IT-SPECIALIST

with federal certificate of proficiency (EFZ)

EDUCATIONAL PLAN

To the SERI Ordinance of 19 November 2020 on Basic Vocational Training for

IT-SPECIALIST

with federal certificate of proficiency (EFZ)

TRANSLATION

from November 19, 2020

Job number 88611

RAFISA
INFORMATIK-DIENSTLEISTUNGEN
STIFTUNG INFORMATIK FÜR AUTISTEN

ICT Berufsbildung
Formation professionnelle
Formazione professionale

Table of Contents

List of abbreviations

FOEN	Federal Office for the Environment
BAG	Federal Office of Public Health
BBG	Federal Act on Vocational Training (Vocational Training Act), 2004
BBV	Ordinance on Vocational Training (Vocational Training Ordinance), 2004
BiVo	Ordinance on Basic Vocational Training (Education Ordinance)
EBA	Federal Professional Certificate
EFZ	federal certificate of proficiency
OdA	Organization of the world of work (professional association)
SERI	State Secretariat for Education, Research and Innovation
SBBK	Swiss Vocational Training Offices Conference
SDBB	Switzerland. Vocational Training Service Center | Job, study and career advice
SECO	State Secretariat for Economic Affairs Suva Switzerland. Accident insurance company
üK	inter-company course

1 Introduction

As an instrument to promote the quality[1] of basic vocational training for computer scientists with a federal certificate of proficiency (EFZ), the training plan describes the practical skills to be acquired by the learner up to the completion of the qualification. At the same time, it supports those responsible for vocational training in the training companies, vocational schools and inter-company courses in planning and implementing training.

For the learners, the curriculum is an orientation aid during the training.

[1]cf. Art. 12 para. 1 let. c Ordinance of 19 November 2003 on Vocational Training (BBV) and Art. 22 of the SERI Ordinance on Basic Vocational Training (Education Ordinance; BiVo) for IT specialists

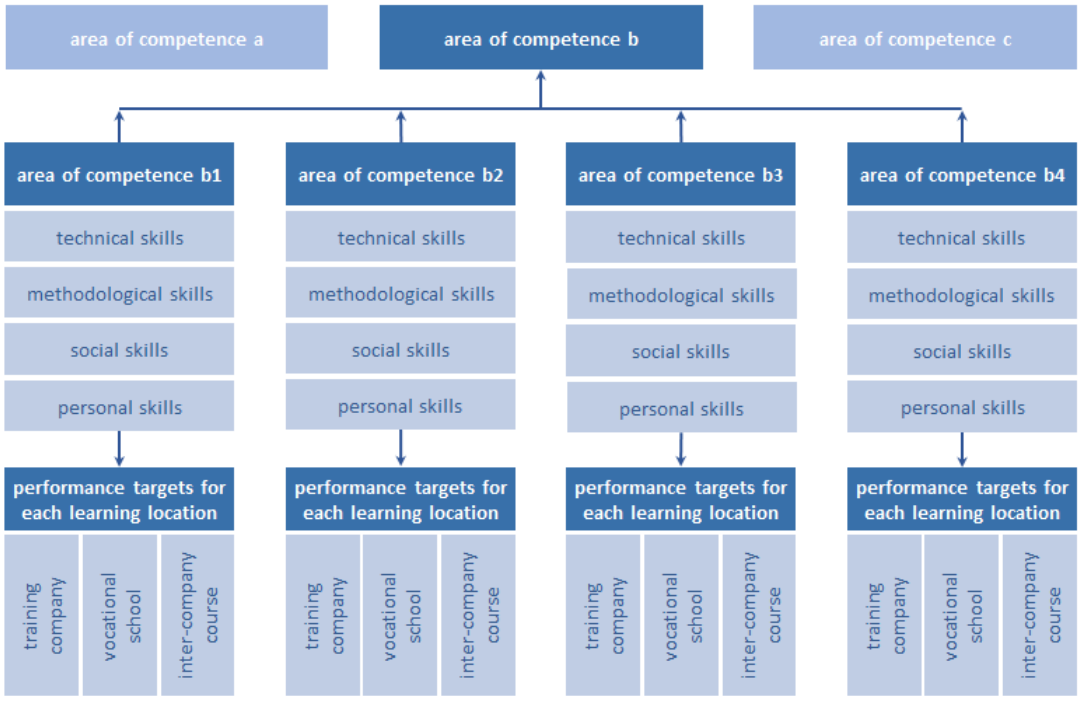
2 Vocational pedagogical basics

2.1 Introduction to action competence orientation

The present curriculum is the pedagogical basis of the basic vocational training in computer science. The aim of basic vocational training is to competently cope with typical professional situations. In order for this to be successful, the learners build up the skills described in this curriculum in the course of their training. These are to be understood as minimum standards for training and define the maximum that can be tested in the qualification process.

The education plan specifies the skills to be acquired. These are presented in the form of action competency areas, action competencies and performance targets.

Presentation of the areas of competence, competence and performance goals for each learning location:



The profession of computer scientist comprises **8 areas of competence**. These describe and justify the fields of activity of the profession and differentiate them from one another.

The profession of computer scientist comprises **8 areas of competence**. These describe and justify the fields of activity of the profession and differentiate them from one another.

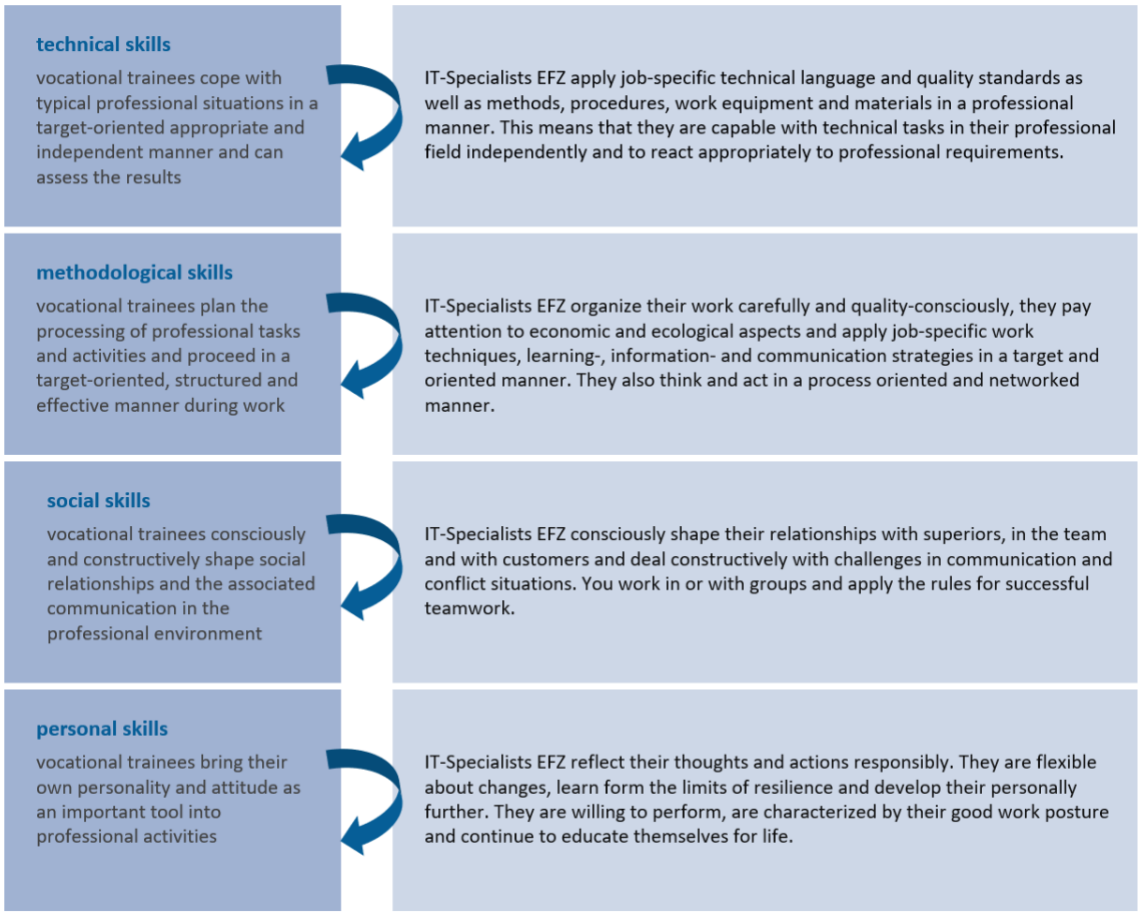
Example: accompanying ICT projects

Each action competence area comprises a certain number of **action competencies**. In action competence area a: Accompanying ICT projects, 7 action competencies are grouped. These correspond to typical professional situations. It describes the expected behavior that the learners should show in this situation. Each action competence includes the four dimensions of technical, methodological, personal and social competence (see 2.2); these are integrated into the performance goals.

In order to ensure that the training company, the vocational school as well as the inter-company courses make their corresponding contribution to the development of the respective action competence, the action competencies are concretized by **performance targets for each learning location**. The lessons in the vocational school and in the inter-company courses are organized through the modules of ICT Vocational Training Switzerland. These are available in the ICT modular system at https://www.ict-berufsbildung.ch/. Action goals and actionable knowledge are defined for each module. The performance goals and modules are coordinated with one another with a view to ensuring optimal cooperation between learning locations.

2.2 Overview of the four dimensions of an action competence

Action competencies include technical, methodological, social and personal skills. In order for computer scientists to survive in the job market, the prospective professionals will acquire these competencies integrally and at all learning locations (apprenticeship company, vocational school, inter-company courses) in the course of basic vocational training. The following illustration gives an overview of the content and the interaction of the four dimensions of an action competence.



2.3 Taxonomy levels for performance goals (according to Bloom)

Each performance goal is assessed with a taxonomy level (K-level; K1 to K6). The K level expresses the complexity of the performance goal. In detail they mean:

Levels	Term	Description
K 1	**Knowledge**	IT specialists EFZ reproduce what they have learned and call it up in a similar situation.
K 2	**Under-standing**	IT specialists EFZ explain or describe the knowledge they have learned in their own words.
K 3	**Application**	IT specialists EFZ apply the technologies / skills they have learned in different situations.
K 4	**Analysis**	Computer scientists EFZ analyze a complex situation, i.e. they break down facts individual elements, reveal relationships between elements and find the structural features.
K 5	**Synthesis**	Computer scientists EFZ combine individual elements of an issue and put them together into a whole.
K 6	**Assessment**	IT specialists EFZ assess a more or less comply issue on the basis of certain criteria.

