Output O3
Digital additional qualifications for the construction and finishing trade

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Language[1]

English

Table of Contents

[1] The official examination regulations are available in German and English.

1. Introduction

Project Summary

Small and medium-sized enterprises (SMEs) in the construction sector urgently need to overcome the following challenges:

a) Fast, active and efficient shaping of the digital transformation.

b) Comprehensive realization of cooperation across different organizations at all stages of the construction process.

c) Attracting the urgently needed, appropriately qualified next generation of skilled workers and entrepreneurs.

The demand for good apartments and houses has rarely been as high as it is now, and yet there is far too little affordable housing available. Hence, significant increases in efficiency and acceleration of construction planning and execution are much needed in the construction industry. Construction projects can be carried out more efficiently through the application of targeted digital tools. In fact, around 30% of planning capacities can be saved this way. In addition, digital technologies make the identification of risks in the construction possible at an early stage so that they can be avoided.

When building one- and two-family houses, up to 25% of the total construction costs go to coordination work, which can be reduced to a very large extent through self-coordination using digital tools. Since the construction industry is characterized by a highly specialized division of labor, coordination errors can quickly occur, which often result in inferior quality and delays. Furthermore, energy and environmental aspects are often not given enough attention during new constructions and reconstructions. With the help of digital technologies, building owners, architects, engineers and craftsmen can plan together easily, increase the quality and ensure the adherence to deadlines. Moreover, new technologies make it possible to determine the energy costs of a building at an early stage and to eliminate risks or hidden costs. Individual priorities can be placed on technical features or environmental aspects. Although digital technologies and tools are already being tested and used in practice, the overall digitalization in the construction sector is only advancing very slowly.

Compared to other countries (e.g. the Netherlands, Denmark or Finland), Germany has a lot of catching up to do. SMEs in the construction and finishing trades, which are very active in the construction of one, two and smaller multi-family houses are particularly hesitant when it comes to using new digital tools and are therefore the focus of the project. The shortage of skilled workers is particularly severe in the construction industry.

The attractiveness for vocational training and construction activities is clearly suffering from the high specialization, physically difficult work, heteronomy, etc. The targeted use of digital technologies can reverse these barriers and lead to decisive increases in attractiveness. Large companies and general contractors in the construction industry often use their own digital systems, which they impose on their SME subcontractors, making them dependent and completely transparent. This leads to the rejection of digitalization in SMEs. There is a lack of SME specific advisory and training programs on digitalization in the construction and finishing trades. Both the owners and the employees of the SMEs have a high need for information, advice and further training. Support capacities must be expanded, and teachers and consultants of SMEs must be prepared and trained in a targeted manner in order to be able to convey SMEs and their employees the use of digital technologies. The SME-specific training courses should highlight the intersections and interdependencies between the various trades and actors through transparent interfaces, in order to promote the need for cooperation and the use of digital technologies.

The overall objectives of the project are:

1. To quickly and productively shape the digital transformation in small and medium-sized enterprises (SMEs) in the construction sector based on the needs and challenges they are facing, so that as many SMEs as possible use digital technologies and tools in all fields of activity in their company.

2. To facilitate easier cooperation through digital technologies between all those involved in the construction work (clients, architects, engineers and SMEs in the various trades) from planning to the execution, including the management of the construction of large-scale projects.

3. To increase the efficiency, quality and punctuality in the construction industry as well as the ability to include environmental and sustainability aspects in the planning, construction or renovation of buildings through the application of specific digital tools and technologies.

4. To increase the attractiveness of vocational training and work in the construction sector in order to meet the already very high and still growing demand for qualified skilled workers and entrepreneurs in this sector. In order to achieve these decisive objectives, the following action goals are pursued in the project.

a) Providing digital technologies and tools as well as cooperation methods suitable for SMEs in the construction industry by analyzing international best practices and adapting them to the different national conditions, which are then transferred to SMEs together with individual implementation advice.

b) Providing SME specific education programs on digital competences and skills by analyzing and adapting international best practices, which are then implemented by chambers with their educational institutions, vocational schools and other VET institutions.

c) Strengthening the educational and counselling capacities as well as the qualification of teachers and consultants of SMEs so that they can give sound advice on digital transformation and implement qualification programs.

d) Increasing the attractiveness of vocational training and winning qualified young people with strong learning ability for the construction sector by developing, testing, evaluating and implementing additional qualification trainings on digitalization in the construction sector, which are completed during or directly after vocational training and result in an independent, recognized vocational qualification.

e) Enabling architects, engineers and SMEs in the construction and finishing trades to realize comprehensive collaborations through the use of digital technologies by developing, testing, evaluating and implementing a training program on collaboration management and digital skills.

f) Enabling SMEs and their employees to make full use of digital technologies in all areas of construction by developing, testing, evaluating and implementing a training program on digital competences and skills.

g) Contributing to closing the entrepreneurship gap by attracting young entrepreneurs with digital competences and skills through the development, testing, evaluation and implementation of a module program for digital entrepreneurship training.

h) Increasing the attractiveness of vocational training and work in the construction sector by offering interesting, expanded areas of activities as well as qualifications with recognized degrees at all levels of vocational training with maximum permeability.

i) Strong regional dissemination of the implementations of the project results by transferring the results and demand-oriented implementation recommendations to 72 SMEs and education institutions from 13 countries.

About the additional qualifications

As digital technologies have so far been little used in SMEs in the construction industry, the teaching of digital technologies in vocational training is not widespread enough, so that there is a clear deficit in digital skills after completion of vocational training. A module program for teaching digital skills during or directly after vocational training was developed, tested in practice, evaluated and completed on the basis of the evaluation results. Target groups are young people who are strong learners in the second half of their vocational training or directly after completing initial vocational training in in construction and finishing trades who want to complete these additional qualifications and receive a recognized continuing education and further training qualification.

Output O3 includes:

- Concept, curricula and teaching materials for a comprehensive modalized training program for the provision of additional digital qualification in the construction and finishing trades
- Official examination regulation
- Implementation Reports
- Evaluation Concept and Report

2. Curriculum additional digital qualifications[2]

Introduction

Digitalization is an essential part of contemporary society. Digital equipment have replaced the analogic ones in almost every field of life. Entertainment industry has for long put effort into digital media. In the industry and business in common computers, robots, and other digital tools have been a part of everyday work from the very beginning of the digital era, and people in common have become accustomed to modern technology. However, in construction industry, and particularly at construction site, the digitalization is just beginning and gaining speed.

When discussing about digitalization in construction branch, two issues should be understood: Firstly, the wideness of the concept "Construction branch". Construction covers activities from designing the building, road or bridge, digging the pit for foundations of the bridge, building etc., building the house, putting in the plumbing and electrics, painting, finishing, maintaining, repairing, and finally demolishing the building. This means that there are several participants involved during the life cycle, skilled workers with different skills, and all sizes of enterprises from one-man practitioners to multinational corporations may have done business with each other. This means that skills and power relationships may not be balanced. Secondly, the nature of construction field has been very conservative, or, at least, construction business has a conservative (see e.g., Riiala & Ilola, 2014[3]) and masculine (e.g. Watts, 2007 [4]; Galea, 2018 [5]) reputation. These properties completed with long contracting chains which often forces the lowest in the chain to price the work at a very low level may cause that there is no will nor money to invest in new tools and equipment. Furthermore, construction has traditionally been a branch where it has been easy to found a business. Man, saw and hammer has been enough for ages. Thus, the theoretic skills of an entrepreneur may be very low if not inadequate.

Training programme

This training programme is aimed to give a knowledge required to gain additional qualification in digital construction. The length of the whole training is 150 hours (Figure 1), divided in three parts. First part, 40 hours, contains basics of digitalization and is directed to those who have no or only little knowledge and experience on digital tools and digitalization. The second part, 80 hours, is obligatory for all and contains the issues that had arisen while the collection of best practices was gathered. The third part, 30 hours, is voluntary and directed to those needing knowledge on BIM, Circular economy,

[2] Compiled by Dr Kari Lilja and Dr Sirpa Sandelin, Satakunta University of Applied Sciences, Finland
[3] Maria Riala & Lauri Ilola (2014) Multi-story timber construction and bioeconomy – barriers and opportunities, Scandinavian Journal of Forest Research, 29:4, 367-377
[4] Watts, J. (2007). IV. Can't take a joke? Humour as resistance, refuge and exclusion in a highly gendered workplace, Feminism & Psychology, 17:2, 259-266.
[5] Galea, N. R. (2018). Built for men: Institutional privilege in the Australian construction industry, Unpublished doctoral dissertation, University of New South Wales.

sustainability, and some special applications of digital technology in construction branch.

The goals of teaching and learning follows the Digital Competence Framework of the European Union, applied to the needs of the construction branch, and are closer presented in the chapter “The requirements of the qualification” later in this document. Goals are divided into three parts. First part (Module 1) contains the basic skills needed by everyone (Figure 2), the second part (Module 2) contains the skills needed in construction business (Figure 3), and the third part (Module 3) is optional and available for those needing certain special skills. The optionality means that this part is optional also for education institute. If there is no need for this part, it can be omitted. It can also be tailored according to local or even company-specific needs. This means, that also the learning objectives must be defined case by case.

