science can also be taught by those who have M.Sc. degree in computer science and finish 60 ECTS teacher education program.

- In-service teacher training: There are several programs of further education and training of professional staff in education that are offered through the Ministry of Education, Science and Sports each year. Among them are also different courses related to teaching computer science and programming that are offered by universities. These courses help teachers to update their knowledge, but they do not offer them the necessary qualification to teach computer science.

2.1.3. Core courses in programming in pre-service curriculum for Teachers in informatics/programming (Computer Science)

Faculty of Education, University of Ljubljana

The teacher education study programme lasts 5 years (300 ECTS): 4 years (240 ECTS) in 1st cycle programmes and 1 year study (60 ECTS) in 2nd cycle programme (master level).

Undergraduate

Name: The two-subject teacher

Type: First cycle university study programme (UN)

Duration: 4 years (240 ECTS)

Core courses in programming in pre-service curriculum for Teachers in informatics/programming (Computer Science)

Courses with main focus on programming

1st Year	An Introduction to Programming - 5 ECTS, Programming 1 - 6 ECTS
2nd Year	Programming 2 - 6 ECTS,
3rd Year	Algorithms and Data Structures - 6 ECTS
4th Year	ICT Supported Teaching Material 1 - 5 ECTS

Courses with focus on teaching programming

2nd Year	ICT for Teaching Computing - 5 ECTS
3rd Year	The Didactics of Computing with Practice - 6 ECTS,
4th Year	ICT Supported Teaching Material 2 - 3 ECTS

Master

Name: Teacher education

Type: Second cycle master study programme

Duration: 1 year (60 ECTS)

Core course in programming in pre-service curriculum for Teachers in informatics/programming (Computer Science)

1st Year	Selected Topics from Computing with Didactics – 6 ECTS

Faculty of Natural Sciences and Mathematics, University of Maribor

The teacher education study programme lasts 5 years (Master level).

Name: The subject teacher

Type: Uniform Master's study program

Duration: 5 years

Core courses in programming in pre-service curriculum for Teachers in informatics/programming (Computer Science)

Courses with main focus on programming

1st Year	Fundamentals of Computer Science and Informatics – 6 ECTS, Programming II – 7 ECTS
2nd Year	Algorithms and Data Structures – 7 ECTS
3rd Year	Fundamentals of Web Programming – 6 ECTS
4th Year	
5th Year	

Courses with focus on teaching programming

1st Year	
2nd Year	
3rd Year	Pedagogical Practice for Computing Science 1 – 4 ECTS, Didactics of Computing Science 1 – 6 ECTS,

4th Year	Didactics of Computing Science 2 - 6 ECTS Pedagogical Practice for Computing Science 2 – 4 ECTS
5th Year	

2.2. Portugal

2.2.1 ICT Teachers

ICT Teachers are integrated in the group 550. To obtain a professional qualification for teaching Informatics it is necessary to hold a Master's Degree in Informatics Education. Currently in Portugal, there are 4 institutions that offer this Master's Degree:

- Instituto da Educação da Universidade de Lisboa
- Instituto de Educação da Universidade do Minho
- Universidade de Évora
- Universidade de Trás-os-Montes e Alto Douro

To access these Master's students must hold a Bachelor's Degree in an Informatics related degree programme. The ANPRI (Association of Portuguese Informatics Teachers) also promote a series of workshops/courses/MOOCs for ICT and non-ICT teachers related to Programming Languages.

2.2.2 Non-ICT Teachers

Non-ICT teachers are usually not familiar with using Programming. Since 2009, the Ministério da Educação has made it mandatory that all teachers take courses related to digital competencies, with one of these 3 courses:

Courses in Digital Competencies for Teachers		
Course A	Course B	Course C
• Access and use of information in digital format; • Writing in Digital Formats; • Introduction to	• Access and use of information in digital format; • Writing in Digital Formats; • Introduction to communication through	• Access and use of information in digital format; • Writing in Digital Formats; • Introduction to communication through

communication through digital means; • Internet Security; • Image Editing; • Creating spreadsheets; • Creating Presentations	digital means; • Internet Security; • Creating spreadsheets; • Creating databases • Creating Presentations	digital means; • Internet Security; • Synchronous/Asynchronous Digital Communication and Interaction • Creating Presentations

In the scope of the different nationwide activities as Probótica and Introduction to Programming, the Government usually promotes specific training activities for teaching Programming, learning computational thinking, how they can apply programming to learning scenarios that are coordinated with other courses (as for example Mathematics) and how to use Scratch.