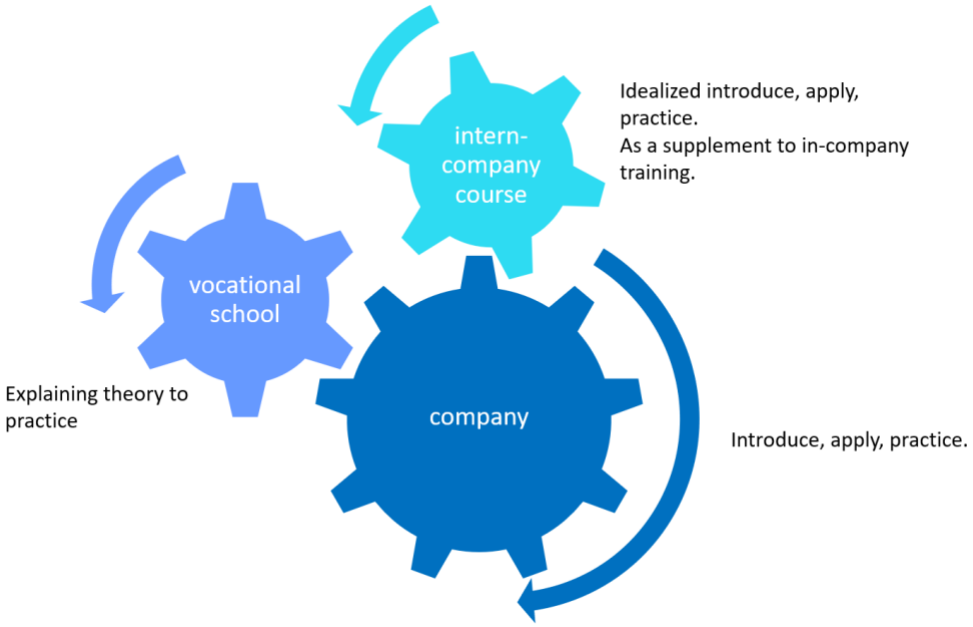
2.4 Cooperation between the learning locations

Coordination and cooperation of the learning locations (with regard to content, working methods, time planning, customs of the profession) are an important prerequisite for the success of basic vocational training. During the entire training, the learners are to be supported in bringing theory and practice into relation with one another. Cooperation between the learning locations is therefore essential, and imparting skills is a shared task. Each learning location makes its contribution taking into account the contribution of the other learning locations. Thanks to good cooperation, each learning location can continuously review and optimize its contribution. This increases the quality of basic vocational training.

The specific contribution of the learning locations can be summarized as follows:

- The teaching company: In the dual system, training takes place in professional practice in the training company, in the training company association, in training workshops, in commercial secondary schools or in other institutions recognized for this purpose, where the learners are taught the practical skills of the profession.
- The vocational school: it provides school education, which consists of teaching professional knowledge, general education and sport.
- The inter-company courses: they serve to impart and acquire basic skills and complement training in professional practice and school education where the professional activity to be learned requires this.

The interaction of the learning locations can be shown as follows:



Successful implementation of the cooperation between learning venues is supported by the appropriate instruments for promoting the quality of basic vocational training (see appendix).

3 Qualification profile

The qualification profile describes the job description as well as the skills to be acquired and the level of requirements of the job. It shows what qualifications a computer scientist must have in order to competently exercise the profession at the required level.

In addition to the description of the competencies, the qualification profile also serves as the basis for structuring the qualification procedure. In addition, it supports the classification of the vocational qualification in the national qualifications' framework for vocational training (NQF Vocational Training) when drawing up the certificate supplement.

3.1 Job profile

Computer scientists are specialists in the development, introduction and management of ICT solutions. They ensure that the economy has the necessary ICT resources at its disposal. IT specialists work in companies of all sizes and across all economic sectors. These are on the one hand user companies such as banks, administrations or insurance companies, on the other hand supply companies such as ICT service providers or ICT developers. Computer scientists specialize in one of the two fields of platform development or application development.

Work area

Computer scientists carry out their assignments as part of a team. They manage simple projects or sub-projects independently. They develop their products and solutions in close cooperation with a wide range of stakeholders. This includes in particular customers, users, suppliers and external service providers. They also exchange knowledge and information in the community.

Computer scientists specializing in platform development are responsible for setting up, operating and monitoring networks, services and server systems. They ensure the functionality and performance as well as the energy efficiency of the ICT infrastructure of companies or private customers.

Computer scientists specializing in application development implement software solutions for products, processes or services in a wide variety of industries. You are responsible for ensuring that customer requirements are translated into functional technical solutions.

Most important action skills

Computer scientists support ICT projects as employees of teams. Your clients can be internal offices or external customers. They clarify the needs of the stakeholders and translate their goals and requirements into technical language. You plan a project in terms of time and human resources and continuously monitor compliance with the goals. In doing so, they apply project-specific procedures, from conventional project management methods to agile approaches.

The professional handling of digital data is a central competence of computer scientists. They develop suitable models for storing data and take security and data protection measures.

As part of their work, they support users, e.g., with complex support inquiries, with the introduction of new ICT solutions and with advice on handling data or the implementation of IT security guidelines.

Computer scientists specializing in platform development ensure seamless operation of the ICT infrastructure and its services in accordance with customer requirements. You plan local networks (LAN), select suitable network components, install and configure them and finally monitor ongoing operations. They act with foresight and take measures to ensure the performance and security of a network.

Physical or virtual server systems and services are central components of ICT platforms. Computer scientists specializing in platform development plan, manage and maintain these. They also use monitoring to ensure that the security and availability of the systems and services is guaranteed.

Computer scientists specializing in application development maintain a close exchange with users and clients so that they are informed at an early stage about the changing requirements of their ICT solution or the system context. You will analyze user models, create design drafts and develop prototypes. In close consultation with stakeholders and the team, they work out the implementation variant conceptually. Finally, they implement them using suitable programming languages.

They check quality and safety using a test concept.

Computer scientists ensure the smooth delivery or provision of their solutions. To do this, they define a suitable process and implement it. You carry out final tests and finally hand over the solution to your client or stakeholder.

Professional practice

Computer scientists are in constant contact with partners as well as clients and other stakeholders. You are required to think your way around a wide variety of industries and business processes and to understand exactly what tasks, processes and responsibilities are. You are characterized by a good and quick perception, communicate well and have the ability to take different perspectives in order to grasp the needs of the stakeholders in their entirety. They present their concepts, variants and finally finished solutions to the stakeholders. You often work in an international environment and therefore have a good command of English.

Computer scientists work in a solution-oriented manner as part of their projects and assignments. They research specifically for information in order to close knowledge gaps or to determine the current state of the art. This constant acquisition of knowledge enables them to develop innovative solutions and to suggest improvements to their stakeholders. Especially in the area of application development, they use graphic aids creatively to design intuitive user interfaces and to achieve a positive user experience.

Computer scientists are used to systematic work. They store requirements, concepts, interim results, test results as well as final solutions in a structured and clear manner. This ensures traceability, for example if adjustments are required later in the process flow or a solution is further developed. You apply efficient procedures that meet both qualitative and economic requirements.

Computer scientists have a high level of analytical skills. When making decisions, e.g. the selection of suitable applications, systems, services or components, they take a holistic perspective and consider possible effects. They also take into account criteria such as energy efficiency and the sustainability of the products. If malfunctions or problems occur during operation, they address them systematically and with the necessary persistence.

The importance of data security and data protection has increased significantly. Computer scientists take security aspects into account in all project phases and processes. They ensure that the solutions they develop meet the legal requirements. They handle sensitive data carefully and treat them confidentially.

Thanks to their modern infrastructure, computer scientists often work mobile and independent of location. They use flexible working models and can work full-time as well as part-time. Depending on the project, they work in different team compositions.

Importance of the profession for society, economy, nature and culture

The penetration of the professional world with ICT services makes the profession of computer scientist a key occupation. Hardly any branch of industry, a business process or a product can do without ICT tools. Computer scientists play a crucial role in the development of new services and products as well as the transformation of existing business models and ensure ongoing operations. In addition, they protect ICT infrastructures and data with suitable means against attacks or misuse and thus make a significant contribution against cyber-crime.

Computer scientists play a key role in designing ICT infrastructures and services to be energy- and resource-efficient and thus making them fit for the future. When developing applications, they consider approaches to control the energy and material flows caused by the use of the software to reduce. They plan ICT infrastructures based on demand and take measures with which they can be operated in an energy-efficient and environmentally

friendly manner. In this way, they not only help to lower the costs of your company, but also contribute to the achievement of Swiss climate and energy targets.

General knowledge

General education includes basic skills for orientation in the personal context of life and in society as well as for coping with private and professional challenges.

3.2 Overview of the competencies

Both disciplines	Specializing in platform development	Specializing in application development

Action competence areas		Action skills							
a	Accompanying ICT projects	a1: Clarify and document the needs of stakeholders as part of an ICT project	a2: Determine the process model for an ICT project	a3: Research information on ICT solutions and innovations	a4: Plan ICT projects and the resulting tasks according to the process model	a5: Variants for Visualize and present ICT solutions	a6: Check the progress of ICT projects and the resulting tasks according to the process model and Report	a7: Hand over ICT solutions to the customer and complete the project	
b	Support and advice in the ICT environment	b1: set up your own ICT workstation	b2: Receiving and processing complex ICT support inquiries	b3: Advising customers on data protection and data security ten	b4: Analyze and visualize customers business processes and document				
c	Creation and maintenance of digital	c1: Identify and analyze data and develop data models	c2: Implement data models in a digital data storage medium	c3: Plan and implement data security and data protection for ICT solutions and document	c4: Prepare data from digital data storage				
d	Delivery and operation of ICT solutions	d1: Record, standardize and automate ICT processes sate	d2: Define the delivery process for ICT solutions	d3: Prepare the execution platform for ICT solutions	d4: Put ICT solutions into operation				
e	Operation of networks	e1: Plan and document networks	e2: Select network components and commission them	e3: Maintain and further develop networks	e4: Implement, document and check the security of networks	e5: Analyze, optimize and document the performance of a network animals	e6: monitor networks		
f	Operation of server systems and server services	f1: Plan and document server systems and services	f2: Commissioning server systems	f3: Commissioning server services	f4: Maintaining and managing server systems and services	f5: Monitor server systems and services.	f6: Security of server systems and Implement services, document-check and check	f7: plan and implement availability of server systems and services	f8: create and implement backup and archiving concepts for data
g	Development of applications	g1: Analyze and document requirements for applications and interfaces	g2: Check design drafts for user interfaces for technical feasibility and develop them further	g3: Assess and document the security of applications and interfaces	g4: Design implementation variants for applications and develop conceptual solutions	g5: Applications and interfaces Implement according to the design and comply with the safety requirements fulfill	g6: Check the quality and safety of applications and interfaces		
h	Delivery and operation of applications	h1: determine a suitable platform for the delivery of applications	h2: Define the delivery process for applications	h3: Carry out the delivery process for applications	h4: Monitor applications and interfaces and identify problems in the running fix the operation				

In the action competence areas, a – c is the

Establishing the skills required for all learners. In the action competence areas i.e., the structure of the action competencies is binding depending on the subject area as follows:

a. Action competence area d – f: for the field of platform development.
b. Competence area g – h: for the application development specialty.

3.3 Requirement level of the profession

The skill level of the profession is further described in the education plan with the performance goals and modules at the three learning locations that are part of the competencies. In addition to the practical skills, general education is imparted in accordance with the SERI Ordinance of April 27, 2006 on minimum requirements for general education in basic vocational training (SR 412.101.241).