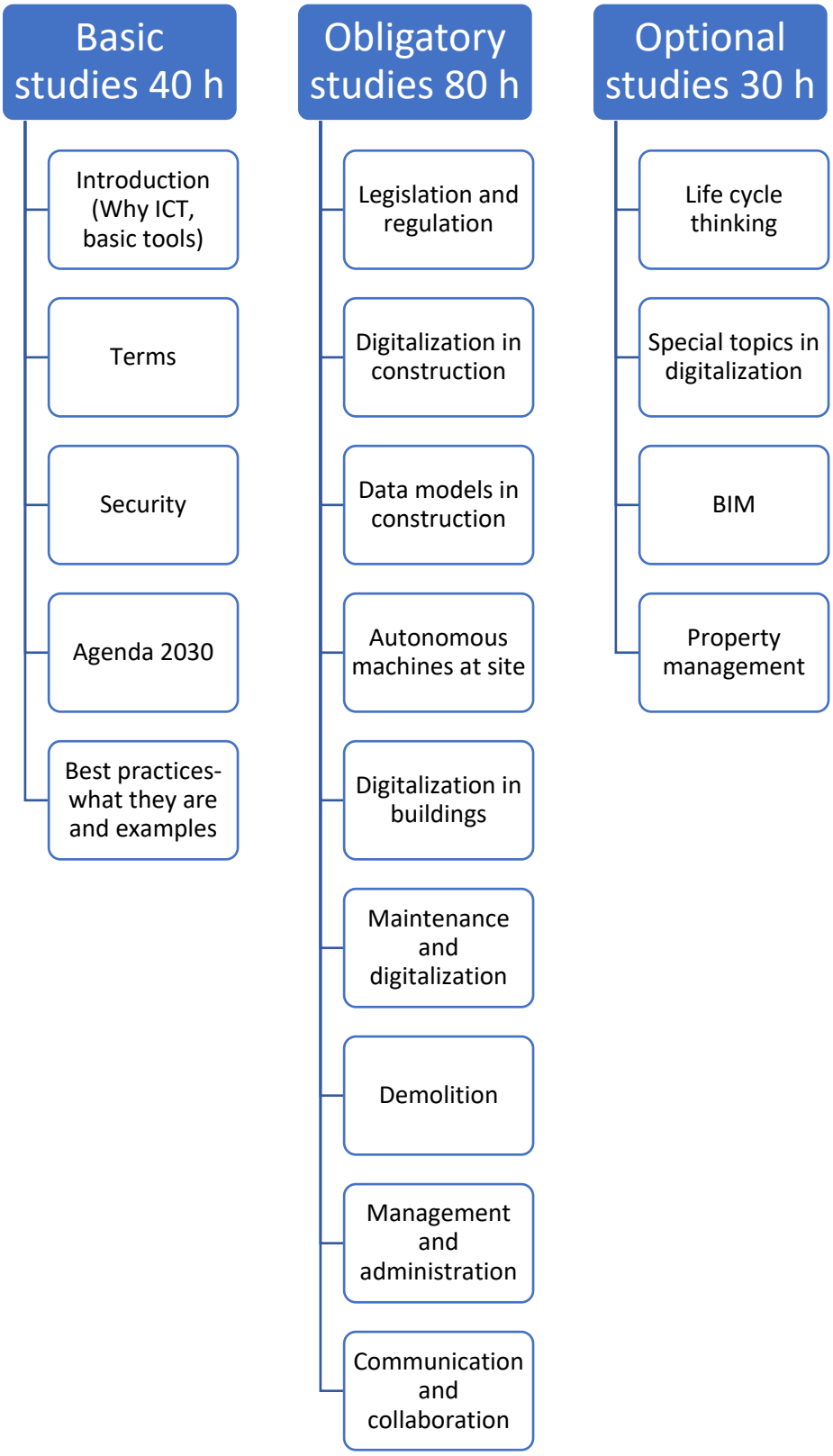


Figure 1: Structure of the programme

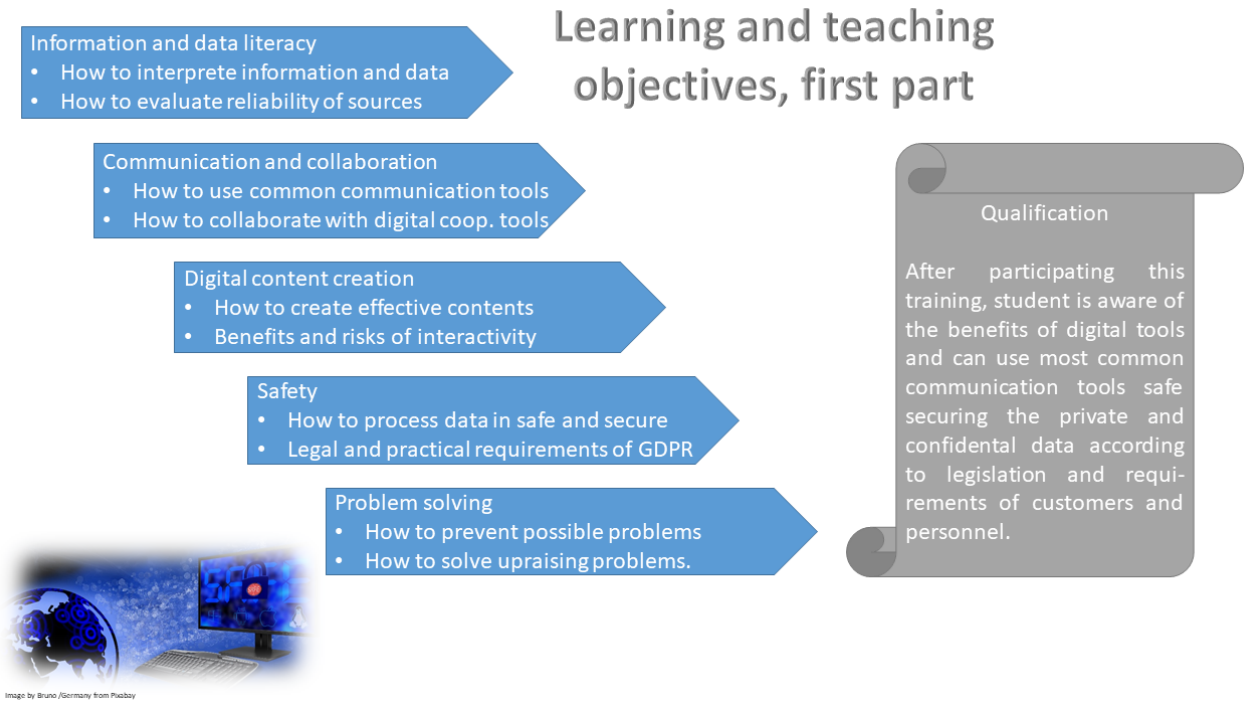


Figure 2: Learning objectives of part 1

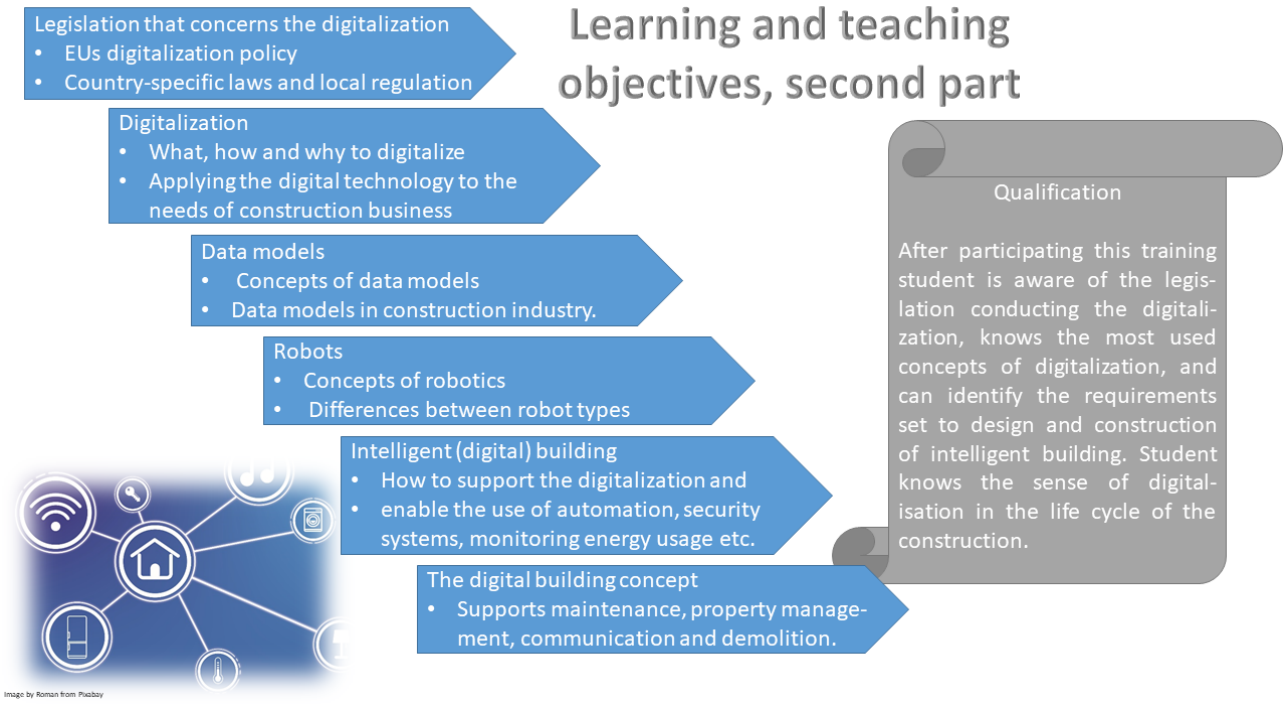


Figure 3: Learning objectives of part 2

Best practices

In this curriculum, the best practices collected and published as Output 1 of this project, are considered as examples. The collection of best practices is available for both teachers and students and it is recommended, that during the lessons, the practices, and the feasibility and needs to modify and localize them will be discussed. The aim of presenting the best practices is not to copy them but to apply them.

Localization

The framework, in which construction business is done, varies very much, depending on country, region and even municipal. The nature circumstances – temperature, humidity, rainfall variability - are quite different on coastal areas, in the middle of the continent, in the mountains or within the lowlands. In addition to the topics and issues that are common to construction business, curriculum should contain space for localization and issues that are important in point of view of local and regional circumstances and regulations. This concerns digitalization and use of digital tools too: even if the technology itself is global, the ways to use and the degree of digitalization may vary a lot between the countries and even between the enterprises. In this curriculum, every topic is open for localization as long as we are staying within the frames of the Digital Competence Framework of the European Union.

Target group

The target group of the programme is young people with strong learning skills, e.g., students having secondary-school graduation, and students in VET level education institutes studying for qualifications in construction and finishing fields. The course suits well to the employees and entrepreneurs working in construction and finishing branches, as well as to others interested in digital construction, too.

Schedule

The schedule and distribution of lesson hours between classroom lectures, online learning and self-learning is flexible and depends on the needs of students (and needs of employers, if applicable), facilities of education institute, and skills of teachers. However, it is recommended that

- in the beginning of each module there would be at least one classroom lecture day (6-8 hours) introducing the topics of the module and
- in the end of each module there should be at least one classroom lecture day (6-8 hours) summarizing the learned topics and presenting the results of assessments if such have been done.

In case of local, regional, or national shutdown, like during the COVID-epidemic, or if needed for some other reason, classroom lectures can be replaced by on-line lectures. An example of schedule is presented in chapter “The content of the course”

Methodology

During the course, following methods can be used (the list is not closed nor excluding other teaching methods):

- Classroom lectures
- Online learning
- Learning tasks (Self -learning)
- Online discussions
- Classroom discussions
- Assessments

With the help of following tools (the list is not final nor excluding other didactic tools):

- Online learning platforms (e.g. Moodle)
- Online collaboration tools (e.g. Padlet)
- Videos
- Articles and other online material

The content of the course

The course is divided into three modules. Contents and details of the curriculum are free for modifications and localizations to be compliant with the local legislation and circumstances. However, it must be borne in mind, that approach of course must be practical, and consider the background of students. It is quite different to apply the course for those having VET-level graduation, than those having Master of Science, or higher education e.g., in engineering or architecture.

Module one

The module one contains the basic and fundamental issues of digitalization. Depending to the circumstances in the country, and the level of the students, this module can be voluntary for experienced better learners. The content of this part covers the introduction and motivation – why the digitalization is important also for construction branch, presentation of common terms, basics of computer security, and discussion on Circular economy and UN Agenda 2030 and digital programme of EU (Figure 4). In module one begins also the discussion concerning best practices.

Figure 4: Contents of first part of the course

This content can be divided into lessons and self-learning tasks in many ways. One example is presented in Figure 5: The model structure of . The course starts with introduction day, a traditional classroom day, beginning with basic information concerning the training. After that follows the motivation phase (why these issues are important), brief information and discussion about UN Agenda 2030, its implementation in EU, digitalization policy and digitalization programmes of EU, and how are they implemented into practice, and lesson and discussion concerning the best practices, what they are and how they should be applied into each organization. Some simple examples of best practices can be presented, too. The length of the day is recommended to be 8 hours, including or without the lunch pause depending to the rules of the country. It is recommended to have short breaks 10-15 min) at least after every second hour during the day.

After the introduction day there will be a self-learning period with on line lessons and DIY (do it yourself) -assignments. The lessons introduce the students to the topics of the next assignment. The answers and results of the assignments can be returned either in the form of essays or into some collaboration platform (e.g. Padlet) which enables other participants to comment and discuss the issues during the self-learning phase. The

topics to be dealt with are Common ICT-Terms, Local and brand-specific terminology, Internet & social media, Risks threatening the data, Safe and secure data processing, and the fundamentals of GDPR.

The concluding day draws all together. Depending to the returning method of the tasks, the results and common feedback are given as presentation or during the discussion concerning the findings, if the results were reported e.g., into Padlet. When choosing the returning and feedback method, also the confidentiality and privacy must be considered. After the results have been presented, some best practices will be discussed, and finally, the concluding lecture will summarize the part 1 of the course. The recommended length of the concluding day is 8 hours with lunch and other pauses.

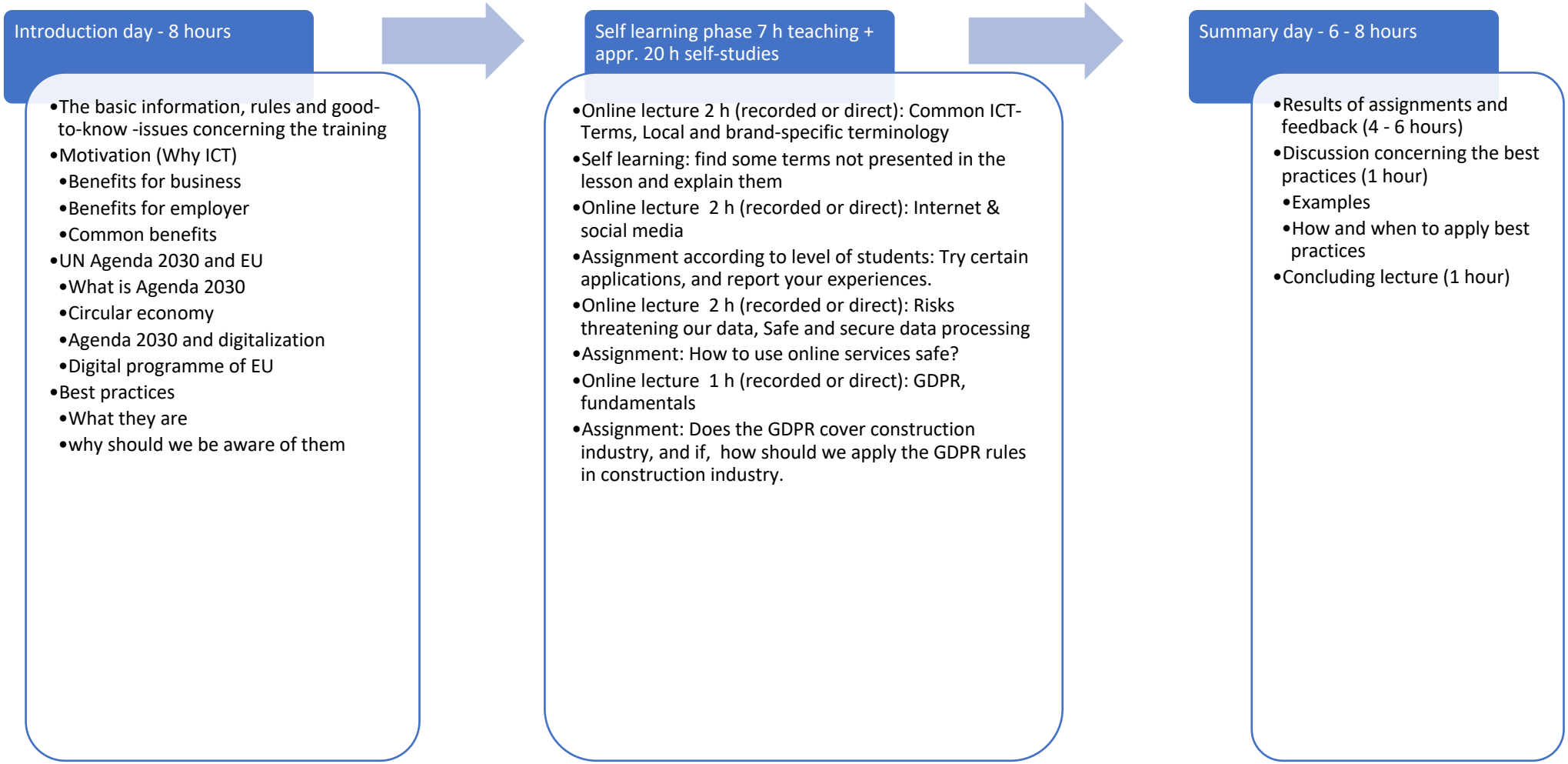


Figure 5: The model structure of first module

Module two

The second module is obligatory for all and contains, in addition to legal and branch-specific issues, issues arisen from collection of best practices (Figure 6). The length of this part is 80 hours consisting of e.g., classroom lectures, self-learning activities,

online lectures and assignments.

Legislation and regulation	•EU's implementation of UN Agenda 2030, Sustainability and Digitalization, directives and their relationship to other regulation •Local legislation, regulation and requirements
Digitalization in construction	•Motivation: What, how and why to digitalize •Applying new tools into construction industry - examples from best practices •Project management: Schedule, purchases, labour, sub-constructors...
Data models in construction	•Concepts: Metadata, raw data, structured data... •Use of data models in construction industry, examples from best practices, other examples
Robots in the industry and at site	•Concepts of robotic, risks and benefits of robotization •Collaborative robots in use •Examples including best practices and other examples
Digitalization in buildings	•What does digitalization in buildings means? •Wiring, cables, switches, power sources, terminals... •Windows, doors, faraday-phenomen...
Maintenance and digitalization	•How to utilize digitalization and digital buildings in maintenance and forecasting the future service needs
Demolition	•Identify dangerous components and find correct ways to recycle materials with help of data models •Bookkeeping and tracing the waste types
Management and administration	•Automating administrative routines at site and in the office •Reporting, forecasting, contracting, purchasing etc
Communication and collaboration	•Tools for enabling communication and collaboration with each participant of the project •Tools for enabling engagement of citizens in the project

Figure 6: Contents of the second part

It is recommended, that the schedule and exact content of the second part will be specified according to skills and knowledge in ICT, and needs of each group. It is obvious, that people with different background and profession have different skills and needs concerning this course. In the appendix A, one possible structure will be presented.