2.3. Bulgaria

2.3.1. National plan for teacher training and/or national standards/requirements for obtaining teacher's qualification

Teacher education in Bulgaria is carried out in accordance with the state requirements for acquiring professional teacher qualification. They provide a framework for a minimum number of classroom hours in the disciplines of Pedagogy (60 classes), Psychology (60 classes), Teaching Methods in… (90 classes), Integrating Education (15 classes), Information and Communication Technologies in Learning and Working in the Digital Environment (30 classes) , Elective courses with a minimum of 30 academic hours, Practical training at school: 1. Observation: 30 hours; 2. 0n-going Pedagogical Practice: 60 hours; 3. Internship: 90 hours

2.3.2. Training of the teachers in informatics/computer science

- Pre-service teacher education for teachers in Informatics, ICT and Computer modelling.

It is conducted at universities with accredited professional background of *1.3. Pedagogy of training in …* with specialties related to training in computer science or information technology. University of Sofia, South-West University "Neofit Rilski", University of Plovdiv, University of Veliko Tarnovo, University of Shumen, University of Ruse, University of Stara

Zagora. Each university offers its own curriculum in accordance with the state requirements for professional teacher qualification.This type of teacher training is conducted in:

- Bachelor's degree in the area of Education in Mathematics and Informatics, Physics and Informatics (4 years/240 ECTS);
- Bachelor's degree in Informatics with optional module „Teacher in Informatics";
- Master's degree in the area of Education in Informatics:
  - 1 year (60 ECTS) for students with a Bachelor's degree in Education in Mathematics and Informatics/Physics and Informatics).
  - 2 years for students with a Bachelor's degree in the following school subjects: Physics, Bachelor's degree in Informatics without teacher qualification, Mathematics, Applied Mathematics, Engineering, Economics.
- 1 year post-graduate courses for Bachelor's Degree graduates in the fields of Physics, Informatics without teacher qualification, Mathematics, Applied Mathematics, Engineering, Economics;

- In-service teacher training for Informatics, ICT and Computer modelling teachers; Offered by:
  - Universities that have accredited Bachelor's or Master's degree programs in Education in Informatics or all programmes in Informatics and Computer science area;
  - NGOs, Private companies, Software companies, Publishers of school textbooks – all courses have to be approved by the Ministry of education;
  - National program "IT Business Educates", which focuses on IT training and includes three branches: Module 1 "Seminars in schools led by representatives of technology companies"; Module 2 "Involving IT Professionals in the Learning Process at School", Module 3 "Teachers in IT Companies". The third module is aimed at continuing qualification of Informatics and IT teachers in specialized and vocational training in

Informatics; companies conducting seminars for teachers on current topics related to the company's activity in up to 16 astronomical hours of in-service training and/or involvement of teachers in the implementation of projects in the company, with a duration of 20 to 40 astronomical hours. The program is funded by the Ministry of Education and Science.

2.1.3. Core courses in programming in the pre-service curriculum for Teachers in Informatics/Programming (Computer Science)

Each university presents its own curriculum. The main courses in the curricula of Computer Science Teacher Education include: Programming Introduction, Information Technology/Computer Technology, Object-Oriented Programming, Operating Systems, Computer Networks, Databases, Discrete Mathematics, Mathematics and Applied Courses of Mathematics, School Courses in Informatics and Information Technology related to specific educational content in Computer Science at school, etc.

2.4. Italy

2.4.1. National Plan for Teacher training

The Teacher Training Plan provides for an investment of 325 million euros for in-service teacher training, which becomes mandatory and permanent as required by the Good School law. To these resources, the 1.1 billion of the Teacher's Charter are added for a total of 1.4 billion, allocated in the period 2016/2019 for the updating and professional development of the whole teaching staff. All tenured professors will be involved in the training plan, for a total of about 750,000 people.

The Teacher Training Plan aims to renovate school system strategically through the teacher's professional development. It is based on some fundamental assumptions, necessary to overcome the weaknesses of the Italian school system and align it to the best international standards. In particular, the priorities foreseen for the period from 2016 to 2019 are:

A. System competences (Didactic and organizational autonomy; Evaluation and improvement; Teaching skills and methodological innovation);

B. Skills for the 21st century (Foreign languages; Digital and new skills learning environments; School and work);

C. Skills for inclusive school (Integration, active and global citizenship; Inclusion and disability; Social cohesion and prevention of youth disadvantages).

For every teacher professional standards, digital portfolio and individual professional development plan are foreseen.