4 Action competency areas, action competencies and performance goals for each learning location

This chapter describes the action competencies grouped into action competency areas and the performance goals for each learning location. The instruments listed in the appendix for promoting quality support the implementation of basic vocational training and promote cooperation between the three learning locations.

Competence area a: Accompanying ICT projects

Action competence a1: Clarify and document the needs of stakeholders as part of an ICT project

Computer scientists record the project goals and needs of the stakeholders and document them:

First, they ask about the project goals and clarify overarching parameters such as costs, time, quality, scope, responsibilities and methodology (initial road mapping session). You use various survey and observation techniques (e.g., open, closed questions, meetings, workshops, shadowing, simulation of the solution to be sought in the form of a time leap). Thanks to their empathy, they are able to precisely capture the needs of the stakeholders / customers and to conduct the conversation in a targeted manner. Next, they analyze the system context: What requirements does the system to be developed have to meet? You clarify the system and context delimitation and identify interfaces. You will develop solutions to eliminate possible conflicting goals. (Requirements Elicitation)

Then they transfer the natural language definition (of the stakeholders) into model-based documentation and classify the project goals and requirements (e.g., Kano model). You take care to minimize any room for interpretation. The aim is to have clear, referenceable project goals and requirements as a basis for the further approach of the engineering process. (Requirements Documentation / Communication)

In a further step, they check the recorded project goals and requirements with regard to measurability, consistency, completeness, necessity, correctness and referenceability. They use supporting techniques (e.g., inspection, walkthrough, perspective-based reading, testing by prototype). (Requirements Validation)

Finally, they define the properties for managing the individual project goals and requirements (e.g., versioning, identifier for referencing, description, author, source, criticality, priority). (Requirements Management)

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
a1.1: You clarify project goals and overarching parameters such as costs, time, quality, scope, responsibilities and methodology of an ICT project. (K3) a1.2: You use various survey and observation techniques (e.g., open, closed questions, meeting, workshop, shadowing, simulation of the desired solution in the form of a time leap). (K5) a1.3: You analyze the system context, define the system and context and identify interfaces. (K4) a1.4: You work out solutions to eliminate possible conflicting goals. (K5) a1.5: You translate the natural language definition (of the stakeholder) into model-based documentation with clear, referenceable project goals and requirements. (K5)	431: Carry out tasks independently in your own environment 306: Handle small projects in your own professional environment	

a1.6: You check the project goals and requirements with regard to measurability, consistency, completeness, necessity, correctness and referenceability (K4) a1.7: You define the properties for the administration of the individual project goals and requirements (e.g. versioning, identifier for referencing, description, author, source, criticality, priority). (K3)		

Action competence a2: Determine the procedural model for an ICT project

Computer scientists choose a process model that corresponds to the project goals and requirements:

First, they analyze the parameters determined in action competence a1 and the conditions given by the client (e.g., team structure, dynamics of requirements, development culture, team size).

Then they weigh the advantages and disadvantages of different plan-driven resp. Agile (iterative, incremental) process models in relation to the ICT project, evaluate them and select a suitable model. If necessary, they adapt the process model to the specific project (process tailoring).

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
a2.1: You analyze the conditions and parameters given by the client. (K4) a2.2: You weigh the advantages and disadvantages of different plan-driven resp. Agile (iterative, incremental) process models in relation to an ICT project and choose a suitable model. (K4) a2.3: You adapt a process model specifically for a project (process tailoring). (K5)	431: Carry out tasks independently in your own environment 306: Handle small projects in your own professional environment	

Action competence a3: Research information on ICT solutions and innovations

Computer scientists are specifically looking for information on ICT solutions in order to close knowledge gaps or to record the current state of the art:

You are looking for innovations, e.g., to create an overview of the market situation or to record the current state of the art. To do this, they search systematically and systematically for information from digital and analog sources. They examine the results critically and identify reliable and unreliable or dubious sources. They pay attention to information on products and solutions that enable economical use of energy and careful use of the resources used.

You collect several variants from the results, compare and evaluate them. They show their technical potential and risks.

For the preferred variant, they create a technical proof of concept (PoC) to prove the basic feasibility of a project (e.g., to minimize risk).

Performance targets operation	Vocational school modules	Inter-company course modules
a3.1: You search focused and systematically for information from digital and analog sources. (K4) a3.2: You determine reliable sources. (K4) a3.3: You compare several variants from the results and evaluate them. (K4) a3.4: You show the technical potentials and risks of variants. (K4) a3.5: You create a technical proof of concept (PoC). (K5)	241: Initialize innovative ICT solutions 245: Implement innovative ICT solutions	248: Realizing ICT solutions with current technologies (elective module)

Action competence a4: plan ICT projects and the resulting tasks according to the process model

Computer scientists plan their tasks according to the chosen procedural model:

Regardless of the process model, they break down an overall task into smaller, more easily assessable activities that can be allocated to a resource (from rough to detailed). They differentiate activities according to effort and duration, create an approximate time estimate and estimate the degree of complexity of the task. They also clarify the sequential dependencies, define the chronological order and, if necessary, store them with resources. Finally, they group and prioritize activities to achieve an interim goal based on time or functional specifications and record this in writing.

In the following, using the example of Scrum, explained "across roles" and in a simplified manner:

You define and prioritize (e.g., BV, ROI) user stories in the product backlog together with the stakeholders.

You define velocity and goals (condition of satisfaction) for the planned iteration (sprint).

They estimate (story points) the user stories (story poker).

You determine the sprint backlog.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
a4.1: You divide an overall task into smaller, more assessable activities that can be assigned to a resource. (K3) a4.2: You identify activities according to type of effort or duration. (K4) a4.3: You estimate the effort, duration and degree of complexity of activities. (K4) a4.4: You clarify the sequential dependencies of activities and define the chronological order. (K4) a4.5: You group and prioritize activities to achieve an intermediate goal based on time or functional specifications. (K3)	431: Carry out tasks independently in your own environment 306: Handle small projects in your own professional environment	

Action competence a5: Visualize and present variants for ICT solutions

Computer scientists prepare different variants of ICT solutions visually and present them:

First, they identify the target group and their information needs about the ICT solutions according to the catalog of requirements. They then identify the target group-relevant features of the ICT solutions. Then they prepare the knowledge gained from the characteristics visually in a way that is appropriate for the target group and the problem (e.g., flipchart, whiteboard, presentation program, video conferencing). They use their creativity and imagination.

Finally, they present their proposed solutions conclusively and convincingly to help the decision-makers in their decision-making (e.g., through storytelling).

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
a5.1: You identify the target group and their information needs for an ICT solution according to the catalog of requirements. (K4) a5.2: You identify the target group-relevant features of an ICT solution. (K4) a5.3: You visualize the knowledge gained from the characteristics in a way that is appropriate to the target group and the problem (e.g., flipchart, whiteboard, presentation program, video conferencing). (K5) a5.4: You present your proposed solutions conclusively and convincingly (e.g., through storytelling). (K5)	431: Carry out tasks independently in your own environment 306: Handle small projects in your own professional environment	

Action competence a6: Review and report the progress of ICT projects and the resulting tasks according to the process model

Computer scientists continuously check the progress of a project or their tasks in it and report it according to the project-specific procedure model:

Depending on their role, they first collect or provide assessments of the status of the assigned orders (in person or via a tool). If you have a coordinating or leading role in the project, there are further steps:

They collect the reviews, categorize and prioritize them. They then consolidate the assessments and, if necessary, develop suggestions for corrective measures. In a further step, they record the progress in writing, visualize and communicate it. Finally, together with the decision-makers, they determine the further course of action, e.g., decision on corrective measures.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
a6.1: You provide assessments on the status of the assignments assigned to you (in person or via a tool). (K3) a6.2: You categorize and prioritize collected reviews. (K4) a6.3: You consolidate the assessments and, if necessary, develop suggestions for corrective measures. (K5) a6.4: You record the progress in writing and present it visually. (K3) a6.5: You report the summarized results on the project progress according to the project-specific process model. (K3)	431: Carry out tasks independently in your own environment 306: Handle small projects in your own professional environment	

Action competence a7: Hand over ICT solutions to the customer and complete the project

Computer scientists' hand over an ICT solution to the customer and complete the project according to the agreement in the project order:

To do this, they first find out who is to be involved with the customer. If not yet available, they will work with the customer to determine the acceptance criteria and procedures as well as the timing of the handover.

Next, they provide the documentation agreed in accordance with the project order. If necessary, they plan a training course / instruction and prepare the training documents. Then they carry out the acceptance according to the specified criteria and record it. Finally, archive and save your work according to company-specific requirements.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
a7.1: You determine the people to be involved at the customers. (K3) a7.2: Together with the customer, you determine the acceptance criteria and procedures as well as the timing of the handover. (K3) a7.3: You provide the documentation agreed according to the project order. (K3) a7.4: You are planning a training course / instruction. (K3) a7.5: You prepare the training materials. (K5) a7.6: You carry out an acceptance according to defined criteria and record it. (K3) a7.7: You archive and save your work according to company-specific requirements. (K3)	431: Carry out tasks independently in your own environment 306: Handle small projects in your own professional environment	

Action competence area b: Support and advice in the ICT environment

Action competence b1: Set up your own ICT workstation

Computer scientists set up their own digital workstation with all the necessary components:

The first step is to set up the computer with an operating system, connect it to a network and test the connection. You configure the necessary security measures (firewall, anti-virus systems, etc.) in accordance with company guidelines. If necessary, they install software, test whether it is working properly and, if necessary, carry out updates. They then connect the computer to other peripheral devices to be used and test their functionalities.

Furthermore, they set up their office table and chair in such a way that ergonomic principles are adhered to. They use office supplies and energy sparingly.

Performance targets operation	Vocational school modules	Inter-company course modules
b1.1: You set up a computer with an operating system. (K3) b1.2: You connect the computer to a network and test the connection. (K3) b1.3: You configure the necessary security measures (firewall, anti-virus systems, etc.) in accordance with company guidelines. (K3) b1.4: You install software, test it and carry out updates if necessary. (K3) b1.5: You connect the computer to the peripheral devices to be used and test their functionalities. (K3) b1.6: You set up your office table and chair according to ergonomic principles. (K3)	114: Use coding, compression and encryption methods 117: Realizing IT and network infrastructure for a small company	187: Put ICT workstation with operating system into operation

Action competence b2: Receive and process complex ICT support inquiries

Computer scientists accept complex support inquiries and develop solutions:

As part of 3rd level support, you will receive a support request for a complex ICT problem. You accept this and immediately begin to systematically analyze the content of the request (e.g., with the help of a questionnaire or a checklist).

Using suitable methods or collaborations, they bring about a solution and document it according to company-specific requirements. You prepare your solution for the inquiry in a target group-oriented manner (e.g., for 2nd level support) and communicate it to the inquirer.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
b2.1: You systematically analyze complex inquiries (e.g., with the help of a questionnaire or a checklist). (K4) b2.2: You bring about solutions using suitable methods or collaborations. (K5) b2.3: You document solutions according to company-specific requirements. (K3) b2.4: You prepare solutions for an inquiry in a target group-oriented manner (e.g., for 2nd level support) and communicate them. (K3)		

Action competence b3: Advising customers on data protection and data security

Computer scientists advise customers on how to handle sensitive data and point out solutions for protective measures:

To do this, they first clarify the security situation with customers with specific questions in relation to the system, network, software and data. On the basis of this information, they suggest necessary and recommended protective measures to customers in the evaluated areas. They create awareness of dangers in the network and in dealing with sensitive data.