Module three

The third module of the course approaches some special topics arisen in practice. It is optional and aimed to give deeper view on topics for those interested in these (Figure 7). Third part gives a trainer also an opportunity to respond the local, regional, and even company-specific needs by choosing topics that are topical in practice.

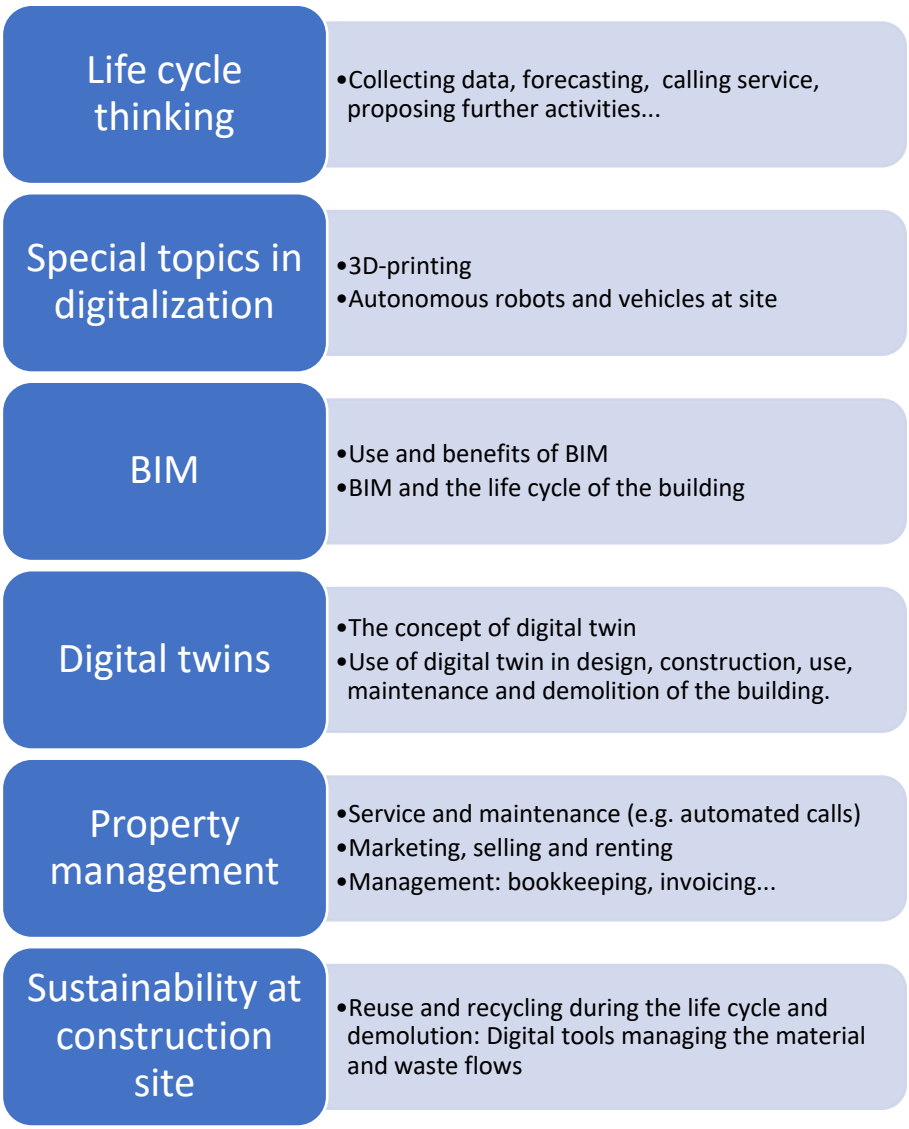


Figure 7: Deeper view on certain issues

The requirements of the qualification

The qualification will be based on The Digital Competence Framework of the European Union, in which there are five (5) competence areas: Information and data literacy, Communication and collaboration, Digital content creation, Safety and Problem solving.

First module

The first module of the course is compatible to the first competence area of the framework including parts from the competence areas 2 and 4 of the framework:

A) Browsing, searching and filtering data, information and digital content

After the course, a student should be able to recognize and complete the information needs by searching for data, information and content in digital environments, to be able to access the information required and to navigate between them by creating personal search strategies, and to update the strategies according to changing needs.

B) Evaluating data, information and digital content

After the course, a student should be able to analyse, compare and critically evaluate the credibility, validity and reliability of sources of data, information and digital content, as well as the credibility, validity and reliability of data gathered from the sources.

C) Managing data, information and digital content

After the course, a student should be able to organise, store and retrieve data, information and content in digital environments, to organise and process them in a structured environment, and to consider the security and immaterial property right (IPR) issues in data processing.

D) Collaborating through digital technologies

After the course, a student should know how to use digital tools and technologies to collaborate in projects and processes, and co-construct and co-create the resources and knowledge.

E) Netiquette

After the course, a student should be aware of behavioural norms and know how to use digital technologies and how to interact in digital environments. Student should be able to adapt communication strategies in different purposes and be aware of cultural, religious, generational, national and gendered diversity in digital environments.

F) Managing digital identity

After the course, a student should be able to create and manage at least one digital identity, protect one's own reputation, and deal with the data that one produces through several digital tools, environments and services considering the IPR-principles.

G) Protecting devices

After the course, a student should be able to protect devices, stored data and digital content, understand risks and threats in digital environments, and be aware of safety and security measures considering the reliability and privacy issues.

H) Protecting personal data and privacy

After the course, a student is aware of GDPR-regulation and should be able to protect personal data and privacy in digital environments. Student understands how to use and share information that is identifiable and can be connected to person, and is able to protect oneself and others from damages. Student understands that digital services use a "Privacy policy" to inform how personal data is used.

Second module

The second module of the course concentrates to the competences required in construction field. Although the European competence framework does not contain issues directly connected to construction branch, the requirements stated in the framework can be applied. The branch-specific requirements are as follows:

A) Legislation

Student is aware of the EUs digitalization policy and knows the most important country-specific laws and local regulation that concerns the digitalization and use of modern information and communication technology.

B) Digitalization

Student know, what, how and why to digitalize and can apply the digital technology to the needs of construction site and his /her own tasks.

C) Data Models

Student know the concepts of data models and understand the use of data models in construction industry.

D) Robots

Student know the concepts of robotics, understand the differences between robot types, and can explain how to use different kind of robots in construction industry and at sites.

E) Buildings

Student knows how to design and build a building that supports the digitalization and enables the use of house automation, security systems, monitoring of energy usage and devices like elevators. Students is aware of security issues and requirements set by both wireless and wired communication systems.

F) Maintenance

Student knows how to utilize digitalization and digital buildings in supporting the maintenance and forecasting the future service needs.

G) Demolition

Student knows how to identify the dangerous components, finds correct ways to recycle the materials with help of the data models, and knows how to keep books and trace the different waste groups.

H) Management

Student knows how to automate the administrative routines at site and in the office, including reporting, forecasting, contracting, purchasing etc.

I) Communication

Student know some common tools for enabling the communication and collaboration with each party of the project as well as tools for enabling the engagement of the citizens in the projects and can use these.

Third module

The third module of the course is optional and approaches some special issues in construction: Life cycle thinking, 3D-printing, Autonomous robots and vehicles at site, BIM, Digital twins, Property management and Sustainability at construction site. After this part of course, student should have a holistic view of digitalization n construction branch. Student should understand how digitalization and sustainability are connected together, and how digitalization can help reaching the SDGs at construction site.

APPENDIXA

Example of contents, Module 1.

Part	Topics	Material (examples)
Introduction day - 8 hours	The basic information, rules and good-to-know - issues concerning the training, including how to continue after this day and how to join online lectures if such are used.	
	Motivation (Why ICT): • Benefits for business • Benefits for employer • Common benefits Recommendation: Introduction lecture, Discussion about how each student can utilize or is utilizing digital tools, what kind of benefits they have experienced, and is there any adverse impacts they had experienced, Concluding lecture	Reasons Why Digitalization Is A Must For Any Business Digitalisation and Innovation Why digitalization is important for companies nowadays Tackling the digitalization challenge: how to benefit from digitalization in practice Digitalization transforms the construction sector throughout asset's life-cycle from design to operation and maintenance Digitalization of the construction industry
	UN Agenda 2030 and EU • What is Agenda 2030 • Circular economy • Agenda 2030 and digitalization • Digital programme of EU Recommendation: Students are searching themselves, either in groups or individually, information on issues and how they are connected with each other. Finally, a concluding discussion will be held, during which, lecturer ensures that at least connections between digitalization and EU's implementation of	Sustainable Development Goals Europe's Digital Decade: digital targets for 2030 Path to the Digital Decade European Digital Decade The Digital Europe - programme Funding for Digital in the 2021-2027 Digitalisation of Construction SMEs EC: Digitalization in the construction sector

	UN's sustainable development goals have been found.	
	Best practices: • What they are • Why should we be aware of them. Recommendation: teacher tells the meaning of "Best Practices", how they should be collected, evaluated and applied in other organizations, highlighting the difference between "Best Practices" and benchmarking. After this, some collected best practices are presented and students discuss about how these practices could be applied in their businesses. It is important to emphasize, that a) collected best practices should not be implemented one-to-one but applied into each organizations business and other circumstances, and b) only very rare best practices are valid for ever and in every situation, thus, best practices collection should be updated regularly.	Definition of best practices Best Practices: Definition Dig-Con Collection of best practices Other collections of best practices, if available, e.g.: Good Practices and Recommendations Best practices for construction document management 10 Construction Best Practices You Should Be Doing Right Now (commercial) Archdaily best young practices 2020 Archdaily best new practices 2021 Archdaily best new practices 2022 etc. It is worth noting that these lists contains, not only digitalization, but all kind of practices connected with construction.
Time to complete the evaluation and feedback survey		
Self learning phase 7 h teaching + appr. 20 h self-studies	**Online lecture** 2 h (recorded or direct): Common ICT-Terms, Local and brand-specific terminology	It would be good, if there were ICT-vocabulary that contains terms and explanations both in English and in country's own language, available.

	Self learning: find some terms not presented in the lesson and explain them	Students should learn how to use search engines, like google. Teacher should be careful not to accept faulty explanations produced by, e.g., ChatGPT: Students are not necessary aware of the risks linked to the use of AI and may trust in the faulty results
	Online lecture 2 h (recorded or direct): Internet & social media: During the lecture, at least one example of e-mail, web meeting, collaboration tool and social media application should be presented and their benefits and risks discussed.	E.g., Gmail, Zoom, Padlet, LinkedIn… Depending to what programs are common in the companies, region and country. The benefits should be highlighted considering the level and background of the students: For entrepreneurs the impacts on income, costs and profit are important, for employees the work safety and improvements into work conditions may play big role in acceptance. The risks endangering the use should be mentioned referring to the lessons on secure and safe data processing, and GDPR.
	Assignment according to level of students: Try to apply certain applications and report your experiences.	E.g., Student should try to form a meeting with the free version of Zoom, and report his/her experiences in the Padlet. It would be good if different groups or individual students could try different applications.
	Online lecture 2 h (recorded or direct): Risks threatening our data, safe and secure data processing, and how to protect data, computer and users. **Note:** the issue is wide enough to be a topic of its own course, thus, only the	The risks that at least should be emphasized are similar-like web pages, data thefts and leaks, identity thefts, blackmailing, viruses and other malware, intruders, and violations against the general data protection rules (GDPR), referring to the GDPR-lecture.

	most topical and important issues should be dealt with.	
	Assignment: How to use online services safe?	E.g.: Student should search some published cases where the risks have realized, and describe, how this could have been avoided.
	Online lecture 1 h (recorded or direct): GDPR fundamentals: European data protecting directive and its national applications. Note: GDPR will be further approached in obligatory part of course. In this part, only main principles should be dealt with.	Data protection in the EU GDPR-directive in EU languages GDPR-directive in parts
	Assignment: Does the GDPR cover construction industry, and if, how should we apply the GDPR rules in construction industry.	This assignment is recommended to be facilitated as discussion, either during the online meeting or by using the discussion thread of the online learning platform in use.
Time to complete the evaluation and feedback questionnaire.		
Summary day - 6 - 8 hours	Results of assignments and feedback (4 - 6 hours)	
	Discussion concerning the best practices (1 hour) • Examples • How and when to apply best practices	
	Concluding lecture (1 hour) Examination - if required (1 hour). **Note:** If examination is required, time to be used in assignments and feedback is at maximum 5 hours.	

Example of contents, Module 2.