The teacher has the task of drawing up an individual plan for his/her professional development structured according the following three macro-areas:

1. Teaching skills;

2. Organisational skills (related to school participation);

3. Professional skills (related to their training).

Digital skills and new environments for learning

2.4.2. Training of teachers in informatics/computer science

- *In service teacher training for secondary school teacher for coding skills development*

S.O.F.I.A., standing for Sistema Operativo per la Formazione e le Iniziative di Aggiornamento (Operative System for Training and Updating Initiatives) addressed to teachers, is the platform developed by the Italian Ministry of Education. It allows teachers to be enrolled in refresher courses and to compile his/her own "professional portfolio", a sort of online curriculum to be completed with own training history and, with the new skills acquired.

According to the National Training Plan and the National Digital School Plan, several training courses on coding are published and promoted in this platform. The aim is to develop coding skills and computational thinking in students at all school levels. These courses, promoted through the platform, are accredited and recognized by the Ministry of Education.

The training aim, related to the coding subject, is to promote new digital competencies in teachers and to develop computational thinking or the ability to elaborate concepts and problems in algorithmic form. In particular, the contents are focused on the knowledge improvement of the following topics:

- How to analyse a problem and codify it;
- How to identify the particular cases of a given problem and codify them;
- How to generalize a problem;
- How to work with artefacts and models to be used in different contexts;
- How to develop teaching units in their own discipline that provide for the use of coding and the acquisition of specific skills;
- How to manage working groups with the use of CS-First, the Google platform integrated with Scratch.

Teachers can attend the training virtually or use didactic materials published on code.org and scratch.mit.edu. The training activity, related to these topics, is organized usually in 25 hours and is addressed to develop the following skills:

- Scratch environment as a tool for coding;
- Simple basic blocks;
- Motion and graphic instructions;
- Instructions for audio and multimedia;
- Working with sprites and drawings;
- Variables and lists;
- The conditional statements if-then and loops;
- Creating geometric figures by coding with Scratch;
- Making multimedia presentations with Scratch;
- Creating interactive tools such as quizzes and simulators;
- Outlining simple graphic games;
- Using offline Scratch on PC;
- Using Scratch on tablet;
- Alternative Scratch platform;
- Advanced use of scratching;
- CS-First as a working group management platform;
- Scratch extensions for digital devices programming;
- Educational robotics, using some devices for primary and lower secondary education;
- MakeApp, creating simple mobile apps with coding.

Other training activities for teachers: Programma Futuro

Regarding computational thinking, since the 2014/15 school year, the Ministry has promoted "Program the Future", a training path dedicated to primary and secondary school.

Content of the program

Unit 1: Internet (14 lessons on Sending binary messages; Encoding and sending numbers; Encoding and sending text; IP addresses, packets and redundancy; Routing, DNS, Protocols and Abstraction – Practice PT – the internet and society);

Unit 2: Digital data (15 lessons on Text compression; Encoding images; Practice PT – Encode and experience; Interpreting visual data; Communicating with visualization; Cleaning data and making summary tables; Practice PT – Tell a data story);

Unit 3: Algorithms and Programming (10 lessons on Designing algorithms; procedural

abstraction & top down design; writing functions; loops and documentation; Practice PT – Design a digital scene);

Unit 4: Big data and privacy (9 lessons on Big data in the real world; Identifying and the cost of “free”; foundations of encryption; Asymmetric and public key encryption; Practice PT: the big data dilemma);

Unit 5: The realization of the App (18 lessons on Designing event-driven apps; user input and variables; Boolean logic and conditionals; Practice PT – digital assistant; while loops; simulations; arrays; functions with return value; processing arrays; Practice PT – improve an app);

Unit 6: Final exam (7 lessons on Preparation – create performance task (12 hours); preparation – explore performance task).

2.5. Croatia

2.5.1. National plan for teacher training or/and national standards/requirements for obtaining teacher’s qualification

The National Council for Education as a body established by Croatian Ministry of Science and Education that monitors the quality of pre-school, primary and secondary education in the Republic of Croatia, issued in 2016 Framework of National Qualification Standards for teachers in primary and secondary schools.

This document for the development of the teaching profession in Croatia is in the form of a recommendation and it is still not completely implemented in Croatian educational system.

The Framework considers the integrity of the teacher's professional role and applies to all primary and secondary school teachers regardless of the educational cycle and the curriculum area or subject. It was developed using the methodology of the Croatian Qualification Framework which is in line with European Qualification Framework (EQF) and regulates the system of qualifications at all levels through qualifications standards based on learning outcomes and following the needs of the labour market, individuals and society.