In order to fulfill these tasks, they are constantly informed about changes in the legal framework / requirements. If necessary, they train employees in the application of the company's own IT guidelines.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
b3.1: You use specific questions to clarify the customer's security situation with regard to the system, network, software and data. (K4) b3.2: You inform customers about dangers in the network and how to deal with sensitive data. (K3) b3.3: You propose necessary and recommended protective measures to the customer in the evaluated areas. (K5) b3.4: You train employees in the application of the company's own IT guidelines. (K5)	231: Apply data protection and data security	216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module) 185: Analyze and implement security measures for SME IT (elective module) 107: Implementing ICT solutions with blockchain technology (elective module)

Action competence b4: Analyze, visualize and document customers' business processes

Computer scientists analyze business processes, present them graphically and document them:

In a first step, they identify relevant process information (designation, triggering event, result, trigger, recipient). Then they break down the business processes into individual process steps in a task analysis. Now they document the process flow and display it graphically on the basis of recognized and customary description standards.

In a further step, you specify the process flow with additional information such as required tools, executing bodies and the description of the output to be generated (result).

Finally, they hand over the documentation to the customer.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
b4.1: You identify relevant process information (designation, triggering event, result, trigger, recipient). (K4) b4.2: You break down a business process into individual process steps in a task analysis. (K4) b4.3: You document a process flow and display it graphically on the basis of recognized and customary description standards. (K3) b4.4: You specify the process flow with additional information such as required tools, executing bodies and the description of the output to be generated (result). (K3)	254: Describe business processes in your own professional environment	

Competence area c: Establishing and maintaining digital data

Action competence c1: Identifying and analyzing data and developing data models

Computer scientists analyze data from various data sources and summarize them in a suitable data model:

Depending on the job, they receive data from various structured and unstructured data sources. First of all, look through the data and classify them in terms of the 4V model (volume, variety, velocity, veracity). Next, they examine the data for uniqueness and inconsistency and clean it up if necessary.

In a further step, you gain indicators / clues for modeling from existing forms of evaluation (reports). Depending on the data type, you determine suitable test cases for data correctness and a suitable structure for the cleaned data. Finally, they normalize the data model and map it in a suitable representation.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
c1.1: You sift through data from various structured and unstructured data sources and classify them in terms of the 4V model. (K4) c1.2: You examine data for uniqueness and inconsistency and correct them if necessary. (K4) c1.3: You gain indicators / reference points for the creation of a model from existing forms of evaluation (reports). (K4) c1.4: Depending on the data type, you determine suitable test cases for data correctness. (K3) c1.5: You determine a suitable structure for the cleaned data. (K4) c1.6: You normalize a data model. (K3 c1.7: You map a data model in a suitable representation. (K3)	162: Analyze and model data 164: Creating databases and inserting data	110: Analyzing and presenting data with tools (elective module) 259: Developing ICT solutions with machine learning (elective module)

Action competence c2: Implementing data models in a digital data storage medium

Computer scientists implement a data model in a suitable digital data storage device:

To do this, first select a suitable data store (e.g., object-relational, relational, distributed / central). Now they implement a normalized data model for storage, taking referential integrity into account.

Next, they plan function and performance tests and prepare the necessary test data. They carry out the function and performance tests and evaluate them. They also plan and carry out data migrations from different source systems to a target system. They check the migrated data in the target system for completeness, integrity and correctness.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
c2.1: You choose a suitable data store (e.g., object-relational, relational, distributed / central). (K3) c2.2: You implement a normalized data model for storage, taking referential integrity into account. (K3) c2.3: You plan function and performance tests and prepare the necessary test data. (K5) c2.4: You carry out function and performance tests. (K3) c2.5: You evaluate function and performance tests. (K4) c2.6: You plan and carry out data migrations from different source systems to a target system. (K5) c2.7: You check the migrated data in the target system for completeness, integrity and correctness. (K4)	164: Creating databases and inserting data	106: Querying, processing and maintaining databases

Action competence c3: Planning, implementing and documenting data security and data protection for ICT solutions

Computer scientists plan, implement and document measures for data security and data protection:

In a first step, they identify and categorize data worthy of protection. Next, they model the sensitive data in accordance with privacy by design. They clarify and qualify the necessary protective mechanisms according to their protection worthiness. In doing so, they take into account the legal framework (including GDPR) and interpret them appropriately.

Then they develop a data security and role concept according to the order, document it and implement it (e.g., create backup, set access authorization, encrypt data).

Finally, they check the data security and protection mechanisms that have been set up with regard to their effectiveness.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
c3.1: You identify sensitive data and categorize them. (K4) c3.2: You model sensitive data in accordance with privacy by design. (K3) c3.2: They clarify the necessary protective mechanisms according to their protection worthiness and qualify them. (K4) c3.4: You develop a data security and role concept according to the order. (K3) c3.5: You create a backup and check whether the restoration was successful. (K3) c3.6: You set access rights according to the concept. (K3) c3.7: You encrypt data according to the concept. (K3) c3.8: You check the data security and protection mechanisms in place with regard to their effectiveness. (K4)	231: Apply data protection and data security	106: Querying, processing and maintaining databases 185: Analyze and implement security measures for SME IT (elective module) 210: Using the public cloud for applications (elective module) 109: Operating and monitoring services in the public cloud (elective module) 259: Developing ICT solutions with machine learning (elective module) 107: Implementing ICT solutions with blockchain technology (elective module)

Action competence c4: Prepare data from digital data storage

Computer scientists analyze and process data from digital data storage media:

At the beginning, they read the data into suitable analysis software. They then carry out an exploratory data analysis and identify possible data errors. You check the validity of the processed data through random samples.

Next, they compare established processing methods and forms of representation with one another and evaluate them. On this basis, you select suitable forms of representation and use them (e.g., logarithmic and linear representation of non-linear relationships). Finally, they provide the data anonymously (e.g., for test cases).

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
c4.1: You read data into suitable analysis software. (K3) c4.2: You carry out an exploratory data analysis and identify possible data errors. (K4) c4.3: You compare established processing methods and forms of representation and evaluate them. (K4) c4.4: You choose suitable forms of representation and use them. (K3) c4.5: You check the validity of the processed data by means of random samples. (K3) c4.6: You provide anonymized data. (K3)	162: Analyze and model data ren	259: Developing ICT solutions with machine learning (elective module) 110: Analyzing and presenting data with tools (elective module)

Competence area d: Delivery and operation of ICT solutions

Action competence d1: Record, standardize and automate ICT processes

Computer scientists record, standardize and automate ICT processes (e.g. user management, service provisioning, log analyzes). This increases the efficiency and quality of the implemented ICT processes:

In a first step, they collect the requirements of the stakeholders in relation to business and / or operationally relevant ICT processes. This happens, for example, as part of a consultation (a1). On this basis, they derive a technical solution proposal and record it in writing. In doing so, they take particular account of operational conditions and standards (e.g. BPMN, orchestration tools, scheduling tools, OS builds).

Finally, they implement the proposed solution. They automate the defined processes step by step. To do this, they use script languages, Infrastructure as Code (IaC) and / or automation frameworks. You will adhere to best practices, taking into account best practices.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
d1.1: You record customer needs in relation to ICT processes in the form of technical requirements in a comprehensible and solution-neutral manner. (K4) d1.2: You derive a technical solution proposal from the requirements and record it clearly. (K4) d1.3: You automate defined ICT processes using script languages, Infrastructure as Code (IaC) and / or automation frameworks. (K4)	122: Automating processes with a script language 158: Planning and executing software migration 169: Provide services with containers 319: Design and implement applications 122: Automating processes with a script language	188: Operate, maintain and monitor services 223: Realizing multi-user applications in an object-oriented manner (elective module) 335: Realizing the mobile application (elective module) 216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module) 210: Using the public cloud for applications (elective module) 109: Operating and monitoring services in the public cloud (optional module)

Action competence d2: Define the delivery process for ICT solutions

Computer scientists define the process with which developed ICT solutions are delivered to the customer. This enables you to achieve a professional delivery of the ICT solution that meets the requirements:

First, they identify existing delivery processes (e.g., software deployment and hardware rollout) taking into account the interfaces and stakeholders concerned. You determine a suitable platform and / or necessary extensions and adjustments.

They document the definitive delivery process in writing and communicate it to all affected departments. In addition, they create a test concept for the delivery (e.g., function and integration tests) and take into account possible security risks (e.g. hardware life cycle, securing data transmission, security concept for the individual components).

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
d2.1: You identify existing delivery processes, affected interfaces and stakeholders. (K4) d2.2: You determine a suitable platform, necessary extensions and adjustments in relation to the defined requirements of the solution. (K4) d2.3: You document a complete delivery process clearly and comprehensibly. (K3) d2.4: You present a delivery process to relevant stakeholders in an understandable and clear manner. (K3) d2.5: You create a complete test concept to test the function and integration of the delivery. (K3)	122: Automating processes with a script language 158: Planning and executing software migration	217: Conceive, plan and build a service for the Internet of Everything (elective module)

Action competence d3: Prepare execution platform for ICT solutions

Computer scientists prepare an execution platform for ICT solutions:

You provide the defined execution platform (according to d2) (e.g., continuous delivery toolchain, virtualization platform). In doing so, they maintain a close and proactive exchange with relevant project participants. They also configure the platform according to the planned requirements. They clearly document the steps and settings made. Finally, they check whether the prepared platform can be removed.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
d3.1: You provide a defined execution platform. (K3) d3.2: You configure an execution platform according to the planned requirements. (K3) d3.3: You document the configuration of an execution platform in a comprehensible manner. (K3) d3.4: You check a prepared platform with regard to the defined requirements. (K3)	158: Planning and executing software migration 169: Provide services with containers	216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module) 210: Using the public cloud for applications (elective module) 109: Operating and monitoring services in the public cloud (optional module)

Action competence d4: putting ICT solutions into operation

Computer scientists put ICT solutions into operation according to requirements. This ensures a successful handover to the client:

Depending on the project, they apply for the necessary access rights as well as authorizations for commissioning. If necessary, they coordinate the adjustments to the systems. Then they carry out the commissioning (e.g., execution of deployment scripts, rollout). They are in regular contact with the stakeholders and inform them about the progress of the commissioning. You test the corresponding solution according to the test concept (d2). Finally, they review the solution for security risks.

They hand over the implemented ICT solution to the client. If necessary, they conduct training or create documentation (see a7).