Topic	Subtopics	Material (examples)
Legislation and regulation	EU's implementation of Agenda 2030 of UN, Sustainability and Digitalization, policies, directives, and their relationship to other regulation.	Europe's Digital Decade: digital targets for 2030 Path to the Digital Decade Digitalisation as key for a sustainable Europe European way for the Digital Decade Sustainable Digitalisation - the path to European Digital future Declaration on digital rights and principles for everyone in the EU The digital services and digital markets acts Digital services act in languages of EU-members Digital markets act in the languages of EU-members Data act (Proposal) Data governance act (Proposal) GDPR - Directive
	Local legislation, regulation, and requirements	Each teacher should use the legal and regulative rules of their own countries.
Digitalization in construction	Motivation: What, how and why to digitalize	https://euconstruction2050.eu/tag/digital-construction/ Digitalisation in the construction sector
	Applying the new tools into construction industry - examples from best practices	
	Project management: Schedule, purchases, labour, sub-constructors.. .	https://www.construction-products.eu/publications/digital-building-logbook/
Data models in construction	Concepts: Metadata, raw data, structured data...	https://guides.lib.unc.edu/metadata/definition https://www.eboss.co.nz/assets/Uploads/Nick-Clements-Masterspec1.pdf

Note: During this topic, it could be a good idea to have a visiting lecturer, e.g., architect, to tell about the use of BIM		https://www.youtube.com/watch?v=xjlnWalwGkU http://www.eubim.eu/wp-content/uploads/2020/03/BIM-and-Digital_ILEKTRA-PAPADAKI.pdf
	Use of data models in construction industry, examples from best practices, other examples	Standardizing BIM
Robots in the industry and at site Note: During this topic, it could be a good idea to visit at site, where robots or autonomic vehicles are used	Concepts of robotic, risks and benefits of robotization	Robotics in Construction Industry in 2022: Use, Benefits & Types Robots Are Coming to the Construction Site Robotics applications in construction Robotics in Construction Industry What are the prospects for robots in the construction industry? Utilizing Industry 4.0 on the Construction Site: Challenges and Opportunities Impact of industry 4.0 platform on the formation of construction 4.0 concept: a literature review Ethical issues in service robotics and artificial intelligence Artificial intelligence in green building
	Collaborative robots in use	Cobots in the construction industry Leveraging Human-Robot Collaboration in Construction Towards human–robot collaboration in construction: current cobot trends and forecasts Applications of Collaborative Industrial Robots in Building Construction Human-robot collaboration in construction: Opportunities and challenges Bim-integrated collaborative robotics for application in building construction and maintenance CoBuilt 4.0: Investigating the potential of collaborative robotics for subject matter experts

	Examples including best practices and other examples	Commercial example: ABB Robotics advances construction industry automation to enable safer and sustainable building Commercial example: Universal robots
Digitalization in buildings Note: The term Digital Building has used both as synonym for “Digital twins”, and synonym for “Digitalized house” and “Smart building”. In this case, the latter interpretation is correct.	What does the digitalization in buildings means? What are the benefits and risks? Examples of smart buildings.	Smart buildings – the digitalization of buildings Intelligent buildings – articles at Science direct Digitalization in Buildings and Smart Cities on the Way to 6G Improving Customer Satisfaction with Automating the Facility Management System for Emergency Maintenance Operations Energy performance optimization in buildings Commercial definition of digital building Commercial smart building concept Commercial concept 2 An extreme example of Digital building - concept
	Wiring, cables, switches, power sources, terminals Note: In this issue, it could be a good idea to have a visiting lecturer who is specialized in physical security of data rooms and wirings.	What is smart building technology? Modelling and design of smart buildings Unfortunately, there are only little international literature concerning the technical details. At least following issues should be dealt with: The wiring should allow future changes and updates. Type (quality and noise protection) of data cables should be good enough (Cat 6). Both the wiring, active equipment, power sources, sensors and terminals should be updateable, protected for both physical risks, like crime and fire, and data security risks like intruders. The server rooms and connections to outside should be safe and secured, the user management should be cared. There should always be a manual way to open and close doors, close water, shut down electricity. If wireless sensors and other wireless equipment are used, the connections should be hidden and secured.
	Barriers of radio signal: Windows, doors,	The Most Important Aspects of Uncertainty in the Internet of Things Field – Context of Smart Buildings 11 major building materials that kill your cell phone reception

	faraday-phenomena... Note: In this issue, it could be a good idea to have a visiting lecturer who is specialized in smart homes and problems met when implementing the wireless technology.	The Security of Smart Buildings Types of smart building sensor and how they work Smart Building' trends – a comparison of wireless standards for automation and control Microlocation for Smart Buildings in the Era of the Internet of Things: A Survey of Technologies, Techniques, and Approaches Note: The concepts of smart home and smart building are quite new, and literature approaching the problems caused by building material is available to a limited extent. However, the rules and principles of the technique are comparable with those of mobile communication technologies, and the experiences gained can be applied.
Maintenance and digitalization	How to utilize digitalization and digital buildings in maintenance and foreseeing the future service needs.	Facilities management and maintenance Building Digital Operation and Maintenance Based on BIM Digital Technologies in Facility Management – The state of Practice and Research Challenges Building Operation and Maintenance: A Framework for Simplified Building Information Modeling (BIM) Digital Mobile Application BIM-Based Digital Twin and XR Devices to Improve Maintenance Procedures in Smart Buildings: A Literature Review Commercial example: Maintenance management software to improve facility maintenance and asset performance
Demolition	Identify the dangerous components and find correct ways to recycle the materials with help of the data models.	Digital tools must accelerate selective demolition of buildings Conserve Resources and Plan for Demolition With Digital Construction Digital twin simplifies documentation of demolition projects Increasing the efficiency and efficacy of demolition through computerised 4D simulation State of the art of demolition and reuse and recycling of construction materials Commercial example: Digital tools are key to curbing construction waste, says Sweco

	Forecasting, bookkeeping, and tracing the waste types.	The applications of digital technology to construction waste management Forward thinking for decreasing construction and demolition waste A BIM-based system for demolition and renovation waste estimation and planning Clean construction and demolition waste material cycles through optimised pre-demolition waste audit documentation: A review on building material assessment tools
Management and administration	Automating the administrative routines at site and in the office	Understanding the implications of digitisation and automation in the context of Industry 4.0: A triangulation approach and elements of a research agenda for the construction industry Commercial keynote: The 6 processes to automate in your construction business Commercial example: Construction Project Management Commercial example: What Is Construction Automation, and How Will It Drive the Future of Building?
	Reporting, forecasting, contracting, purchasing etc	Digitalization and Automation in Construction Project's Life-Cycle: A Review An Automatic Process for the Application of Building Permits Material and Equipment (M&E) productivity management in the Construction sector Productivity monitoring in building construction projects: a systematic review Commercial text: Automating your day-to-day activities: Why it's helpful and how you can do it?
Communication and collaboration	Tools for enabling the communication and collaboration with each party of the project	Collaboration tools for Construction Industry Collaboration Software Helping Build Construction Projects - Note: Sponsored text The value of collaboration in your construction project Crowdsourcing as a service – from pilot projects to sustainable innovation routines Collaborative Supply Chain Management (SCM) Tools for Improved Teamwork in Construction Projects Sustainable Value Creation for Stakeholders During a Projects Life Cycle: A Structured Visual Tool for Communication and Collaborative Decision-Making

		Commercial text: Construction collaboration software
	Tools for enabling the engagement of the citizens in the project	User participation in the building process Digital tools for stakeholder participation in urban development projects
Time for examination		
Time for completing the evaluation and feedback survey.		

Example of time division

Topic	**Subtopics**	Teaching	Individual work	Total
Legislation and regulation	Agenda 2030 of UN, EU's implementation of the agenda, Sustainability and Digitalization, policies, directives, and their relationship to other regulation.	1	1	2
	Local legislation, regulation, and requirements	2	4	6
Digitalization in construction	Motivation: What, how and why to digitalize	1	1	2
	Applying the new tools into construction industry - examples from best practices	2	0	2
	Project management: Schedule, purchases, labour, sub-constructors...	4	4	8
Data models in construction	Concepts: Metadata, raw data, structured data...	2	2	4
	Use of data models in construction industry, examples from best practices, other examples	2	0	2
Robots in the industry and at site	Concepts of robotic, risks and benefits of robotization	1	3	4
	Collaborative robots in use	2	2	4
	Examples including best practices and other examples	2		2

Digitalization in buildings	What does the digitalization in buildings means?	1	1	2
	What are the benefits and risks?	1	2	3
	Examples of smart buildings.	1	3	4
	Wiring, cables, switches, power sources, terminals	2	1	3
	Barriers of radio signal: Windows, doors, faraday-phenomena…	2	4	6
Maintenance and digitalization	How to utilize digitalization and digital buildings in maintenance and foreseeing the future service needs.	2	2	4
Demolition	Identify the dangerous components and find correct ways to recycle the materials with help of the data models.	3	3	6
	Forecasting, bookkeeping, and tracing the waste types.	1	1	2
Management and administration	Automating the administrative routines at site and in the office	2	2	4
	Reporting, forecasting, contracting, purchasing etc.	1	1	2
Communication and collaboration	Tools for enabling the communication and collaboration with each party of the project	2	2	4
	Tools for enabling the engagement of the citizens in the project	2	2	4
				80

Note: Individual work contains self-learning, assignments etc. If there will be company or site visits, time spend to these can be counted as individual work.

Example of contents, Module 3.

Examples of topics that could be dealt with in 3rd module. Education institute can weight these topics and / or choose additional topics according to needs of companies and students. For example, if in some area or company, sustainable construction is an emerging issue, it is recommended to weight *Life cycle thinking* and *Sustainability at construction site*. If some company wants to get known with the robotics, topics *Autonomic robots and vehicles* at site and *BIM* might be interesting for them. That is why no time recommendations for each topic are given in this module.

Topic	Content	Material (examples)
Life cycle thinking	Life cycle thinking, Life cycle assessment, ICT in LCA: Collecting data, forecasting, calling service, proposing further activities...	• Life Cycle Thinking for the Building and Construction Sector • Life cycle thinking • A life-cycle perspective on the building sector- Good Practice in Europe • Good practices Report • Life Cycle Thinking Example – The Impacts of a Building • Life-cycle assessment • Using Life Cycle Assessment • Life Cycle Thinking and Sustainability Assessment of Buildings Note: It is worth having a look at all the papers in this special issue. • Life cycle assessment in the construction sector: A review • Construction products and life-cycle thinking • Circular economy in the construction industry: A systematic literature review • Use of Life Cycle Assessments in the Construction Sector: Critical Review

		• What is Life Cycle Assessment (LCA) in Construction? • An introduction to Life Cycle Assessment (LCA)
Special topics in digitalization	3D-printing It is recommended, that the equipment and materials available, and targets in which this method can be used in the country in question, will be emphasized	• 3D-Printing • 3D Printing in Construction • 3D printing for construction and architecture projects • Fresh Properties of Sustainable Building Materials 3D Printing Application Note: It is worth having a look at all the papers in this special issue. • Metal 3D printing in construction: A review of methods, research, applications, opportunities and challenges • Review of binder jetting 3D printing in the construction industry • Key factors influencing the implementation of three-dimensional printing in construction • Examples from practice
	Autonomous robots and vehicles at site	• How autonomous robots are changing construction • Robots are coming to the construction site • Autonomous Robots Used on Construction Sites - and more! • Lightweight Navigable Space Segmentation for Autonomous Robots on Construction Sites

		• On-site autonomous construction robots: Towards unsupervised building • A methodology to monitor construction progress using autonomous robots • Developing a framework for the implementation of robotics in construction enterprises • Robots that build the world (Commercial) • Development of BIM-integrated construction robot task planning and simulation system
BIM	Use and benefits of BIM	• Top 5 benefits of BIM construction • What are the Uses and Benefits of BIM in Construction Project? • Benefits of Building information modeling • The Potential Benefits of Building Information Modelling (BIM) in Construction Industry • Managing change in BIM-Level 2 projects: benefits, challenges, and opportunities • A SWOT analysis of the use of BIM technology in the polish construction industry • Contributing project characteristics and realized benefits of successful BIM implementation: A comparison of complex and simple buildings • Critical success competencies for the BIM

		implementation process: UK construction clients • An overview of BIM adoption in the construction industry: Benefits and barriers
	BIM and the life cycle of the building	• The Benefits of Lifecycle BIM for Facility Management • How to make your BIM model work for Life-Cycle Assessment • Benefits of BIM throughout the entire building lifecycle • Enabling BIM for property management of existing buildings based on automated As-IS capturing • Barriers to the implementation of Building Information Modelling (BIM) for facility management • BIM uses for deconstruction: An activity-theoretical perspective on reorganising end-of-life practices • BIM-Based Life Cycle Assessment of Buildings—An Investigation of Industry Practice and Needs • Autodesk BIM for the Building Lifecycle (Commercial)
Digital twins	The concept of digital twin	• What are Digital Twins? • The Purpose of Digital Twins in Construction • Digital Twin Technology in the Construction Industry

		• Characterising the Digital Twin: A systematic literature review • Digital twin application in the construction industry: A literature review • Construction with digital twin information systems • Digital Twins for Construction Sites: Concepts, LoD Definition, and Applications • Differentiating Digital Twin from Digital Shadow: Elucidating a Paradigm Shift to Expedite a Smart, Sustainable Built Environment • Digital Twins in Construction, Engineering, & Architecture (Commercial)
	Use of digital twin in design, construction, use, maintenance and demolition of the building.	• Virtual Reality, Digital Twins and Metaverse Note: It is worth having a look at all the papers in this special issue. • Digital Twin for Supply Chain Coordination in Modular Construction • An Adapted Model of Cognitive Digital Twins for Building Lifecycle Management • BIM-Based Digital Twin and XR Devices to Improve Maintenance Procedures in Smart Buildings: A Literature Review • Digital Twin Applications in 3D Concrete Printing • Digital Twins' Applications for Building Energy Efficiency: A Review

Property management Note: Issues connected with property management has been dealt in documents connected with the other topics too.	Service and maintenance (e.g. automated calls)	• Property Maintenance: A 'Black Hole' Of Data • Automated landlord: Digital technologies and post-crisis financial accumulation • Application of integrated building information modeling, IoT and blockchain technologies in system design of a smart building • Digital Twin: Vision, Benefits, Boundaries, and Creation for Buildings
	Marketing, selling and renting Note: This topic is very country- and region-specific, and in addition to this, also target group matters. It is recommended, that teacher searches the country-specific material.	• Real Estate Marketing Tools That Help You Sell More Homes • More real estate marketing tools • Fair Housing Enforcement in the Age of Digital Advertising: A Closer Look at Facebook's Marketing Algorithms
	Management: bookkeeping, invoicing…	• It is recommended to search country-specific material
Sustainability at construction site It is worth noting, that issues of this topic have also been approached in papers presented in other topics.	Reuse and recycling during the life cycle and demolition: Digital tools. Note: regulation concerning the demolition and waste management both during the demolition and during the whole life cycle are country- and regional specific, thus, these rules and practices should be included into teaching too.	• How Digital Transformation Promotes Sustainability in Construction • The path for net zero… • Digitalisation drives sustainability in the construction industry • Digital and sustainable construction go hand-in-hand - BIM+ • Special Issue: Sustainability and Digital Transformation • Distributed manufacturing: A new digital framework for

		sustainable modular construction • BIM-based end-of-lifecycle decision making and digital deconstruction: Literature review • Special Issue: Recent Progresses and New Strategies on Recycled Materials and Reused Components for Sustainable Civil Infrastructures
	Managing the material and waste flows with help of digital tools. Note: regulation concerning the waste flows, reuse and recycling are country- and regional specific, thus, these rules and practices should be included into teaching too.	• Upgrading construction and demolition waste management from downcycling to recycling in the Netherlands • A material and component bank to facilitate material recycling and component reuse for a sustainable construction: Concept and preliminary study • Reaching net-zero carbon emissions in construction supply chains–Analysis of a Swedish road construction project

Notes for the teachers

The material enclosed is an example showing how the topics of this course could be presented. Each teacher should adjust this to the circumstances of his own country, considering the local regulation the level and skills of the trainees, and the study programme of the students; are they studying construction, finishing, plumber, some examples to be given. Each programme may require different weightings and highlights, and it is on the responsibility of each teacher to consider these special needs.