The Framework of National Qualification Standards for teachers in primary and secondary schools includes main competencies necessary for the performance of key activities in the daily work of teachers and their professional development. In order to emphasize competences shared by all teachers, the learning outcomes are written generically, without going into the specifics of a particular school subject. Defined learning outcomes show that the teacher's responsibilities are wider than the specific tasks associated with performance in classroom and encourage professional activities and development without limiting the teacher's autonomy and creativity.

The Framework contains the following sets of learning outcomes:

1. Academic discipline, learning subject/educational area
2. Learning and teaching
3. Evaluation
4. Learning environment
5. Cooperation in school, with family and community
6. Educational system and school organization
7. Professional communication and interaction
8. Professionalism and professional development

2.5.2. Training of the teachers in informatics/computer science

- Pre-service

To obtain a professional qualification for teaching Informatics/Computer science it is necessary that a candidate hold a Master's Degree in Informatics Education (2 years, 120 ECTS). The students can enrol in the Master study of Informatics Education upon completion of Bachelor study of Informatics (3 years, 180 ECTS).

Institutions that offer this Master's Degree in Croatia are:

- University of Rijeka, Department of Informatics
- University of Zagreb, Faculty of Humanities and Social Sciences,
- University of Zagreb, Faculty of Organization and Informatics
- University of Split, Faculty of Science
- Juraj Dobrila University of Pula, Faculty of Informatics.

In Master's Degree programmes students should have 60 ECTS (out of 120 ECTS) through courses from so-called Teaching module that includes courses related to Teaching methods of Informatics/Computer science and Teaching practice in schools but also courses from the fields of Pedagogy, Psychology, and Didactics.

There are also several double-major study programmes at Croatian universities that offer possibility to study Informatic together with some other subject or scientific field, usually from natural (Mathematics, Physics) or technical sciences (Technics) but also from social science (Croatian/English/German/Italian language, History, Pedagogy, Philosophy, etc.). The students who have finished such study programmes are able to teach in schools both Informatics/Computer science and the other mastered subject.

Supplementary teacher education programmes (60 ECTS) are offered to those who hold a Master's Degree in Informatics/Computer science (but not Informatics Education) in order to obtain a professional qualification for teaching Informatics/computer science in schools. An example is "Additional pedagogical and psychological education" programme offered by Faculty of Humanities and Social Sciences, University of Rijeka.

- In-Service

In-service training for teachers is carried out by the Education and Teacher Training Agency (ETTA) and the Ministry of Science and Education.

The teachers of Informatics have started to introduce new curricula in primary and secondary schools from the school year 2018/2019. so, the aim of professional development has been to prepare them for implementing learning outcomes, subject matter, and activities for their students according to the new curriculum. The main goal is to have competent teachers who are ready to respond to the challenges of using modern teaching methods and modern technology.

A virtual learning environment for collaboration and communication has been prepared, bringing together all the teachers of Informatics. This virtual environment named “Loomen” is based on the Learning Management System (LMS) Moodle and enables mentoring, continuous communication between participants, online collaboration and teamwork, and creating a learning community in which all teachers share knowledge and materials.

In addition, teachers are supposed to regularly participate in symposiums, online and offline workshops, and attend lectures and webinars by domestic and foreign experts, usually organised by the ETTA during the school holidays. Topics of the training include those related to computational thinking and programming as well as modern teaching approaches including those about Game Based Learning (GBL).

2.5.3. Core courses in programming in pre-service curriculum for Teachers in informatics/programming (Computer science)

To enrol in Master studies in Informatics Education, students need to hold Bachelor’s Degree in Informatics. It is assumed that the students acquired all the necessary programming knowledge during the Bachelor studies. Examples of some courses which give the students core competences in programming at the bachelor study of Informatics/Computer Science are: Programming 1, Programming 2, Algorithms and data structures, Object oriented programming, Object oriented modelling, Programming for the Internet, etc.

2.6. Turkey

2.6.1. National plan for teacher training or/and national standards/requirements for obtaining teacher's qualification

The Fundamentals of the Assignment of Teachers to Education Institutions affiliated to the Ministry of National Education and the Higher Education Programs they Graduated and the Principles of Courses to be Taken for Monthly Payments

Assignment method

The teaching profession is entered as a candidate teacher.