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
d4.1: You apply for the necessary access rights as well as authorizations for commissioning. (K3) d4.2: You coordinate adjustments to the peripheral systems. (K4) d4.3: You execute deployment scripts for commissioning. (K3) d4.4: You carry out a software rollout. (K3) d4.5: You coordinate a hardware rollout with the affected stakeholders. (K4) d4.6: You regularly inform clients about the progress of commissioning. (K3) d4.7: You test a commissioned ICT solution for functionality and security. (K4)	122: Automating processes with a script language	216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module) 210: Using the public cloud for applications (elective module) 109: Operating and monitoring services in the public cloud (optional module)

Competence area e: Operation of networks

Action competence e1: plan and document networks

Computer scientists plan existing or new IP networks for a wide variety of clients (small businesses to large companies) and update the necessary documentation. In this way, they create a comprehensible basis for the construction and operation of the networks:

First, they record the requirements (e.g., availability, security) from relevant stakeholders (e.g. client, internal department, manufacturer) (see a1). Based on the requirements, they derive an initial proposal or possible solutions. Depending on the situation, they take into account operational conditions, technical standards or legal requirements. You put the proposal in writing.

In the next step, you carry out the detailed design: You design the suitable network infrastructure (LAN) taking into account the spatial conditions and specifications (e.g., bandwidth, transmission media, required service availability and security). They systematically document the physical and logical network structure and make sure that they have recorded all relevant information.

They also evaluate possible Internet service providers (ISPs) according to the network requirements, select a provider and record the information, including cost options, in the concept.

Finally, they create a test concept to check the functionality, performance and security of the network.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
e1.1: You work out a solution proposal for a network for the attention of stakeholders, taking into account operational conditions, technical standards and legal requirements. (K5) e1.2: You estimate the probability of failure of a new or existing network and, if necessary, plan redundancies. (K4) e1.3: You design a network infrastructure (LAN) taking into account the spatial conditions and other requirements. (K5) e1.4: You design physical and systemic security measures in the local network. (K5) e1.5: You document a physical and logical network structure systematically and completely. (K3) e1.6: You select a suitable Internet service provider (ISP) according to the given requirements. (K4) e1.7: You create a test concept to check the functionality, performance and security of the network. (K5)	117: Realizing IT and network infrastructure for a small company 129: Commissioning LAN components 346: Design and implement cloud solutions 184: Implement network security	185: Analyze and implement security measures for SME IT (elective module) 216: Integrating Internet of Everything devices into an existing platform (elective module) 109: Operating and monitoring services in the public cloud (optional module)

Action competence e2: Select network components and put them into operation

On the basis of the completed network planning (e1), computer scientists select suitable network components and put them into operation:

First, they carry out a research and determine the suitable network components. You create a material list according to the internal ordering process and the budget. Check the ordered network components for completeness upon receipt.

Usually, they create a concept for the configuration. The next step is to commission the network components. Often, they first set up the network components in-house, carry out preconfigurations and upgrades and carry out an initial functional check. They then install the network components on site at the customer. You carry out a final configuration and test the functionality of the network according to the concept created.

Depending on the situation, they hand over the installed network to the customer, inform him and implement it if necessary.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
e2.1: You determine suitable network components, taking into account the requirements and budget. (K4) e2.2: You create a complete material list according to the internal ordering process. (K3) e2.3: You check network components for completeness when goods are received. (K4) e2.4: You create a comprehensible configuration concept. (K5) e2.5: You carry out pre-configurations and upgrades for network components. (K3) e2.6: You install network components on site and carry out the final configuration. (K3) e2.7: You test installed network components for functionality. (K3) e2.8: You explain to a customer how a network works in simple terms. (K3)	117: Realizing IT and network infrastructure for a small company 129: Commissioning LAN components 145: Operating and expanding the network	190: Setting up and operating the virtualization platform 216: Integrating Internet of Everything devices into an existing platform (elective module) 109: Operating and monitoring services in the public cloud (elective module)

Action competence e3: Maintain and develop networks

Computer scientists maintain networks as part of maintenance orders and develop the networks further if necessary (Continuous Service Improvement):

They carry out visual inspections of the network components on site at the defined maintenance intervals. On this basis, they decide whether measures are necessary (e.g., dedusting). They also carry out the log check of the components (e.g., temperature fluctuations, flow rates, performance rates, workloads, error messages). If necessary, they take measures for short-term or long-term further development (e.g., additional components, redesigning the network, adapting the configuration, patches and upgrades).

They carry out the necessary updates and upgrades of the components as well as any other maintenance work (e.g., firmware update). They carefully document the maintenance work and recommendations that have been carried out. If necessary, they clarify major measures with superiors and clients. In doing so, they are aware of the life cycle of network components and can inform you when they will probably need to be replaced. They also take into account ecological criteria, such as energy labels or sustainability. During all maintenance work, ensure that the devices are handled carefully and take measures to protect them from electrostatic discharge.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
e3.1: You check network components through visual inspections and define maintenance measures if necessary. (K3) e3.2: You carry out a log check of network components. (K4) e3.3: You define short-term and long-term measures for the further development of components. (K4) e3.4: You carry out updates and upgrades of components according to the existing operating concept and manufacturer specifications. (K3) e3.5: You carefully document the maintenance work that has been carried out. (K3) e3.6: You inform a stakeholder about the life cycle of devices and about current standards in relation to energy and ecology. (K3) e3.7: You estimate the time for replacement purchases of devices. (K3)	129: Commissioning LAN components 145: Operating and expanding the network	184: Implement network security 216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build service for the Internet of Everything (elective module) 109: Operating and monitoring services in the public cloud (optional module)

Action competence e4: Implementing, documenting and checking the security of networks

Computer scientists implement, document and check the security of networks. This ensures that critical systems are protected against attacks or pests as required:

First, they analyze and evaluate possible security risks of a network. To do this, they use current and company-specific tools (e.g., port scanner). On this basis, they design physical and systemic security measures in the local network (e1).

They implement the planned security measures by implementing security-relevant services and components (e.g., firewall, VPN, NAT, VLAN, DMZ). They then systematically test the security measures and document their functionality.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
e4.1: You will analyze and evaluate the security risks of a network using current and company-specific tools. (K4) e4.2: You implement security-relevant services and components. (K3) e4.3: You test implemented security measures systematically and according to the test concept. (K3) e4.4: You document the functionality of implemented security measures. (K3)	117: Realizing IT and network infrastructure for a small company 129: Commissioning LAN components 145: Operating and expanding the network 231: Apply data protection and data security	184: Implement network security 185: Analyze and implement security measures for SME IT (elective module) 216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build service for the Internet of Everything (elective module) 109: Operating and monitoring services in the public cloud (elective module)

Action competence e5: Analyze, optimize and document the performance of a network

Computer scientists analyze, optimize and document the performance of a network. This typically happens during operation, in regular cycles or when problems are reported (e.g., monitoring, user messages):

After a stakeholder has made contact and describes the problem (e.g., start of an application is slow), they first clarify possible causes. You analyze the network load (LAN) and then define possible solutions (e.g., load balancing, QoS, PoE). You take into account various factors, such as the effect of the cabling on performance. You document the chosen solution and adapt the configuration of the corresponding components (e.g., switch, router, access point).

Finally, you test the functionality of the network. If necessary, suggest replacing or expanding the components to the stakeholder (-e1)

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
e5.1: You analyze possible causes in the event of limited network performance. (K4) e5.2: You analyze the utilization of a network and determine suitable optimization measures, taking possible effects into account. (K4) e5.3: You document optimization measures in a comprehensible manner. (K3) e5.4: You adapt the configuration of network components according to the optimization measures taken. (K3) e5.5: You test the functionality of a network. (K4)	129: Commissioning LAN components	216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module) 109: Operating and monitoring services in the public cloud (optional module)

Action competence e6: Monitoring networks

Computer scientists continuously monitor networks. In this way, they guarantee seamless network operation and identify problems, malfunctions and opportunities for improvement at an early stage:

Using various monitoring tools, they continuously monitor networks, either for their company or for customers as part of a service agreement (SLA). In particular, they check the availability and functionality of the network components. They also monitor the utilization of the network (e.g., performance of components and transmission links). They assess the urgency of incoming messages / alarms and take appropriate measures at the right time (trouble shooting). They isolate the fault at the component level. They proceed in a structured and persistent manner until the fault can be identified. Finally, they organize troubleshooting in a team or with external partners.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
e6.1: You monitor networks continuously and reliably with the given monitoring tools. (K4) e6.2: You check the availability and functionality of network components as well as the utilization of the network. (K4) e6.3: You prioritize messages and alarms according to urgency and determine suitable measures. (K4) e6.4: You localize and identify errors at the level of the network components using a structured approach. (K4) e6.5. You organize troubleshooting in a team or with external partners. (K3)	129: Commissioning LAN components 145: Operating and expanding the network	184: Implement network security 216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module) 109: Operating and monitoring services in the public cloud (elective module)

Competence area f: Operation of server systems and server services

Action competence f1: Planning and documenting server systems and services

Computer scientists plan server systems and server services for a wide variety of clients (small businesses to large companies) and update the necessary documentation. In this way, they create a comprehensible basis for the construction and operation of the systems and services:

First of all, they record the requirements for the required functions and the planned budget from relevant stakeholders (e.g., client, internal department, manufacturer) (◊a1). Based on the requirements, they derive an initial proposal or solution variants for possible server systems and / or server services (e.g., web services, databases, data storage services, data analytics). Depending on the situation, they take into account operational conditions, technical standards, legal requirements and basic IT protection. They advise the stakeholders, clarify their questions and critically question requirements. You put the solution options with the requirements in writing.

In the next step, you determine the suitable platform (e.g., in-house VM, cloud, hybrid system, container) and the associated performance parameters (e.g., OS, CPU, memory, storage, networking). To do this, they apply measurable evaluation criteria. If necessary, select suitable hardware and software. You think ahead and consider the framework conditions, such as the specifications of a manufacturer, application and installation options or the power supply and energy efficiency.

You also define the required services and determine the required resources (e.g., server resources, cloud services, licenses, authorizations, SSO). In doing so, they take into account relevant dependencies, such as client-side compatibilities (browser, ciphers). You take a holistic perspective and consider possible effects.

Finally, they create a test concept to check the functionality, performance and security of the systems and services during commissioning.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
f1.1: You develop proposed solutions for server services and server systems for the attention of stakeholders, taking into account operational conditions, technical standards, legal requirements and basic IT protection. (K5) f1.2: You clarify questions from stakeholders in relation to proposed solutions in an understandable way and critically question requirements. (K3) f1.3: You record possible solutions with all requirements in writing. (K3) f1.4: You determine suitable platforms and performance parameters on the basis of measurable evaluation criteria. (K4) f1.5: You select suitable hardware and software with foresight and taking the framework conditions into account. (K4) f1.6: You define suitable services with the required resources, taking into account relevant dependencies and effects. (K4) f1.7: You create a test concept to check the functionality, performance and security of systems and services. (K3)	123: Put server services into operation 141: Commissioning the database system 143: Implement backup and restore systems 157: Planning and implementing IT system implementation 159: Configuring and commissioning directory services 169: Provide services with containers 300: Integrating cross-platform services into a network 346: Design and implement cloud solutions	187: Put ICT workstation with operating system into operation 190: Setting up and operating the virtualization platform (elective module) 210: Using the public cloud for applications (elective module) 109: Operating and monitoring services in the public cloud (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module)

Action competence f2: Put server systems into operation

Computer scientists put planned server systems into operation (server systems are hardware, virtual machines or containers that are either in-house or cloud-based):

Once the final decision to implement a server system has been made, procure the required components and / or resources (e.g. personnel, material, infrastructure, licenses, cloud services).