Target group

The target group of the programme is young people with strong learning skills, e.g., students having secondary-school graduation, and students in VET level education institutes studying for qualifications in construction and finishing fields. The course suits well to the employees and entrepreneurs working in construction and finishing branches, as well as to others interested in digital construction, too.

Work required

In the curriculum, the average work required by each module is measured in working hours to make it easier for teachers to plan the practical application. If the education institute requires ECTS credit units (abbreviated in this presentation as CU) to be used, the hours can be changed to CUs. One credit unit equals 27 hours workload. The curriculum consists of modules totalling 150 hours corresponding approximately 6 (5,6) ECTS credit units containing class lectures, online studies, individual studies, and assignments.

Teaching methods

Teachers are encouraged to use varying methods containing e.g.:

- Lectures,
- Visiting lecturers,
- Construction site visits,
- On line studies,
- Videos approaching the topics (Reliability of the source must be evaluated),
- Individual studies and
- Assignments.

Cooperation with the local experienced industry practitioners is highly recommended. All modules can be studied individually, so the modules can be offered also via open studies to all companies and organizations operating at the construction and finishing branches, who intend to develop their skills in using the modern information technology in their business.

Contents of the curriculum

The variation in regulations and circumstances and qualification requirements are quite different in the BSR-countries, thus the material was written only as a form of framework inside which the local actors should modify the contents of modules according to their own regulations and local requirements, without forgetting the needs of different study programmes. By using innovative, problem-based, and experiential educational approaches, teacher will be able to help students to become experts who are able to acquire, create, implement, and use high-quality digital solutions at construction sites.

The overall objectives of the curriculum are:

- The student deepens his/her knowledge about underlying basic information concerning digital solutions in the construction and finishing business.
- The student understands the regulatory framework and knows essential contents of legislation on digitalization.
- The student can explain specific terms that relate to digitalization in common, and digitalization in construction business.

- The student understands the benefits of digitalization and knows how to develop construction work with the help of digital tools.
- The student deepens his/her knowledge about common digital tools and their usability in the context of construction business.

The curriculum is divided into modules as follows:

- Module 1: Basic knowledge – optional – for those having no or only little knowledge in digitalization and digital tools.
- Module 2: Common digital solutions in construction business – compulsory for everyone.
- Module 3: Special issues in digitalization at construction sites – optional or compulsory, depending to the needs of trainees and goals of training. The contents of this module can be modified to meet the regional needs and needs of the trainees and their employers.

About the links

The links to materials have been tested during the period February – March 2023. However, the links may be changed and deleted very fast; thus, it is recommended that links, which will be given to students, will be checked in the beginning of each course. Some of the links may be behind the paywall and require agreement between the educational institute and publisher to be available. In such case, contact your librarians. Some of the links refer to documents that have been written in commercial or political purposes. The authors of this document do not take a stand for or against any product, and the research results and opinions found in the links are also the responsibility of the original authors of the documents in question.

Additional Links

The links below are examples of available materials. Some of these links may have been included into tables of recommended material too.

https://euconstruction2050.eu/tag/digital-construction/

http://www.eubim.eu/wp-content/uploads/2020/03/BIM-and-Digital_ILEKTRA-PAPADAKI.pdf

https://www.construction-products.eu/publications/digital-building-logbook/

https://single-market-economy.ec.europa.eu/document/download/dabecaa1-0008-4034-a3d6-5f01d76c0f24_de

https://ec.europa.eu/growth/document/download/3ae8a41e-4b82-4150-968c-1fc73d1e2f61_en

https://www.linkedin.com/pulse/digitalisation-construction-sector-eu-report-2021-panagiotidou

https://www.sustainableplaces.eu/sp2020_smart-buildings_dg-grow_i-papadaki/

https://www.digitaleurope.org/resources/digital-building-transformations-for-europes-green-renovations-sustainable-living-and-working/

https://mdpi-res.com/d_attachment/energies/energies-15-01994/article_deploy/energies-15-01994.pdf?version=1646815634

https://app.dimensions.ai/details/grant/grant.8586776

https://www.ocnni.org.uk/umbraco/Surface/Qualification/GetQualificationGuide?qubaId=127531

https://www.ocnni.org.uk/umbraco/Surface/Qualification/GetQualificationGuide?qubaId=127431

https://www.ocnni.org.uk/umbraco/Surface/Qualification/GetQualificationGuide?qubaId=127489

https://www.ocnni.org.uk/umbraco/Surface/Qualification/GetQualificationGuide?qubaId=127490

https://www.ocnni.org.uk/umbraco/Surface/Qualification/GetQualificationGuide?qubaId=127458

https://www1.bca.gov.sg/docs/default-source/docs-corp-news-and-publications/media-releases/skillsfuture-built-environment-career-map.pdf

https://www.digitalconstructionskills.com/elearning

https://the-icm.co.uk/2020/05/06/digital-competencies-framework-%E2%94%80-icm-works-%E2%94%80-unlocking-constructions-digital-future/

https://joint-research-centre.ec.europa.eu/digcomp/digital-competence-framework_en

https://digital-competence.eu/

https://constructioninnovationhub.org.uk/wp-content/uploads/2021/11/Digital-Capabilities-a-framework-for-early-career-professionals-across-built-environment-disciplines.pdf

https://www.oph.fi/sites/default/files/documents/DYW_Digital%20competences%20and%20capacities%20in%20youth%20work_Report.pdf

https://www.oph.fi/sites/default/files/documents/191033_digitalisaatio_ammatillisessa_koulutuksessa.pdf

https://ervet-journal.springeropen.com/articles/10.1186/s40461-022-00130-w

https://eufordigital.eu/wp-content/uploads/2020/11/EU4Digital-Methodology-for-measuring-and-forecasting-skills-gaps.pdf

https://www.cedefop.europa.eu/files/04._p.kampylis_eu_frameworks_and_tools_supporting_digital_competences.pdf

https://www.kmop.gr/wp-content/uploads/2020/06/Building-digital-competences-of-low-skilled-adults-45.pdf

https://www.atlantis-press.com/proceedings/icieve-21/125972278

https://www.researchgate.net/publication/325485063_Digitalisaatio_ammatillisessa_koulutuksessa_UUTTA_TIETOA_AMMATILLISEN_KOULUTUKSEN_DIGITALISAATIOSTA_-_Digitalization_in_Professional_Education/link/5b10e41daca2723d9978ddca/download

https://education.ec.europa.eu/fi/news/guidelines-for-teachers-tackling-disinformation-and-promoting-digital-literacy

3. Official examination regulations

The following examination regulations were adopted in German by the Vocational Training Committee of the Schwerin Chamber of Skilled Crafts in March 2023 and by the General Assembly of the Schwerin Chamber of Skilled Crafts in May 2023 and subsequently approved by the Ministry of Education of the State of Mecklenburg-Vorpommern and then published in the journal Nord Handwerk. The examination regulations, of which an English translation is also attached below, have thus entered into force.

A procedure for the international recognition of the official further education qualification at EQF Level 5 was also developed, discussed and agreed.

Examination Regulation

Rechtsvorschriften für die Fortbildungsprüfung zur Fachkraft für digitale Bautechnologien für kleine und mittlere Unternehmen (HWK) nach § 42a HwO

Die Handwerkskammer Schwerin erlässt aufgrund der Beschlüsse des Berufsbildungsausschusses vom ..... 2023 und der Vollversammlung vom ..... 2023 gemäß des § 42 a der Handwerksordnung (HwO) in der Fassung der Bekanntmachung der Neufassung vom 24.09.1998 (BGBl. I S. 3074; 2006 I S. 2095) zuletzt geändert am 31.08.2015 (BGBl. I S. 1474) folgende besonderen Rechtsvorschriften für die Fortbildungsprüfung zur Fachkraft für digitale Bautechnologien für kleine und mittlere Unternehmen (HWK).

§ 1 Ziel der Prüfung und Bezeichnung des Abschlusses

1) Durch die Prüfung zur Fachkraft für digitale Bautechnologien für kleine und mittlere Unternehmen (HWK) ist festzustellen, ob der Prüfling die notwendigen Kenntnisse, Fähigkeiten und Erfahrungen besitzt, digitale Technologien in kleinen und mittleren Unternehmen des Bau- und Ausbaugewerbes in handwerklich orientierten Funktionsbereichen sachgerecht einzusetzen.

2) Die erfolgreich abgelegte Prüfung führt zum anerkannten Abschluss Fachkraft für digitale Bautechnologien für kleine und mittlere Unternehmen (HWK).

§ 2 Zulassungsvoraussetzungen

Zur Prüfung ist zuzulassen, wer

1) eine mit Erfolg abgelegte Ausbildungsprüfung in einem Beruf des Bau- und Ausbaugewerbes nachweist.

2) Abweichend von Absatz 1 kann zur Prüfung auch zugelassen werden, wer durch Vorlage von Zeugnissen oder auf andere Weise glaubhaft macht, dass auf Grund der bisherigen Tätigkeit Kenntnisse, Fähigkeiten und Erfahrungen erworben worden sind, die eine Zulassung zur Prüfung rechtfertigen.

§ 3 Gliederung, Inhalt und Dauer der Prüfung

1) Theoretische Grundlagen

Im ersten Prüfungsteil sind Grundkenntnisse in folgenden Handlungsfeldern nachzuweisen:

a) Analyse der Einsatzmöglichkeiten digitaler Technologien in der Ausführung von Neubau-, Ausbau-, Modernisierungs-, Sanierungs- und Renovierungsarbeiten

b) Unterbreitung betriebswirtschaftlich begründeter Vorschläge zur Nutzung digitaler Technologien

c) Aktivitäten zur Verwendung digitaler Bau-Technologien im Betrieb

d) Prüfung der betrieblichen Eignung von digitalen Bau-Technologien

e) Entwicklung von Optimierungsvorschlägen zur Verbesserung der Nutzung von digitalen Bau-Technologien

Der erste Teil der Prüfung wird mündlich durchgeführt und soll insgesamt nicht länger als 30 Minuten dauern.

2) Planung, Realisierung und Bewertung des Einsatzes digitaler Bau-Technologien

Im zweiten Prüfungsteil soll der Prüfling nachweisen, dass er in der Lage ist, betriebsbezogen für Arbeiten im Bau- und Ausbaubereich digitale Technologien auszuwählen, einzusetzen und zu evaluieren. Dazu gehören:

a) das Aufzeigen von Aktionsfeldern für die Nutzung digitaler Bau-Technologien in KMU

b) die Planung des Einsatzes digitaler Bau-Technologien im Betrieb

c) die Darstellung von Vor- und Nachteilen bei der Nutzung digitaler Bau-Technologien im Betrieb

d) die Klärung sämtlicher Voraussetzungen zur Nutzung digitaler Bau-Technologien im Betrieb

e) die Verankerung des Einsatzes digitaler Bau-Technologien im Betrieb

f) Maßnahmen zur Überprüfung der Geeignetheit von digitalen Bau-Technologien im Betrieb

Der zweite Teil der Prüfung wird schriftlich durchgeführt und soll 60 Minuten nicht überschreiten.

3) Projektarbeit

Der dritte Prüfungsteil erfolgt in Form einer Projektarbeit, die als schriftliche, berufsbegleitende Hausarbeit anzufertigen ist. Den Umfang und den Beginn der

Projektarbeit legt der Prüfungsausschuss fest. Die Bearbeitungszeit soll mindestens 120 Stunden betragen.

4) Auf der Grundlage der Prüfungsleistungen in der Projektarbeit ist ein Fachgespräch zu führen, indem der Prüfling zeigen soll, dass er die der Projektarbeit zugrunde liegenden fachlichen Zusammenhänge aufzeigen, den Ablauf der Projektarbeit begründen und mit der Projektarbeit verbundene fachliche Probleme und deren Lösungen darstellen kann. Das Fachgespräch soll nicht länger als 30 Minuten dauern.

§ 4 Anrechnung anderer Prüfungsleistungen

1) Von der Ablegung der Prüfung in einzelnen Handlungsfeldern kann der Prüfling auf Antrag von der Handwerkskammer befreit werden, wenn er/sie vor einer zuständigen Stelle, einer öffentlichen oder staatlichen anerkannten Bildungseinrichtung oder vor einem staatlichen Prüfungsausschuss eine Prüfung bestanden hat, deren Inhalt den Anforderungen des jeweiligen Handlungsfeldes entspricht.

2) Eine vollständige Freistellung ist nicht zulässig.

§ 5 Bestehen der Prüfung und mündliche Ergänzungsprüfung

1) Die Prüfungsleistungen in den Prüfungsteilen gem. § 3 sind einzeln zu bewerten.

2) Die in den drei Prüfungsteilen erzielten Punktzahlen in den mündlichen und schriftlichen Prüfungsleistungen sind zu einer Gesamtpunktzahl zusammenzufassen. Dabei besteht die Gesamtnote zu

15 % aus dem ersten Prüfungsteil,

25 % aus der schriftlichen Prüfung des zweiten Prüfungsteils,

40 % aus der Projektarbeit des dritten Prüfungsteils und

20 % aus dem Fachgespräch im dritten Prüfungsteil.

3) Die schriftliche Prüfung des zweiten Prüfungsteils ist durch eine mündliche Prüfung zu ergänzen, wenn diese für das Bestehen der Prüfung den Ausschlag geben kann. Die mündliche Prüfung soll nicht länger als 15 Minuten pro Prüfung dauern.

4) Die Prüfung ist bestanden, wenn in jedem Prüfungsteil mindestens ausreichende Leistungen erbracht worden sind.

5) Über das Bestehen der Prüfung ist ein Zeugnis auszustellen, aus dem die Prüfungsgesamtnote hervorgehen muss.

§ 6 Wiederholung der Prüfung

1) Eine Prüfung, die nicht bestanden wurde, kann zweimal wiederholt werden.