Article 48 of the Law No. 657, the following special conditions are required for the candidates to be appointed as prospective teachers / teachers;

a) The graduation program should be suitable for the area to be appointed according to the decision of the Ministry regarding the determination of those to be appointed as teachers,
b) Successful completion of pedagogical formation training approved by the Ministry, except for those who will be assigned to areas where graduates of higher education programs, which constitute a resource for teaching, do not meet the needs,
c) The equivalence of higher education and / or pedagogical formation certificates of the graduates of higher education institutions abroad to the higher education institutions or programs in Turkey has been accepted by the Higher Education Council,
d)Those who will be assigned within the scope of the first assignment must have a base score and above for the fields to be assigned from KPSS,
e) Not having been sentenced to be expelled from the civil service or teaching profession.

What are the responsibilities of the IT teacher?

The main task of the information technology teacher is to teach students the principles of information technology. Other responsibilities of professionals can be grouped under the following headings:

- Preparing lesson plans according to curriculum standards;

- Developing interactive course materials that will make the students interested in the course;
- Performing practical training on individual or group basis;
- To control, evaluate and give feedback to students;
- Evaluating student development according to the results of homework, exam and practical application;
- According to the results of measurement and evaluation, to determine which concept should be carried out for the specific study;
- If necessary, contact the parent or school management regarding student development;
- To make updates to the computers, hardware, software, network and operating systems used in the classroom;
- To ensure that students attend courses in an environment in accordance with health and safety procedures;
- Ensuring the layout of the classroom;
- To ensure that students attend courses in an environment appropriate to health and safety procedures;
- To maintain professional development.

2.6.2. Training of the teachers in informatics/computer science

- Pre-service

Ministry of National Education - Department of Education Research and Development - Vocational Teachers' Information Technology Monitoring and Application Levels

The pre-service teacher training is provided by next departments:

1. Computer Education
2. Computer Systems Educational
3. Computer and Control Education
4. Electronics and Computer Education
5. Computer Engineering
6. Computer Science Engineering
7. Control and Computer Engineering
8. Education of Computer and Instructional Technology
9. Department of Mathematics and Computer Science
10. Statistics and Computer Science

11. Department of Computer Technology / Department of Computer Technology and Information Systems

12. Information Technology

- In-service

In-service teacher training is organised in a lot of courses:

- Design and Production Course with 3D Printer
- USB PLC Control and Image Processing Course with Android Programming
- Computer - Python Programming Training Course
- Computer Aided Design (AUTODESK FUSION 360) Course
- Computer Aided Design 3DS Max Course
- Computer Aided Three Dimensional Design (Solidworks) Course
- Computer Aided Publication Indesign Course
- Computerized Mold Applications (ASSYST) Basic Course
- Corel Draw Instructor Training Course
- E-Factory (Basic Level) Course
- Different Approaches in Education Course
- FATIH Project in Education (Pardus Use) Course
- Innovation in Education Course
- Best Practices in Education Seminar
- New Approaches in Education Course
- Industry 4.0 Applications Course
- Introduction to Industrial Automation Technologies (Mitsubishi) Course
- Introduction to Industrial Automation Technologies Course
- Industrial Type Inverter - Servo Motor (Mitsubishi) Course
- Project Writing Training Seminar for Erasmus + Program
- FATIH Project - Conscious and Safe Use of IT and Internet Course
- FATİH Project - Technology Use in Education Trainer Training Course
- FATIH Project - Robotics and Coding Trainer Training Course
- FATIH Project Area Based Instructional Design Instructor Training Course
- FATİH Project Education Information Network V Class Course
- FATİH Project Interactive Classroom Management Course

- Microsoft Office Course
- Microcontrollers and Embedded Systems Course
- Object Oriented Programming (Visual C #) Course
- Network (CCNA 1) Course
- Reading Culture and Z Library Course
- Robot Programming Course
- SPSS Usage (Basic Level) Course
- STEM (Trainer Training) Course
- Presentation Techniques Course
- Basic Robotics Course

2.6.3. Core courses in programming in pre-service curriculum for Teachers in informatics/programming (Computer science)

- Main Courses Taken During Education
- Information Technologies in Education
- Computer Education Technologies
- Computer Managed Instruction
- Graphics and Animation in Education
- Distance Education
- Multimedia Design and Production
- Computer Hardware
- Microprocessors
- Logic
- Database
- Information technologies
- science and technology
- Information and communication technology
- information technologies
- Communication Technologies in a Globalizing Society
- Information Technologies Field;
- Computer Technical Service
- Computer Networks and Communication

- Network Operation
- Web Programming
- Database Programming

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