Finally, they put the components and / or services into operation by setting up and configuring them. They proceed according to the defined planning and take into account internal requirements, guidelines and best practices. You check the server system with the planned tests (-f1) and transfer it to productive operation.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
f2.1: You procure selected components and resources for a server system according to operational processes. (K3) f2.2: You install components and services according to defined planning as well as internal requirements, guidelines and best practices and configure them. (K3) f2.3: You check the functionality of a server system by means of suitable tests. (K4) f2.4: You are transferring a server system to productive operation. (K3)	157: Planning and implementing IT system implementation	187: Put ICT workstation with operating system into operation 190: Setting up and operating the virtualization platform (elective module) 109: Operating and monitoring services in the public cloud (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module)

Action competence f3: Put server services into operation

Computer scientists put planned server services into operation (server services include e.g., DNS, web server, database, JRE, collaboration platform, IoT gateway, messaging bus, big data analytics):

Once the final decision to implement a server service has been made, procure the required resources (e.g., personnel, licenses, cloud services).

In the next step, you put the services into operation by installing and configuring them according to the requirements. You proceed according to the defined planning and take into account internal requirements, guidelines and best practices. You check the service with the planned tests and transfer it to productive operation. Finally, they update the operating manual and hand it over to the client.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
f3.1: You procure selected resources for a server service in accordance with operational processes. (K3) f3.2: You install and configure a server service taking into account the requirements, guidelines, legal requirements and best practices in operation. (K3) f3.3: You check the functionality of a server service by means of suitable tests. (K4) f3.4: You are transferring a server service to productive operation. (K3) f3.5: You update the operating manual and hand it over to the client. (K3)	123: Put server services into operation 141: Commissioning the database system 159: Configuring and commissioning directory services 169: Provide services with containers 300: Integrating cross-platform services into a network 346: Design and implement cloud solutions	109: Operating and monitoring services in the public cloud (optional module) 217: Conceive, plan and build a service for the Internet of Everything (elective module)

Action competence f4: Maintain and manage server systems and services

Computer scientists maintain and manage server systems and server services. In this way you ensure continuous productive operation:

Depending on the requirements of the system or the service, you first define the maintenance tasks and their maintenance cycle (daily / weekly / monthly / for certain events, according to the SLA). You carry out the maintenance tasks reliably at the defined times and document them. If updates are required (e.g., upgrades, patches, firmware), test them and import them into the productive environment.

They also test the functionality, performance and security of systems and services in regular cycles. If changes are made to the systems, they are clearly documented. You proceed in a disciplined manner and ensure that interventions in systems and services are traceable at all times. They are also aware of their duty of confidentiality and handle data with confidence and care.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
f4.1: You define maintenance tasks and maintenance cycles for server systems and server services. (K4) f4.2: You reliably perform maintenance tasks in accordance with specifications. (K3) f4.3: You document the maintenance tasks carried out in a comprehensible manner. (K3) f4.4: You test updates and import them into the productive environment. (K3) f4.5: You systematically test the functionality, performance and security of systems and services. (K3) f4.6: You document interventions and adjustments to systems and services in a comprehensible manner and adhere to confidentiality. (K3)	182: Implement system security 159: Configuring and commissioning directory services 169: Provide services with containers 300: Integrating cross-platform services into a network 346: Design and implement cloud solutions	187: Put ICT workstation with operating system into operation 190: Setting up and operating the virtualization platform (elective module) 109: Operating and monitoring services in the public cloud (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module)

Action competence f5: Monitor server systems and services

Computer scientists monitor server systems and server services. This enables you to identify problems at an early stage and minimize the risk of failure:

Together with the respective stakeholders, they first define which server systems and server services are to be monitored. They then determine suitable monitoring methods (script, software, notifications, etc.). They also define threshold values and actions that are to be carried out if the threshold values are exceeded or not reached. In doing so, they estimate the respective risks based on their experience and according to the requirements of the client or the service agreements (SLA).

If the monitoring system is in operation, you use periodic tests to check whether the monitoring system is working reliably. They document the results in a comprehensible manner. In the event of error messages or alarm messages, they act quickly and take appropriate measures.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
f5.1: You define server systems and server services to be monitored in consultation with stakeholders. (K3) f5.2: You determine suitable monitoring methods. (K4) f5.3: You determine sensible threshold values and corresponding actions, taking into account the risks. (K4) f5.4: You regularly check the functionality of a monitoring system by means of tests and document the results. (K4) f5.5: You take appropriate measures quickly in the event of error or alarm messages. (K4)	182: Implement system security 123: Put server services into operation 346: Design and implement cloud solutions	188: Operate, maintain and monitor services 190: Setting up and operating the virtualization platform (elective module) 109: Operating and monitoring services in the public cloud (elective module)

Competence for action f6: Implementing, documenting and checking the security of server systems and services

Computer scientists implement, document and check the security of server systems and server services:

First, they create a security concept based on the stakeholders' requirements. This describes possible risks as well as suitable security systems / methods for basic IT protection (e.g., firewall, anti-virus software, authorizations, SSO). You work in a team and bring in partners if necessary. You observe the best practices of the solutions used.

You configure the defined security elements and then test their effectiveness. They carry out security tests in regular cycles during operation. They document the results in a comprehensible manner. They regularly inform themselves about technological developments in security systems (e.g., MELANI, CVE) and adapt their security concepts accordingly.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
f6.1: You create a security concept for server systems and server services in a team and in accordance with best practices. (K5) f6.2: You configure security elements effectively. (K3) f6.3: You test security systems at regular intervals and document the results in a comprehensible manner. (K4) f6.4: You check security concepts for up-to-dateness and adapt them to technological developments if necessary. (K4)	182: Implement system security 141: Commissioning the database system 143: Implement backup and restore systems 169: Provide services with containers 346: Design and implement cloud solutions 231: Apply data protection and data security	188 Operate, maintain and monitor services 190: Setting up and operating the virtualization platform (elective module) 109: Operating and monitoring services in the public cloud (elective module)

Action competence f7: Planning and implementing the availability of server systems and services

Computer scientists plan the availability of server systems and server services. You implement measures to comply with the requirements for data loss and downtime:

In discussions with their stakeholders, they determine the manageable data loss (recovery point objective), the manageable failure of server systems and server services (recovery time objective) and data retention periods (backup retention). You record the results in writing in the form of documentation.

In the next step, they check the current systems and services on the basis of the quality or service agreements (SLA) and record where availability is not yet guaranteed. You decide on any adjustments and define possible solutions / optimizations. Their analytical and conceptual skills are particularly in demand here. They discuss the optimization measures with the stakeholders and obtain their approval for approval.

Finally, they implement the solutions / optimizations: They make the planned adjustments in the environment. They test at regular intervals whether the availability of the systems and data meets the defined requirements.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
f7.1: In discussions with stakeholders, you determine the manageable data loss (RPO), the manageable failure of systems and services (RTO) as well as data retention periods and document the results. (K3) f7.2: You check current systems and services for compliance with the specified availabilities. (K4) f7.3: You design solutions / optimization measures to ensure specified availability. (K5) f7.4: You explain the solutions / optimization measures that have been developed to stakeholders in a comprehensible and comprehensible manner in accordance with the profitability. (K3) f7.5: You implement planned solutions and / or optimizations in the environment. (K3)	141: Commissioning the database system 143: Implement backup and restore systems 169: Provide services with containers 346: Design and implement cloud solutions	190: Setting up and operating the virtualization platform (elective module) 109: Operating and monitoring services in the public cloud (elective module)

Professional competence f8: Create and implement backup and archiving concepts for data

Computer scientists create backup and archiving concepts for data and implement them. In doing so, you ensure that data is available over the long term:

Together with the stakeholders, you determine which data (e.g., user, configuration, system, log data) should be backed up and archived. Then they create a backup (including a recovery and disaster recovery concept) and / or an archiving concept.

In doing so, they take a holistic view: They take into account the backup cycle, data retention periods and compliance requirements. They also define relevant aspects such as periodicity, size, type of medium, authorizations and accesses. They also take into account legal requirements regarding data protection (e.g., DSVGO).

They check at regular intervals whether the restoration of the data and services is working properly. They document the test results in a comprehensible way.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
f8.1: In consultation with stakeholders, you define the data to be backed up or archived. (K4) f8.2: You create a complete backup and archiving concept with all relevant information and taking legal requirements into account. (K4) f8.3: You create a complete disaster recovery concept with all relevant information and taking into account the operational requirements. (K4) f8.4: You test the recoverability of data / services at regular intervals and document the results in a comprehensible manner. (K3)	143: Implement backup and restore systems 169: Provide services with containers 346: Design and implement cloud solutions 231: Apply data protection and data security	190: Setting up and operating the virtualization platform (elective module) 109: Operating and monitoring services in the public cloud (elective module)

Action competence area g: Development of applications

Action competence g1: Analyze and document requirements for applications and interfaces

Computer scientists analyze the requirements determined in the customer meeting (a1) and document them (requirement engineering):

In a first step, they record customer needs in the form of professional and technical requirements. In order to deepen the users' perspective, they describe the target groups and their needs in the team and with relevant stakeholders (e.g., using "personas"). This can be done in the form of a workshop. On this basis, they check the technical requirements for an application and its interfaces (e.g., UI, REST, sensors, peripherals) for consistency, completeness and measurability (acceptance criteria). They record information on framework conditions, context, delimitation and definition of terms. If necessary, they supplement the requirements.

In a further step, they catalog the requirements, i.e., they sort and group them according to industry or project-specific criteria (e.g., functional, non-functional, quality). They record the results in the system (e.g., backlog, issues, use cases, user stories) or on paper and provide them with a clear description (identification).

Finally, as part of the team, they estimate the time required, complexity, scope and prioritization. Depending on the situation, they coordinate the procedure with the project manager or product owner. In consultation with the stakeholders, make sure that the definitive requirements are valid and that there are no misunderstandings. If there are changes in the course of the application development, they add the requirements (iterative procedure).

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
g1.1: You record customer needs in the form of professional and technical requirements in a comprehensible and solution-neutral way. (K3) g1.2: You develop user models in a team based on personas. (K5) g1.3: You check functional and technical requirements for consistency, completeness and measurability. (K4) g1.4: You catalog requirements according to industry or project-specific criteria and record them in writing. (K4) g1.5: You give requirements a clear description. (K3) g1.6: You estimate the time required, complexity, scope and prioritization of work packages in the team. (K4) g1.7: You check the requirements with relevant stakeholders for validity. (K3) g1.8: You continuously document functional and technical requirements. (K3)	322: Design and implement user interfaces 254: Describe business processes in your own professional environment 426: Developing software with agile methods 162: Analyze and model data 164: Creating databases and inserting data 321: Programming distributed systems 346: Design and implement cloud solutions 324: Supporting DevOps processes with tools	

Action competency g2: Check design drafts for user interfaces for technical feasibility and develop them further

Computer scientists check design drafts for user interfaces for technical feasibility and develop them further in the interests of user-friendliness:

You receive design guidelines and specifications with regard to user interfaces from the client or other partners. On this basis, they create functional design drafts (e.g., mock-ups, grids, wireframes). You use suitable graphic tools for this. Depending on the situation, they adapt drafts that have already been created.