2) Hat der Prüfling bei nicht bestandener Prüfung in einzelnen Prüfungsteilen gemäß § 3 mindestens ausreichende Prüfungsleistungen erbracht, so ist diese Prüfungsleistung

auf Antrag nicht zu wiederholen, sofern sich der Prüfling innerhalb von zwei Jahren, gerechnet vom Tage der Feststellung des Ergebnisses der nicht bestandenen Prüfung, zur Wiederholungsprüfung angemeldet hat. Die Bewertung der Prüfungsleistung ist im Rahmen der Wiederholungsprüfung zu übernehmen.

§ 7 Anwendung anderer Vorschriften

Soweit diese Rechtsvorschriften keine abweichende Regelung enthalten, ist die Prüfungsordnung für die Durchführung von Fortbildungsprüfungen im Bereich des Berufsbildungsgesetzes der Handwerkskammer Schwerin in der jeweils gültigen Fassung anzuwenden.

§ 8 Inkrafttreten

Diese Rechtsvorschriften treten mit ihrer Bekanntmachung im Amtlichen Mitteilungsblatt der Handwerkskammer Schwerin (Nordhandwerk) und ihrer Veröffentlichung auf der Homepage www.hwk-schwerin.de unter der Rubrik „Rechtsgrundlagen“ in Kraft.

Legal provisions for the advanced training examination as a specialist for digital construction technologies for small and medium-sized enterprises (HWK) according to § 42a HwO

The Chamber of Crafts Schwerin issues on the basis of the decisions of the Vocational Training Committee of ..... 2023 and the General Assembly of ..... 2023 according to § 42 a of the Crafts Code (HwO) in the version of the announcement of the new version of 24.09.1998 (Federal Law Gazette I p. 3074; 2006 I p. 2095) last amended on 31.08.2015 (Federal Law Gazette I p. 1474) the following special legal provisions for the advanced training examination as a specialist for digital construction technologies for small and medium-sized enterprises (HWK).

§ 1 Objective of the audit and description of the financial statements

1) The examination as a specialist for digital construction technologies for small and medium-sized enterprises (HWK) must determine whether the examinee has the necessary knowledge, skills and experience to use digital technologies appropriately in small and medium-sized enterprises in the construction and finishing industry in craft-oriented functional areas.

2) The successfully passed examination leads to the recognized degree of specialist for digital construction technologies for small and medium-sized enterprises (HWK).

§ 2 Admission requirements

For the examination, it must be allowed who:

1) proves a successfully passed training examination in a profession in the construction and finishing industry.

2) By way of derogation from paragraph 1, any person who demonstrates, by means of certificates or by other means, that knowledge, skills and experience have been acquired on the basis of previous activity which justify admission to the examination may also be admitted to the examination.

§ 3 Structure, content and duration of the examination

1) Theoretical foundations

In the first part of the examination, basic knowledge in the following fields of action must be demonstrated:

a) Analysis of the possible applications of digital technologies in the execution of new construction, expansion, modernization, restauration and renovation work

b) Submission of economically justified proposals for the use of digital technologies

c) Activities for the use of digital construction technologies in the company

d) Examination of the operational suitability of digital construction technologies

e) Development of optimization proposals to improve the use of digital construction technologies

The first part of the exam will be conducted orally and should not last more than 30 minutes in total.

2) Planning, implementation and evaluation of the use of digital construction technologies

In the second part of the examination, the examinee is to prove that he is able to select, use and evaluate digital technologies for work in the construction and expansion sector. These include:

a) the identification of fields of action for the use of digital construction technologies in SMEs

b) the planning of the use of digital construction technologies in the company

c) the presentation of advantages and disadvantages in the use of digital construction technologies in operation

d) the clarification of all requirements for the use of digital construction technologies in operation

e) the anchoring of the use of digital construction technologies in the company

f) measures to verify the suitability of digital construction technologies in operation

The second part of the exam is conducted in writing and should not exceed 60 minutes.

3) Project work

The third part of the examination takes the form of a project work, which is to be prepared as a written, part-time term paper. The scope and start of the project work is determined by the examination board. The processing time should be at least 120 hours.

4) On the basis of the examination achievements in the project work, a technical discussion is to be conducted in which the examinee is to show that he can show the technical relationships underlying the project work, justify the course of the project work and present technical problems associated with the project work and their solutions. The expert discussion should not last longer than 30 minutes.

§ 4 Crediting of other audit services

1) Upon request, the examinee may be exempted from taking the examination in individual fields of action by the Chamber of Crafts if he/she has passed an examination before a competent authority, a public or state recognized educational institution or before a state examination board, the content of which meets the requirements of the respective field of action.2) A complete exemption is not permitted.

§ 5 Passing the examination and oral supplementary examination

1) The examination performance in the examination parts according to § 3 must be evaluated individually.

2) The scores achieved in the three parts of the examination in the oral and written examinations must be combined into a total number of points. The overall grade is too

15 % from the first part of the examination,

25 % from the written examination of the second part of the examination,

40 % from the project work of the third part of the examination and

20 % from the expert discussion in the third part of the examination.

3) The written examination of the second part of the examination must be supplemented by an oral examination if this can be decisive for passing the examination. The oral exam should not last longer than 15 minutes per exam.

4) The examination is passed if at least sufficient performance has been achieved in each part of the examination.

5) A certificate must be issued stating the passing of the examination, from which the overall examination grade must be shown.

§ 6 Repetition of the examination

1) An exam that has not been passed can be repeated twice.

2) If the examinee has completed at least sufficient examination performance in individual parts of the examination in accordance with § 3 in the event of a failed examination, this examination performance shall not be repeated on request, provided that the examinee has registered for the repeat examination within two years, calculated from the date of determination of the result of the failed examination. The assessment of the examination performance is to be taken over as part of the repeat examination.

§ 7 Application of other provisions

Insofar as these legal provisions do not contain any deviating regulations, the examination regulations for the conduct of further training examinations in the area of the Vocational Training Act of the Schwerin Chamber of Skilled Crafts in the currently valid version shall apply.

§ 8 Entry into force

These legal provisions enter into force with their publication in the Official Gazette of the Chamber of Crafts Schwerin (Nordhandwerk) and their publication on the homepage www.hwk-schwerin.de under the heading "Legal bases".

Evaluation in the Qualification Framework and international recognition

A qualifications framework for the Baltic Sea Region was designed under the Project Leonardo “Baltic Education”[6]. By means of the European Credit Transfer System of Vocational Education and Training (ECVET), this “BSR-QF” provided the basis for the evaluation of two craft occupations – “carpenter” and “painter”. ECVET is a system which allows to characterize qualification (knowledge, skills and competence) by transferable and accumulable learning units and to assign credit points to the learning outcomes. The BSR-QF and the applied ECVET process for the two named occupations formed the basis for the evaluation of the three advanced training programmes developed "Workplace Innovation".

EQF and BSR-QF – an introduction

The Maastricht Declaration of 2004, the Lisbon Strategy of 2000 as well as several other European Union initiatives, and in this context specifically dedicated funding to raise the geographical and labour market mobility and to promote lifelong learning, will yield increased employment and economic growth across EU countries. Rapid social, technological and economic changes along with an aging society make lifelong learning a necessity. For that reason, education is a major component to meet and to achieve the ambitious Lisbon goals. Hence, the European Commission has induced to develop a European Qualifications Framework and to establish National Qualifications Frameworks (hereinafter: NQF) by 2010. The modelling of National Qualifications

[6] Hanseatic Parliament: Baltic education, Hamburg 2008

Frameworks lies in the competence of national authorities, whereas the EU-Commission has recommended that the EU Member States implement NQFs. The European Qualifications Framework represents a meta-framework and is considered by the European Commission as crucial in meeting European objectives, set out in the Lisbon Strategy.

The main purpose of a qualifications framework is to improve transparency, quality and comparability of professional and academic qualification levels across differing education systems and European countries. The EQF itself does not constitute a formal recognition of occupational qualifications. A special feature of Europe is the enormous diversity of educational systems. A prerequisite to make this specificity an asset is to foster transparency.

Transparency can be considered as a fundamental prerequisite for the recognition of qualifications, and it improves comparability. Better comparability between countries is a decisive element to increase labour mobility and to ensure permeability of qualifications, whereby permeability constitutes a prerequisite for lifelong learning.

In the near future, qualifications frameworks must meet these criteria with concrete and well-designed concepts. A qualifications framework is an appropriate tool for the development and for classifying qualifications. The European Qualifications Framework was adopted in November 2007.

Under the project “Baltic Education”, constructive and fruitful discussions at European and national levels should be encouraged by a “Baltic Sea Region Qualifications Framework” (hereinafter: BSR-QF). This BSR-QF should be regarded as a supplement and contribution to the ongoing debate rather than a substitute for the shaping of National Qualifications Frameworks. The project “Baltic Education” has delivered a sizeable contribution to this strategy.

The Baltic Sea Region (BSR) is an area with a considerable number of different countries. These countries share common problems as they endeavour to cope with the same economic and demographic challenges and concerns. It is essential for this region to further develop vocational training, to improve quality and to establish transparency and recognition models. To solve these complex issues, the BSR-QF provides an orientation, allowing for classifications across the whole qualification range and also serving as a common ground for constructive discussions, conceptual considerations and individual progress.

The Baltic Sea Region Qualifications Framework

The BSR-QF comprises eight qualification levels that take into account acquired skills from the European Higher Education Area (EHEA) plus vocational qualifications and competences.

This concept is consistent with the recommendations of the European Commission. Table 1 shows the elaborated proposal for the BSR-QF. The following presents a brief overview of the respective competence levels of the BSR-QF. The following section

provides more detailed information on the methodology and descriptors that have been developed and used for the BSR-QF.

Competence level 1 – Basic education

Skills profiles to be reached at this stage are general basic training skills and they will not be counted to vocational training or academic education. Basic training is a prerequisite to gain access to higher qualification levels. The development of learning skills still requires resolute continued guided support. It is not possible to assign this skills level to a specific domain. Therefore, qualifications in this level are domain independent.

Competence level 2 – No vocational training

Level 2 comprises the first level of vocational training (VET area). Qualifications at this stage are not specifically pronounced, since knowledge and skills are at an early stage of evolving. Methods and social skills are not yet domain-specific. 1 to 2-year qualification programmes, training phases and vocational training preparation phases are covered by this stage.

Tab.1: Baltic Sea Region-Qualifications Framework

Level	Education Degree	Framework for Qualification of the VET* area and EHEA**
1	*Basic Education*	-
2	*No Vocational Graduation* graduation/training after/for 1-2 years, and work and apprenticeship preparation phase (at the age of 15/16)	First cycle VET area
3	*Lower Vocational Graduation* certificate of apprenticeship (in 2-4 years), and no/limited professional or experience (certificate of apprenticeship + <5 years of profession experience)	Second cycle VET area
4	*Middle Vocational Graduation* long profession experience as skilled worker (certificate of apprenticeship + ≥5 years of profession experience); comprehensive further education; “young master craftsman” with no/limited professional experiences (<3 years of profession experience)	Third cycle VET area
5	*Upper Vocational Graduation* master craftsman with long profession experiences as master (≥3 years); “master craftsman plus”; long	Fourth cycle VET area and short cycle academic area

Level	Education Degree	Framework for Qualification of the VET* area and EHEA**
	profession experiences and further education (certificate of apprenticeship + ≥8 years of profession experience); introductory study period	
6	Bachelor (academic bachelor's degree) and other similar qualifications and competences	Fifth cycle VET area and first cycle academic area
7	Master (academic master's degree) and other high qualifications and competences	Sixth cycle VET area and second cycle academic area
8	PhD and other very high qualifications and competences	Seventh cycle VET area and third cycle academic area

Competence level 3 – Lower vocational training

Level 3 covers complete vocational training from a training period of 2 to 4 years. Access to the competence level of a lower vocational training is possible after completion of a secondary school or after reaching the competence level 2. This involves professional skills, equivalent with an expertise level of an initial vocational training. The graduate has no or limited work experience. Qualifications at this level include a broad general education and an initial job specific expertise. Therefore, only specific parts of a domain will be covered in this qualification level. Completion of the skill level 3 is a precondition for achieving the competence levels 4 and 5.

Competence level 4 – Intermediate vocational education

Compared to Level 3, this level specifies a higher degree of professional and technical expertise. Vocational training qualifications, extensive advanced training, "Young master craftsman", and long work experience are covered by this stage. The level in this field is relatively high and all parts of a professional domain are covered. Level 4 qualifications indicate great job specific knowledge and skills. In this level, a person can be regarded as a specialist who has the knowledge and skills to relatively independently solve problems. Finally, achieving level 4 along with extensive advanced training, allows a limited number of candidates with ambitious and superb qualifications to access an academic bachelor level, without having previously obtained a general qualification for university entrance.

Competence level 5 – Higher vocational education

At this stage, candidates already have a formal vocational qualification as a master craftsman, including follow-up trainings; they have long professional experience and thus a high degree of technical expertise. Each part of a domain is covered at a high level,

but without scientific expertise. Knowledge acquired by candidates at this competence level comprise autonomous learning, broad theoretical and practical knowledge. At this relatively high level of competence basic academic studies are touched upon. Completing of the competence level 5 with comprehensive, previous vocational education and further training (e.g. as "Master Craftsman Plus") gives access to competence level 6, without having a general qualification for university entrance. It is possible to obtain credits for university entrance, based upon previously acquired knowledge (maximum 120 credit points). Nevertheless, persons who seek access to the bachelor level, have to pass an individual interview. Competence level 5 covers the short academic cycle with regard to the European Higher Education Area (EHEA). University students with circa 120 credit points are within competence level 5. [7]

Competence level 6 – Bachelor and other comparable education and skills

Candidates within this qualification range have already completed the first cycle of the EHR and the 5th level of vocational training. The academic bachelor's degree is obtained by students who usually scored 180-240 credit points[8]. Level 6 qualifications feature advanced theoretical knowledge and skills. This also applies to individuals with completed vocational training and notably domain-oriented knowledge. Precondition for access to the competence level 6 is the general qualification for university entrance or similar sophisticated competences and skills within a domain-specific education. Completing the qualification levels 4 and 5 also opens up access to the competence level 6.

Competence level 7 – Master and other higher qualification and skills

Having an outstanding domain-specific knowledge, candidates are at a significantly high level within this stage. They are highly qualified professionals, with advanced training and skills in a most deeply specific domain. Qualifications at this level include self-determined and theoretical learning. The master's degree is one of the conditions for reaching the third level of the academic cycle. Competence Level 7 is the second highest qualification of the EHR and the second highest level of the vocational training cycle.