In the next step, you identify problematic parts of the user interface, e.g., information that is dependent on one another or non-standard components. They check the feasibility of the problematic parts using prototypes that they design on paper or using tools. They take into account a wide variety of aspects, such as the scope of information, dependencies on fields, interaction elements, navigation, responsiveness, design laws or accessibility. They then discuss the parts that cannot be technically implemented with the stakeholders. You propose these solutions and revise the design accordingly.

On the basis of the prototype or several prototypes, they finally develop functional user interfaces. They use the latest methods and tools.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
g2.1: You develop design drafts for user interfaces using suitable graphic tools and taking into account design guidelines and specifications. (K5) g2.2: You identify problematic parts of user interfaces. (K4) g2.3: You design prototypes of user interfaces. (K4) g2.4: You check the technical feasibility of user interfaces, taking relevant aspects into account. (K4) g2.5: You discuss design drafts with stakeholders and propose alternative solutions for parts that cannot be technically implemented. (K3) g2.6: You develop functional user interfaces based on prototypes. (K5)	322: Design and implement user interfaces 319: Design and implement applications 320: Object-oriented programming 293: Create and publish website	294: Realizing the front end of an interactive web application 223: Realizing multi-user applications (object-oriented) (elective module) 335: Realizing the mobile application (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module)

Action competence g3: Assess and document the security of applications and interfaces

Computer scientists assess the security of applications and interfaces and document the results:

First, they clarify relevant security-related questions in relation to the system environment, e.g., which interfaces are there? Who are the users of the application? Which other systems access the application? What protection needs do the data have? the application (availability, confidentiality, liability, integrity)? Which internal and legal requirements have to be complied with?

From this, you derive the risks that affect the application and its interfaces. They take a forward-looking attitude and point out hazard methods and possible manipulations from outside. They discuss the results as a team. You derive measures and record them (e.g., data encryption, access security, identity management, escaping). Finally, they adapt the catalog of requirements accordingly and discuss them with the stakeholder.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
g3.1: You clarify security-relevant questions in relation to a system environment with foresight and derive possible risks from them. (K4) g3.2: You obtain security-relevant information in the team or in the community (e.g., OWASP). (K3) g3.3: You record security-relevant risks and the measures derived from them in a comprehensible manner. (K3) g3.4: You explain measures to secure the applications and interfaces in the team. (K3) g3.5: You adapt a catalog of requirements according to the results and discuss them with the stakeholder. (K3)	183: Implement application security 114: Use coding, compression and encryption methods 450: Test applications 346: Design and implement cloud solutions	295: Realizing the backend for applications 216: Integrating Internet of Everything devices into an existing platform (elective module) 217 Conceive, plan and build a service for the Internet of Everything (elective module) 107: Implementing ICT solutions with blockchain technology (elective module)

Action competence g4: Design implementation variants for applications and develop conceptual solutions.

Computer scientists design implementation variants for applications and work out an implementation concept for the selected variant. You will work closely with the stakeholders and the team:

In a first step, they use sketches and descriptions to show basic variants with regard to the implementation (e.g., technologies, components, frameworks, libraries, systems). Together with the respective stakeholders, they create a comprehensible benefit analysis of the various variants with meaningful, assessable decision criteria. Based on the benefit analysis, they advise the stakeholder in making decisions about an optimal solution. In doing so, they ensure that this is ethically, morally and legally justifiable. Finally, if necessary, check the selected variant in the form of a feasibility study (→ a3).

From this, they gradually develop a functional and technical implementation concept (e.g., use cases, components, layers, processes, interfaces, classes, data model). To do this, they analyze the relevant data, processes, systems and interfaces and document the results. They use suitable aids, such as UML or other diagrams. Depending on the situation, it is also possible that you design adaptations for existing applications.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
g4.1: They show basic implementation variants in relation to the implementation on the basis of sketches and descriptions. (K5) g4.2: In cooperation with the stakeholder, you create a comprehensible benefit analysis with meaningful, assessable decision criteria. (K4) g4.3: You advise the stakeholder in the decision-making process for an optimal, ethically and legally justifiable solution. (K5) g4.4: You develop a professional and technical implementation concept using suitable tools. (K5) g4.5: You carry out a feasibility study for the chosen implementation variant. (K4)	319: Design and implement applications 320: Object-oriented programming 323: Functional programming 164: Creating databases and inserting data 321: Programming distributed systems 346: Design and implement cloud solutions 306: Handle small projects in your own professional environment	106: Querying, processing and maintaining databases 223: Realizing multi-user applications (object-oriented) (elective module) 335: Realizing the mobile application (elective module) 259: Developing ICT solutions with machine learning (elective module) 216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module) 210: Using the public cloud for applications (elective module) 107: Implementing ICT solutions with blockchain technology (elective module)

Action competency g5: Implement applications and interfaces according to the draft and meet the security requirements

Computer scientists implement applications and interfaces on the basis of the defined requirements and elaborated drafts. This can be both new and the expansion of existing applications:

In a first step, you set up a suitable development and runtime environment. The created implementation concept as well as company specifications serve as a basis.

Then you start programming the back-end and front-end according to the defined requirements. To do this, you use predefined programming languages and development tools. They regularly test the implementation for errors and fix them (debug). They continuously ensure that they comply with regulatory and technical guidelines (e.g., frameworks, design specifications). They also take security requirements into account.

During implementation, make sure to adhere to the generally known code guidelines in order to ensure traceability and comprehensibility (e.g., clean code, coding conventions).

They continuously store the programmed elements in a software management system (e.g., Git). You are able to access saved intermediate results at any time. You adhere to the company's internal guidelines (e.g., branches). Finally, they make any adjustments to the implementation concept in order to keep it up to date.

IT technologies are developing rapidly. Computer scientists are constantly informed about innovations and their effects (e.g., what new frameworks are there?) And implement the findings in their daily work.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
g5.1: You set up a suitable development and runtime environment based on the implementation concept and company specifications. (K3) g5.2: You program a back-end using predefined programming languages in an efficient, structured manner and in accordance with the relevant specifications. (K3) g5.3: You program a front end using predefined programming languages in an efficient, structured manner and in accordance with the relevant specifications. (K3) g5.4: You check interim results with the requirements (functional, non-functional, safety) and make corrections on an ongoing basis. (K4) g5.5: You check compliance with code guidelines. (K3) g5.6: You store the changes and extensions of the implementation clearly and reliably in a software management system. (K3) g5.7: You adapt an implementation concept in a comprehensible manner. (K3)	319: Design and implement applications 320: Object-oriented programming 323: Functional programming 293: Create and publish a website 165: Using NoSQL databases 321: Programming distributed systems 322: Design and Implement User Interfaces 183: Implement application security 426: Developing software with agile methods 324: Supporting DevOps processes with tools	106: Querying, processing and maintaining databases 294: Realizing the front end of an interactive web application 295: Realizing the backend for applications 223: Realizing multi-user applications in an object-oriented manner (elective module) 335: Realizing the mobile application (elective module) 216: Integrating Internet of Everything devices into an existing platform (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module)

Action competence g6: Check the quality and security of applications and interfaces

Computer scientists use test concepts to check the quality and security of applications and interfaces. This ensures that applications can be implemented in accordance with requirements, errors can be corrected and the application released for production:

In the first step, you create a test concept. They describe the test environment of the application with the relevant information (e.g., system, actors, data, users, authorizations). They also determine which test types are needed (e.g., unit tests, user acceptance tests, integration tests, load / performance tests or security tests). On this basis, they define suitable test equipment. Then they describe the test cases with reference to the use cases and requirements. You take into account different perspectives (e.g., limit values, error situations). They ensure that the defined test cases are repeatable (automated or manual). You define the expected results and document them in a comprehensible manner.

If necessary, set up a suitable test environment in a further step. The previously created test concept serves as a basis for this. If possible, you implement test cases that can be automated.

Then they carry out all test cases, evaluate the test run and record the results. You proceed carefully and formulate the protocol in a comprehensible manner. In the event of unsuccessful test cases, they take corrective action either in the test or in the implementation. After making corrections, they carry out a retesting. They check the implementation in accordance with the defined security concept and take appropriate measures to ensure compliance with any deviations.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
g6.1: They describe the test environment of an application with all relevant information. (K3) g6.2: You define test equipment based on the selected test types. (K4) g6.3: You describe repeatable test cases in relation to use cases and requirements in a comprehensible manner and define the expected results. (K4) g6.4: You set up a suitable test environment according to the test concept. (K3) g6.5: You implement the automatable test cases according to the defined test equipment. (K4) g6.6: You carry out test cases comprehensively and carefully. (K3) g6.7: You evaluate the test run and log the results in a comprehensible manner. (K4) g6.8: You define corrective measures and implement them. (K4) g6.9: You check the implementation according to the defined security concept and take appropriate corrective measures (K4).	183: Implement application security 426: Developing software with agile methods 450: Test applications 324: Supporting DevOps processes with tools 321: Programming distributed systems	295: Realizing the backend for applications 223: Realizing multi-user applications in an object-oriented manner (elective module) 259: Developing ICT solutions with machine learning (elective module) 217: Conceive, plan and build a service for the Internet of Everything (elective module)

Competence area h: Delivery and operation of applications

Action competence h1: Determine a suitable platform for the delivery of applications

Computer scientists analyze the different requirements for the operation of applications and determine a suitable platform:

In a first step, they analyze the specified requirements and identify the dependencies between the components (microservices, existing software, APIs / interfaces). Then they define a suitable platform for operating the application (cloud, on-premise, client, hybrid, multicloud).

In a further step, you define the layer model (SaaS, PaaS, IaaS) within the framework of the stakeholder (e.g., costs, responsibility, feasibility). You identify the security requirements (including data protection) for the platform and select suitable services. You estimate the required resources and select them on the basis of the platform operator's recommendation (performance, storage requirements, availability, costs, access; no Rocket science). They pay attention to economic and ecological solutions. Finally, in cooperation with the team and / or the stakeholder, they check their selection for consistency, make any necessary adjustments and record the results.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
h1.1: You identify the dependencies between different components. (K4) h1.2: You define a suitable platform for the operation of an application. (K4) h1.3: You define a layer model within the framework of the stakeholder. (K4) h1.4: You identify the security requirements for the platform and select suitable services. (K4) h1.5: You select the required resources based on the recommendation of the platform operator. (K3) h1.6: As a team, you check your selection for consistency, make adjustments and record the results. (K4)	346: Design and implement cloud solutions 347: Use service with container	210: Using the public cloud for applications (elective module)

Action competence h2: Define the delivery process for applications

Computer scientists define delivery processes for applications as well as the technologies and tools to be used:

When defining the delivery processes, you are guided by the existing process model (e.g., Scrum).