Competence level 8 – PhD and other first-rate qualifications and skills

A PhD title is one of the highest academic degrees and it is the highest level within the EHR system. An academic person at this proficiency level is a professional and expert. Competence level 8 is the highest vocational training cycle to be reached by individuals. These persons have outstanding expertise and intellectual abilities in a most highly specific domain field. Persons at qualification level 8 have leadership skills and

[7] cf. MINISTRY FOR SCIENCE, TECHNOLOGY, AND INNOVATION (Eds.) (2005): *A Framework for Qualifications in the European Higher Education Area.* Bologna Working Group on Qualifications Frameworks. Copenhagen.

[8] MINISTRY FOR SCIENCE, TECHNOLOGY, AND INNOVATION (Eds.) (2005): *A Framework for Qualifications in the European Higher Education Area.* Bologna Working Group on Qualifications Frameworks. Copenhagen.

experience as well as potential for critical, methodical analyses, assessments and presentations.

Methodology and Descriptors

The proficiency levels measure professional, personal skills, abilities and competences within a specific domain. It is a method to classify and assess qualifications in levels. It is not the acquired diplomas but skills that are subject to assessment in levels. Qualifications are understood as a set of skills. A competence is defined as the ability to meet tough requirements in a specific context. Competent execution or effective actions involve the mobilization of expertise, cognitive and practical skills as well as social and behavioural components such as attitudes, emotions, values and motivations.[9] Skills are more than school and work-related knowledge. It is therefore a consistent argument that (professional) skills comprehensively include social and personal competence. Skills, as they are set out in the BSR-QF, are not occupation-specific, but they are in fact aggregates.[10] Hence, educational degrees were used in the project to describe, illustrate and classify skills. This increases the legitimacy among stakeholders, builds on familiar ways of thinking and classification patterns and enables easy, transparent and unbureaucratic description and understanding.

Table 2 shows the descriptors for each skills level of the BSR-QF. The descriptors "expertise" and "competence" are equivalent to the descriptors in the EQF.

The Baltic Sea Region Qualifications Framework contributes to the discussion and advisory debate on the development of the National Qualifications Framework. The design is consistent with the structures and methods of the European Commission.[11] This BSR-QF contributes to the fostering of education and the economy of the Baltic States as it presents an instrument to reduce cross-border barriers, which limit the work-related mobility and productivity dependent thereon. Accordingly, the BSR-QF has been accepted by the members of the Hanseatic Parliament in the General Assembly on 8 November 2007 in Vilnius as a substantial support and development tool. In the further

[9] D. S. RYCHEN/L. H. SALGANIK (2003): Key Competencies for a Successful Life and a Well-Functioning Society. DeSeCo Project report Summary, OECD, Paris, p. 2

[10] cf. BUNDESINSTITUT FÜR BERUFSBILDUNG (BIBB) (Eds.) (2005): *Fachlicher Prüfbericht zu den Grundbegriffen und Deskriptoren des Entwurfs für einen Europäischen Qualifikationsrahmen*. Bonn; and Hanf, Georg und Volker Rein (2005): *Towards a National Qualification Framework for Germany*. Federal Institute for Vocational Education and Training (BIBB), Bonn.

[11] cf. EUROPÄISCHE KOMMISSION (EC) (2005): *Towards a European Qualifications Framework for Lifelong Learning*. Commission Staff Working Document, SEC (2005) 957, Brussels; EUROPEAN COMMISSION (EC) (2006): *Implementing the Community Lisbon Programme. Proposal for a recommendation of the European Parliament and of the Council on the establishment of the European Qualifications Framework for lifelong learning*. COM (2006) 479 final, 2006/0163 (COD), Brussels; and Ministry of Science, Technology and Innovation (Eds.) (2005): *A Framework for Qualifications in the European Higher Education Area.* Bologna Working Group on Qualifications Frameworks, Copenhagen.

work of the present project, the BSR-QF ensures orientation for grading, structuring and evaluation of individual professions.

Tab. 2: Descriptors for competence levels 1-8 (Source: Own research)

Level	Expertise*	(Methodological) Competence*	(Formal) education degree	Framework for Qualification of the VET area and EHEA
	In the BSR-QF, expertise is described as knowledge and skills (equivalent with EQF)	*In the BSR-QF, competence describes the degree of responsibility and autonomy*	*The (Formal) education degree describes the degree which can be reached by an individual*	*The framework VET area and EHEA is a modified and extended EHEA framework*
1	Basic general Education; basic skills required to carry out simple tasks	Work under direct supervision in a structured context	–	–
2	Basic factual knowledge of a field of work or study; basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work under direct supervision in a structured context with some autonomy	-	-
3	Knowledge of facts, principles, processes and general concepts,	Take responsibility for completion of tasks in work;	graduation/training after/for 1-2 years, and work and apprenticeship	First cycle VET

	in a domain; a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	adapt own behaviour to circumstances in solving problems	preparation phase (at the age of 15/16)	First vocational training
4	Factual and theoretical knowledge in broad contexts within a domain; a range of cognitive and practical skills required to generate solution to specific problems in a domain	Exercise self-management within the guidelines of work contexts that are usually predictable, but are subject to change supervise the routine work of others, taking some responsibility for the evaluation and improvement of work activities	Certificate of apprenticeship (in 3 - 4 years), and no/limited professional or experience (certificate of apprenticeship + < 3 years of profession experience)	Second cycle VET Complete vocational training
5	Comprehensive, specialised, factual and theoretical knowledge within a domain and an awareness of the boundaries of that knowledge; a comprehensive range of cognitive and practical skills required to develop creative solutions	Exercise management and supervision in contexts of work or study activities with unpredictable change; review and develop performance of self and others	Long profession experience as skilled worker (certificate of apprenticeship + ≥ 5 years of profession experience); comprehensive further education	Third cycle VET Experienced qualified professional

	to abstract problems			
6	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles; advanced skills, demonstrating mastery and innovation required to solve complex and unpredictable problems in a specialised domain	manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts take responsibility for managing professional development of individuals and groups	Bachelor (academic bachelor's degree) and other similar qualifications and competences Master craftsman and Technician with long profession experiences as master (≥ 3 years); introductory study period	Fourth cycle VET First cycle academic area and professional Master
7	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking; critical awareness of knowledge issues in a field and at the interface between different fields; specialised problem-solving skills required in research and or innovation in order to develop new knowledge and procedures and to integrate	manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams	Master (academic master's degree) and other high qualifications and competences Master craftsman with training as a business economist in the skilled trades with long profession experiences as master (≥ 5 years); longer study period	Fifth cycle VET Second cycle academic area and Business Economist in trade

	knowledge from different fields			
8	Knowledge at the most advanced frontier of a field of work or study and at the interface between domains; the most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and or innovation and to extend and redefine existing knowledge or professional practice	demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research.	PhD and other very high qualifications and competences	Sixth cycle VET Third cycle academic area

* European Commission (EC) (2006): Implementing the Community Lisbon Programme. Proposal for a recommendation of the European Parliament and of the Council on the establishment of the European Qualifications Framework for lifelong learning. COM (2006) 479 final, 2006/0163 (COD), Brussels.

Structuring and evaluation

The objective of the Baltic Education Project was to develop, introduce and implement a system for mutual recognition of professional qualifications. This will be achieved by using the European Credit Transfer System of Vocational Education and Training (ECVET).[12] ECVET is a system that enables describing qualifications by transferable and accumulable learning units (in the form of knowledge, skills and competence) and corresponding allocated credit units.[13]

[12] EUROPEAN COMMISSION (EC) (2006): European Credit System for Vocational Education and Training (ECVET). A system for the transfer, accumulation and recognition of learning outcomes in Europe. SEC (2006) 1431, Brussels, p. 3

[13] EUROPEAN COMMISSION (EC) (2006): European Credit System for Vocational Education and Training (ECVET). A system for the transfer, accumulation and recognition of learning outcomes in Europe. SEC (2006) 1431, Brussels, p. 3

ECVET also perfectly complements the European Qualifications Framework.[14] In its guidelines, the European Commission outlined the overall concept as follows:

a) focus on learning outcomes expressed in terms of knowledge, skills and competence.

b) based on a process of qualification.

c) adapted to the demands of lifelong learning and all learning contexts, on an equal footing.

d) geared towards the mobility of people.[15]

Further ECVET consultation guidelines and regulations specify:

a) mobility of people undertaking training.

b) validation of the outcomes of lifelong learning.

c) transparency of qualifications.

d) mutual trust and cooperation between vocational training and education providers in Europe.[16]

The experience and methods of ECVET in the project “Baltic Education”, form the basis for the evaluation of the training programmes developed "Management and Technologies of Water, Wastewater, Waste and Circular Economy".

In a first step, the individual training modules are evaluated according to the principle "25 training hours = 1 credit point". Based on this starting point, in a second step the significance and content of each training module is evaluated by project partners and experts and then the credit points for each module are determined in a group evaluation.

Within the framework of the "Baltic Education" project, a procedure for the mutual international recognition of vocational education and further training qualifications was developed and agreed with all countries bordering the Baltic Sea. Following this agreement, the project developed and agreed a procedure for the recognition of qualifications from all training courses. The following procedure then follows for the recognition of the degrees of all training courses of the project.

- Lecturers/examiner rates the courses by assigning credit points.

[14] cf. EUROPEAN COMMISSION (EC) (2006): Implementing the Community Lisbon Programme. Proposal for a recommendation of the European Parliament and of the Council on the establishment of the European Qualifications Framework for lifelong learning. COM (2006) 479 final, 2006/0163 (COD), Brussels.
[15] EUROPEAN COMMISSION (EC) (2006): European Credit System for Vocational Education and Training (ECVET). A system for the transfer, accumulation and recognition of learning outcomes in Europe. SEC (2006) 1431, Brussels, p. 5
[16] EUROPEAN COMMISSION (EC) (2006): European Credit System for Vocational Education and Training (ECVET). A system for the transfer, accumulation and recognition of learning outcomes in Europe. SEC (2006) 1431, Brussels, p. 35

- Mutual recognition of completion in the Baltic Sea countries follows upon fulfilment of the following conditions:
  a) The final exam was passed.
  b) The assessment of the course has resulted in at least 8o % of the possible credit points shown in Tables 3 to 5 (20% margin of tolerance).
  c) Skills were acquired in all three mandatory modules
  Where they do not yet exist, each of the future participants will receive an EU education passport in which the results are documented.

Structuring and evaluation of additional qualifications

In the project " Efficient construction through digital technologies in the construction and finishing trade (DIG-CON)" a training with three modules will be developed and implemented.

Module 1 Basic and fundamental issues of digitalization

Module 2 Branch-specific issues and issues arisen from collection of best practices

Module 3 Special topics arisen in practice

All three modules are classified as mandatory, in which knowledge and skills have to be acquired.

With regard to the assignment of the course in the BSR-QF, the classification was made in competence level 4 “Complete vocational training”

The assessment in the project led to the following conclusions:

Table 3: Evaluation additional qualifications by credit points system

Module	**Credit Points**
Module 1 Basic and fundamental issues of digitalization	2.5
Module 2 Branch-specific issues and issues arisen from collection of best practices	5,5
Module 3 Special topics arisen in practice	2,0
Total	10,0

Internationally recognised educational qualification

Participants who complete all six main modules and pass the final examination receive the internationally recognised further training qualification "Specialist for digital construction technologies for small and medium-sized enterprises (HWK)”.

4. Implementation Reports

Latvian Chamber of Commerce and Industry[17]

Introduction

The demand for good apartments and houses has rarely been as high as it is now, and yet there is far too little affordable housing available. Hence, significant increases in efficiency and acceleration of construction planning and execution are much needed in the construction industry. Construction projects can be carried out more efficiently by applying targeted digital tools. In addition, digital technologies make the identification of risks in construction possible at an early stage so that they can be avoided.

Within the project, best practices on the digital tools and training programmes that are used in the construction sector were researched, as well as the training programme was developed. This training programme was developed using the KAIN (Knowledge Acquisition according to Individual Needs) method. The KAIN method aims to create a common knowledge base for participants with different experiences, taking into consideration their individual experiences, and to help develop and implement projects in their companies.

The trainings in Latvia were carried out total in five sessions (04.12.2023., 05.12.2023., 06.12.2023., 07.12.2023., and 08.12.2023), making it short yet intense training course. Each session consisted out of a full training day that with theoretical and practical information, as well as with some self-learning tasks.

The training was initially planned to be carried out for the architectural students, however, due to unexpected circumstances, it was decided to carry out the training for more general audience at the Turiba University, university of business. Based on this, a bit more generic training modules were selected, so a wider number of participants could apply for this training.

The training experts emphasised: “Digitalisation is crucial for enhancing efficiency, accessibility, and competitiveness across various sectors, including business. By automating tasks and streamlining processes, digital technologies significantly boost productivity and reduce costs. They enable businesses to harness data analytics for deeper insights into market trends and customer behaviour, facilitating informed decision-making. Digital platforms expand customer reach and improve service accessibility, while tools like social media and mobile apps enhance customer engagement through personalized experiences. Moreover, digitalisation drives innovation by introducing new business models and supports sustainability by reducing physical resource needs. It also equips businesses with the resilience to adapt swiftly to changing circumstances, ensuring continuity and adaptability in times of disruption. Overall, digitalisation is a key enabler of modern business practices, fostering growth and ensuring long-term competitiveness in a rapidly evolving digital landscape. That is why it is essential to learn it also in the business sectors as well.”

[17] Prepared by Jurijs Dubatovka, Latvian Chamber of Commerce and Industry

Admission and organisation of the training

Initially, the Latvian Chamber of Commerce and Industry planned to implement the training together with one of the universities that focuses on digitalisation in construction. However, the expert who was supposed to lead the training, unexpectedly decided not to do that. Due to this, LCCI contacted other university – Turiba University, who were interested in piloting the training, but for more generic audience, since the university is mainly focused on the business.

In total 45 participants took part in the trainings, while total number of applications exceeded 60. Trainings were separated in 5 separate full day sessions (04.12.2023., 05.12.2023., 06.12.2023., 07.12.2023., and 08.12.2023). At the end of each training session, the participants were given self-learning tasks, which were voluntary, and which were discussed before the beginning of each new session. As well, participants were encouraged to ask their questions during the trainings.