First, they analyze the dependencies between the various components in relation to the delivery process. You also pay attention to predictable migrations (code first, database schema) of data taking into account the architecture. You determine suitable integration practices (e.g., Git-Flow, Trunk, Continuous Integration) based on the application type and the selected process model and record them. They also determine suitable deployment practices (e.g., continuous deployment, continuous delivery).

Finally, they determine a suitable artifact management (e.g., container registry.)

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
h2.1: You analyze the dependency of the components in relation to the delivery process. (K4) h2.2: You determine suitable integration practices and record them. (K4) h2.3: You determine suitable deployment practices and record them. (K4) h2.4: You determine a suitable artifact management and record it. (K4)	426: Developing software with agile methods 346: Design and implement cloud solutions 324: Supporting DevOps processes with tools	210: Using the public cloud for applications (elective module)

Action competence h3: Carry out the delivery process for applications

Computer scientists carry out delivery processes for applications according to specifications:

If not yet available, first create a proof of concept for the chosen solution (→ a3.5).

Now you start to implement the defined delivery process. You set up the services, write automation scripts and define environment variables with suitable methods and tools (e.g., CI / CD Pipeline, CLI, YAML).

You provide components (runtime environment / services) and package the application (e.g., Docker, container). They also manage and version the artifacts. They proceed in a structured manner, regularly check their work for errors and correct them.

Finally, they check the entire delivery process of the application according to the specifications (e.g., checklist) and test the functionality / interaction of the applications using a test concept (e.g. integration test). You show the will and meticulous approach to improve and optimize the delivery process.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
h3.1: You set up services for delivery. (K3) h3.2: You write automation scripts and define environment variables using suitable methods and tools. (K3) h3.3: You provide components for delivery. (K3) h3.4: You package an application. (K3) h3.5: You manage and version artifacts. (K3) h3.6: You check the delivery process of the application according to the specifications. (K4) h3.7: You check the functionality / interaction of the applications using a test concept. (K4)	122: Automate processes with a script language 324: Supporting DevOps processes with tools 347: Use service with container 346: Design and implement cloud solutions	122: Automate processes with a script language 324: Supporting DevOps processes with tools 347: Use service with container 346: Design and implement cloud solutions

Action competence h4: Monitor applications and interfaces and resolve problems during operation

Computer scientists monitor applications and interfaces, take measures to maintain stability and, if necessary, resolve problems during operation:

For monitoring resp. When monitoring an application, you first define what is to be recorded (metrics) and configure the systems accordingly (log depth, measuring points). In the application, you take measures for the early detection of misuse or dangers.

They carry out the monitoring at regular intervals and check the status of the application on the basis of the recorded information. If necessary, they carry out an analysis, e.g., if there is an error message from the customer or the system. To isolate the problem, reproduce the bug. They proceed analytically and persistently until the fault can be determined. They also check that the applications and interfaces are up to date and have security settings. To do this, they regularly read the messages from the manufacturers of the frameworks and services used.

On the basis of the error analysis, they determine a procedure for resolving the problem and discuss this depending on the impact in the team or with the stakeholder. They act with foresight and implement the defined measures in good time (e.g., software life cycle: planning and installing updates / patches, renewal of security certificates, configuration adjustments). They record problems and measures in a comprehensible manner and, if necessary, also supplement the test cases.

Performance targets operation	**Vocational school modules**	**Inter-company course modules**
h4.1: You define and configure tools for monitoring an application. (K3) h4.2: You carry out the monitoring reliably and carefully at regular intervals. (K3) h4.3: You analyze an occurring problem using a structured approach. (K4) h4.4: You check the currentness and security settings of the applications and interfaces based on the manufacturer's information. (K4) h4.5: You define a target-oriented approach to problem solving and discuss this in the team and / or with the stakeholder. (K5) h4.6: You implement the agreed measures and record them in an understandable and comprehensible manner. (K3)	183: Implement application security 431: Carry out tasks in one's own environment independently 321: Programming distributed systems 346: Design and implement cloud solutions	187: Put ICT workstation with operating system into operation 110: Analyzing and presenting data with tools (elective module) 109: Operating and monitoring services in the public cloud (elective module)

5 Overview of the modules in lessons at the vocational school and in inter-company courses

The teaching at vocational schools comprises 24 modules. In addition, 7 inter-company courses are defined, 4 of which are compulsory and 3 elective modules. Elective modules: The regional OdA, in cooperation with the companies and the vocational schools, choose their modules from the catalog below, which are taught at the vocational school and in the üK centers to cover the company's needs. The modules are designed for the subject and deepen knowledge in the subject. In the elective modules, modules from the other subject can also be chosen. Exchanges across Switzerland among regional over-the-counter providers are possible and desirable.

Legend:

Modules (vocational school and intern-company course compulsory) both subject areas	Module specializing in plattform development	Module specializing in application development	Inter-company course as a compulsory elective module (both subject areas)

Specializing in platform development

1st year of apprenticeship		2nd year of apprenticeship		3rd year of apprenticeship		4th year of apprenticeship
professional school	üK	professional school	üK	professional school	üK	professional school
117 Realizing IT and network infrastructure for a small company	187* Put ICT workstations with operating system into operation	114 Use coding, compression and encryption processes	188* Operate, maintain and monitor services	159 Configuring and commissioning directory services	185 Analyze and implement security measures for SME IT	157 Planning and implementing IT system implementation
431 Carry out tasks in one's own environment independently	106* Querying, processing and maintaining databases	129 Commissioning LAN components	184* Implement network security	145 Operating and expanding the network	223 Realizing multi-user applications in an object-oriented manner	182 Implement system security
319 Design and implement applications	216* Integrating Internet of Everything devices into an existing platform	346 Design and implement cloud solutions	259 Developing ICT solutions with machine learning	300 Integrate cross-platform services into a network	335 Realizing the mobile application	241 Initialize innovative ICT solutions
162 Analyze and model data		141 Commissioning the database system	248 Realizing ICT solutions with current technologies	306 Handle small projects in your own professional environment	110 Analyzing and presenting data with tool	245 Implement innovative ICT solutions
231 Apply data protection and data security		143 Implement backup and restore systems	190* Setting up and operating the virtualization platform		217 Conceive, plan and build a service for the Internet of Everything	
164 Creating databases and inserting data		169 Provide services with containers	210 Using the public cloud for applications			
122 Automating processes with a script language		158 Planning and executing software migration	109* Operating and monitoring services in the public cloud			
123 Put server services into operation		254 Describe business processes in your own professional environment	107 Implementing ICT solutions with blockchain technology			

Specializing in application development

1st year of apprenticeship		2nd year of apprenticeship		3rd year of apprenticeship		4th year of apprenticeship
professional school	üK	professional school	üK	professional school	üK	professional school
117 Realizing IT and network infrastructure for a small company	187* Put ICT workstations with operating system into operation	114 Use coding, compression and encryption methods	294* Realizing the front end of an interactive web application	323 Functional programming	223* Realizing multi-user applications in an object-oriented manner	321 Programming distributed systems
431 Carry out tasks independently in your own environment	106* Querying, processing and maintaining databases	320 Object-oriented programming	295* Realizing the back end for applications	450 Test applications	335* Realizing the mobile applications	324 Supporting DevOps processes with tools
319 Design and implement applications	216* Integrating Internet of Everything devices into an existing platform	346 Design and implement cloud solutions	210* Using the public cloud for applications	183 Implement application security	110 Analyzing and presenting data with tool	241 Initialize innovative ICT solutions
162 Analyze and model data		322 Design and implement user interfaces	248 Realizing ICT solutions with current technologies	306 Handle small projects in your own professional environment	217 Conceive, plan and build a service for the Internet of Everything	245 Implement innovative ICT solutions
231 Apply data protection and data security		165 Using NoSQL databases	190 Setting up and operating the virtualization platform		185 Analyze and implement security measures for SME IT	
164 Creating databases and inserting data		347 Use service with container	107 Implementing ICT solutions with blockchain technology			
122 Automating processes with a script language		426 Developing software with agile methods	109 Operating and monitoring services in the public cloud			
293 Create and publish a website		254 Describe business processes in your own professional environment	259 Developing ICT solutions with machine learning			

6 Advanced basic skills

The advanced basic skills include 320 math (120) and English (200) lessons. The focus is on action-oriented lessons based on practical examples from computer science.

6.1 Mathematics

Apprenticeship year	Competencies	Lessons
1. Apprenticeship year	Analyzes and describes customer requirements and problems using formal logic. Converts these into program code, business logic and for the design of data models. * Selects and uses dynamic hash algorithms suitable for specific applications for efficient data storage and search, as well as algorithms for data encryption. * Models moving three-dimensional objects in interactive applications using vectors, matrices and transformations. *	80
2. Apprenticeship year	Analyzes existing data using statistical methods and derives relationships. *	40

* Compulsory elective: three of the four competencies are to be developed in class.

6.2 English

Apprenticeship year	Competencies	Lessons
1. Apprenticeship year	• Answer inquiries from customers or partners in English orally and in writing.	40
2. Apprenticeship year	• Answer inquiries from customers or partners in English orally and in writing • Writes a simple, short text for operational communications in English.	80
3. Apprenticeship year	• Answer inquiries from customers or partners in English orally and in writing • Writes a simple, short text for operational communications in English. • Moderates a simple session in English.	40
4. Apprenticeship year	• Posts and replies to articles in English. • Moderates a simple session in English.	40

7 Creation and entry into force

The educational plan was drawn up by the undersigned organization of the world of work. It refers to the SERI ordinance of ... on basic vocational training for computer scientists with a federal certificate of competence (EFZ)

The education plan is based on the transitional provisions of the Education Ordinance.

Bern, November 19, 2020

ICT vocational training in Switzerland

The President	The Managing Director
Andreas Kaelin	Serge Frech

SERI approves the training plan after it has been examined.

Bern, November 19, 2020

State Secretariat for Education,
Research and Innovation

Rémy Hübschi
Vice President, Head of Vocational & Education Training

***

English translation:

Dietikon, June 23, 2021

Rafisa Informatik GmbH
Bernstrasse 88, 8953 Dietikon
Switzerland

on behalf of:

ICT-Berufsbildung Schweiz
Waisenhausplatz 14, 3011 Bern
Switzerland

Appendix 1: List of instruments to ensure and implement basic vocational training and to promote quality

Documents	Source of supply
SERI ordinance on basic vocational training for computer scientists EFZ	Electronically State Secretariat for Education, Research and Innovation (www.bvz.admin.ch > Professions A-Z) Print version Federal Office for Buildings and Logistics (www.bundespublikationen.admin.ch)
Education plan for de SERI Ordinance on Basic Vocational Training for Computer Scientists EFZ	ICT vocational training in Switzerland
Implementation provisions for the qualification procedure wih final examination incl. Appendix (evaluation grid and, if applicable, evidence of performance in inter-company courses and/or evidence of performance in training in professional practice)	ICT vocational training in Switzerland
Education report	Template SDBB | SCFO www.oda.berufsbildung.ch
Training program for the inter-company course	ICT vocational training in Switzerland
Organizational regulations for the inter-company course	ICT vocational training in Switzerland
Curriculum for the vocational schools	ICT vocational training in Switzerland