Trainings itself took place in the premises of the Turiba University. The trainings were mixed – face-to-face and online, making it more flexible for students to attend all trainings.

Training was led by three experts:

- **Ms Kristīne Neimane (Mg.sc.env)**

  Head of the Project Department at Turiba University and Member of the Board of ActiveLV Ltd. In addition, she is a mentor of the Association of Mentors of Turiba University. Kristine has many years of experience in project development and implementation, including EU-funded programme projects. Kristine also has experience in attracting funding from various funds for projects and ideas, and she shares this knowledge with students. Of course, she also has experience in managing international projects, organising events and building collaborations, where knowledge of different communication tools is also useful.
- **Ms Jana Bunkus (Mg.sc.comm.)**

  Founder and CEO of J.B. Spark Communication. More than 20 years of experience in public relations, most of it in municipalities and the non-governmental sector, but in recent years also with companies, institutions and organisations. She is engaged as a communication expert on various communication-related issues and projects. Acting Head of the Communication Department of the Faculty of Business Administration of Turiba University and Acting Head of the Department of Communication Sciences. Mentor of the Association of Mentors of Turiba University.
- **Mr Jānis Pekša (Ph.D.)**

  Head of IT Department of Turiba University and mentor of the Association of Mentors. Jānis also teaches the following subjects: algorithms, data structures and complexity; database management systems; introduction to operations research; internet systems and standards; object-oriented programming; research design and forecasting in business; software development basics in

Java; software development basics in Python. Alongside his studies, Jānis also actively follows artificial intelligence solutions and their applications.

Participants profile and organisation of the training

Participants from Latvia were between 20-60 years old, from both genders, mostly with bachelor's or comprehensive school degree. Students were not only from Latvia, but also from other countries, that is why the training was carried out in English. They all were university students, from which 30% were also working, while 2% were unemployed. Also, 25% of the participants were working in the field of education and training, other 25% were in the consulting, while the remaining 50% were from other fields. Most of the participants, 98%, have 0-5 years of experience in the field, while 2% have been working more than 6 years.

Trainings were carried out in face-to-face and online formats. As no specifical software had to be installed on the computers, no preliminary preparation had to be done by the participants. A detailed curriculum was as follows:

Curriculum:

1. Session (04.12.2023)

- Introduction (Why ICT)
    - Benefits for business
    - Benefits for employers
    - Common benefits
- Terms
    - Common ICT-terms, local and brand-specific terminology
    - Internet and social media
    - Common and recommendable practices in searching and processing the data
- Self-learning: Searching for examples for the use of digital tools in business, assessing benefits. Finding some terms not presented in the lesson and exploring them.

2. Session (05.12.2023)

- Agenda 2030
    - What is Agenda 2030
    - Circular economy
    - Agenda 2030 and digitalisation
    - Digital programme of EU
- Self-learning: Try certain applications (social media), and report experiences.

3. Session (06.12.2023)

- Security
    - Local and physical risks
    - Risks in networked world
    - Safe and secure data processing
    - Fundamentals of GDPR
- Self-learning: Investigate local and physical risks in global companies with focus on safe and secure data processing with GDPR fundamentals.

4. Session (07.12.2023)

- Best practices- what they are and examples
    - Why we should be aware of best practices
    - How should we apply best practices
    - Examples of best practices
- Self-learning: Limit best practices with examples.

5. Session (08.12.2023)

- Management and administration
    - Automating administrative routines at site and in the office
    - Reporting, forecasting, contracting, purchasing etc
- Communication and collaboration
    - Tools for enabling communication and collaboration with each participant of the project
    - Tools for enabling engagement of citizens in the project
- Self-learning assignments: Explore feedback tools. Explore Google site tools. Explore management tools and try to prepare a project plan.

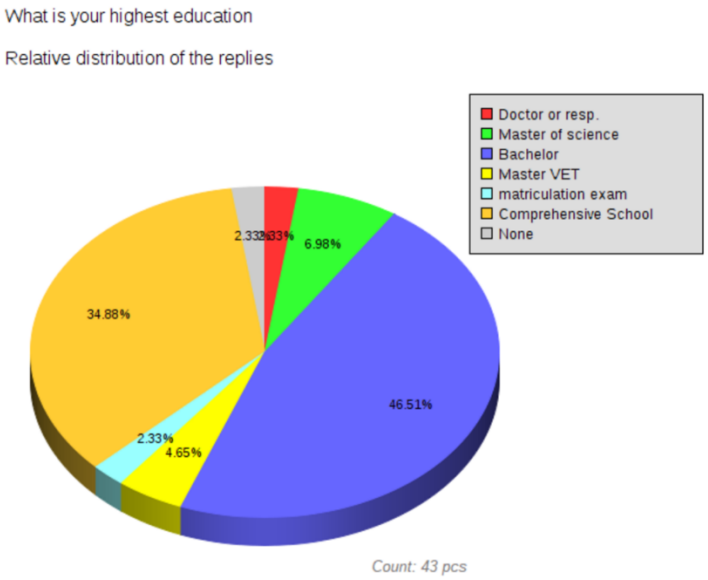
In total, participants were satisfied with the trainings and happy with the trainings and topics. Additionally, the feedback from experts was that the training was useful not only for students, but also for themselves.

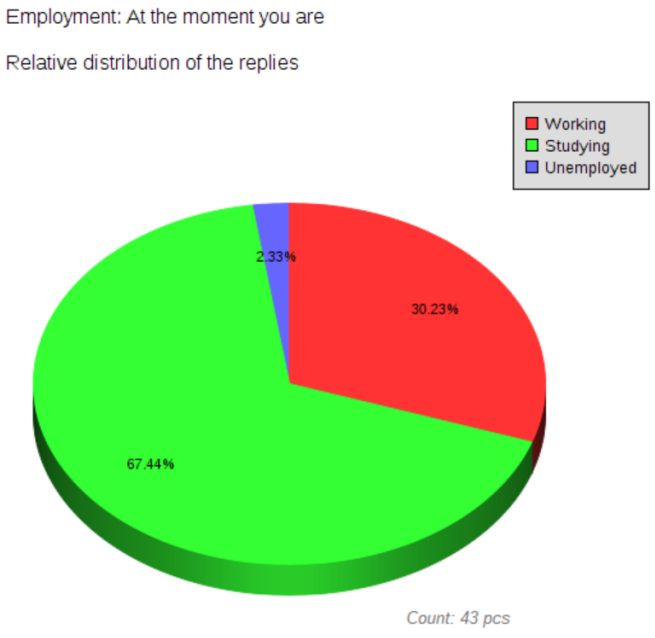
At the end of the training, the participants were given a certificate of training completion.

Main Findings and Conclusions

To draw conclusions and gather the feedback from the participants about the trainings, evaluation survey prepared by SAMK (project partner 4) was used. It was not translated and participants filled them electronically, at the end of training. In total, 43

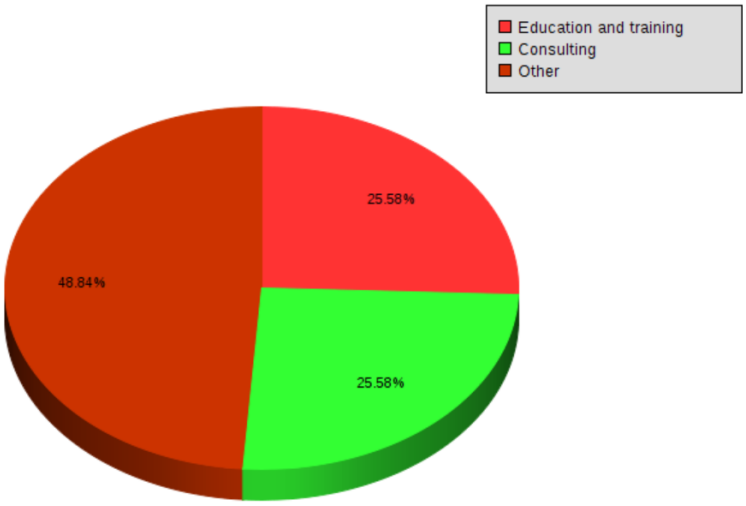
participants completed surveys. Below it is possible to see particular questions and answers given by participants.





In which branch you are / were / will be working or studying

Relative distribution of the replies



Count: 43 pcs

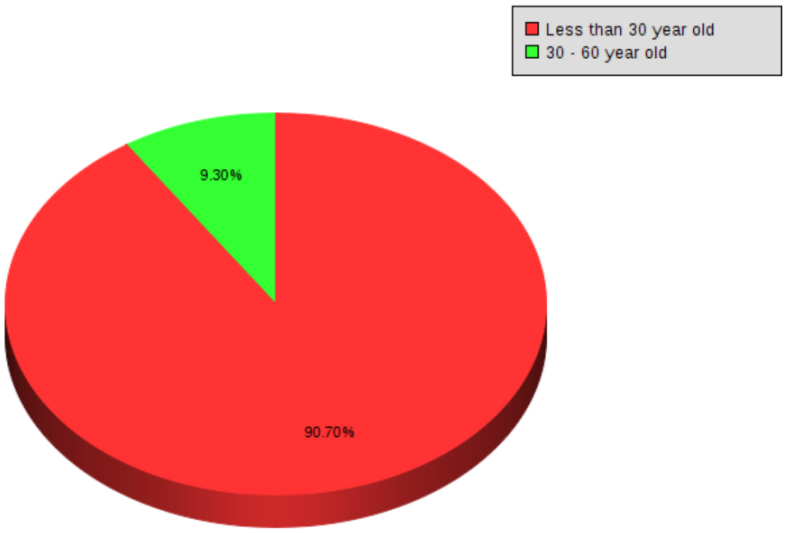
Experience in the branch
Select

Relative distribution of the replies

Count: 43 pcs

Age: At the moment you are

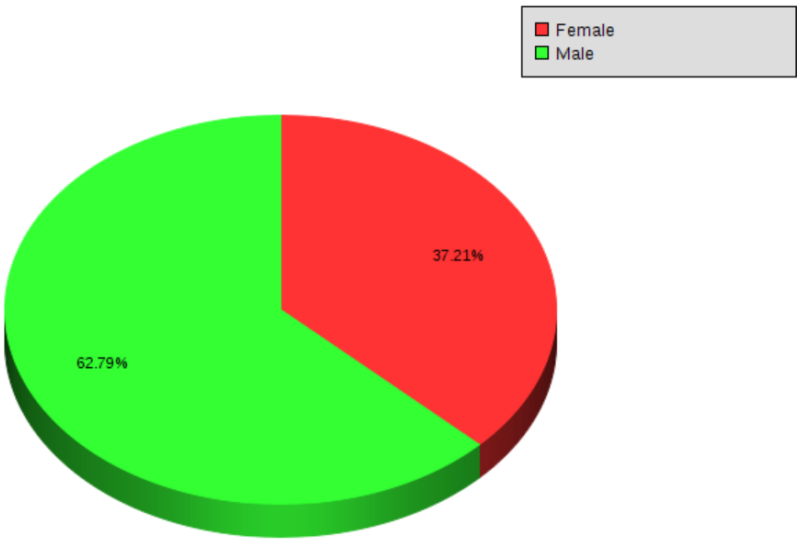
Relative distribution of the replies



Count: 43 pcs

Gender: Are you

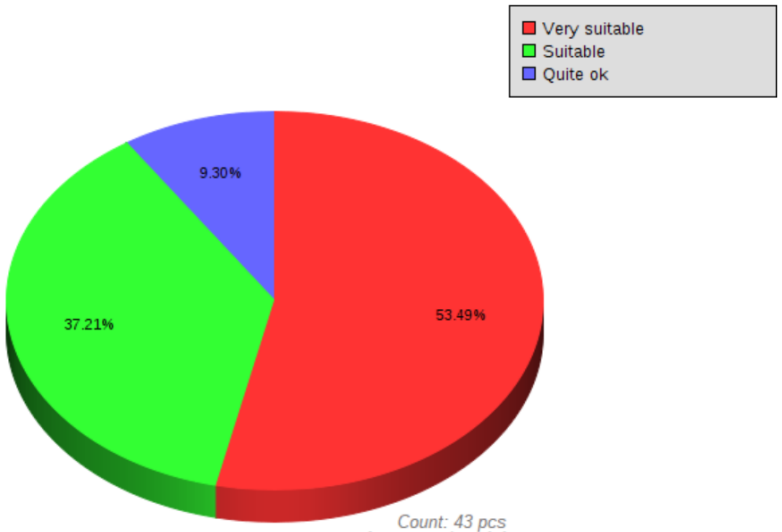
Relative distribution of the replies



Count: 43 pcs

Facilitations
The place for the training was

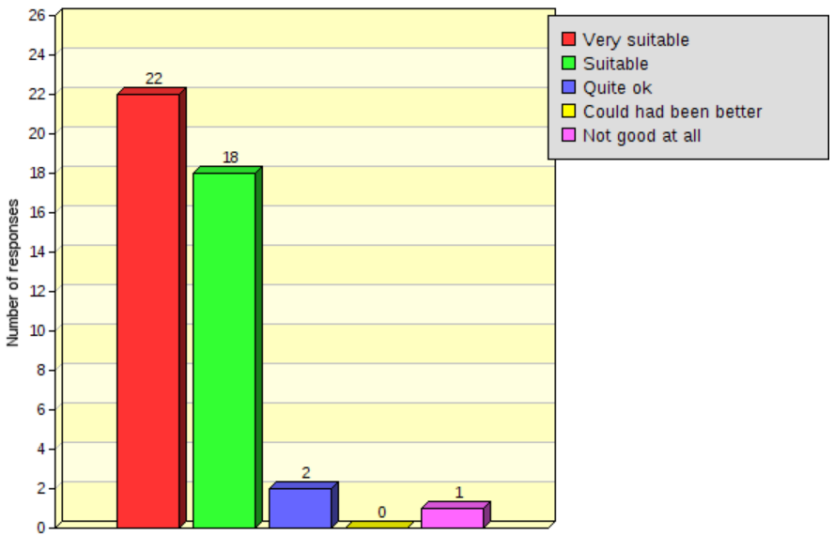
Relative distribution of the replies



Count: 43 pcs
Average value: 4.4
Min: 3
Max: 5
Median: 5
Standard deviation: 0.66

Facilitations
The time (Date) of the training was

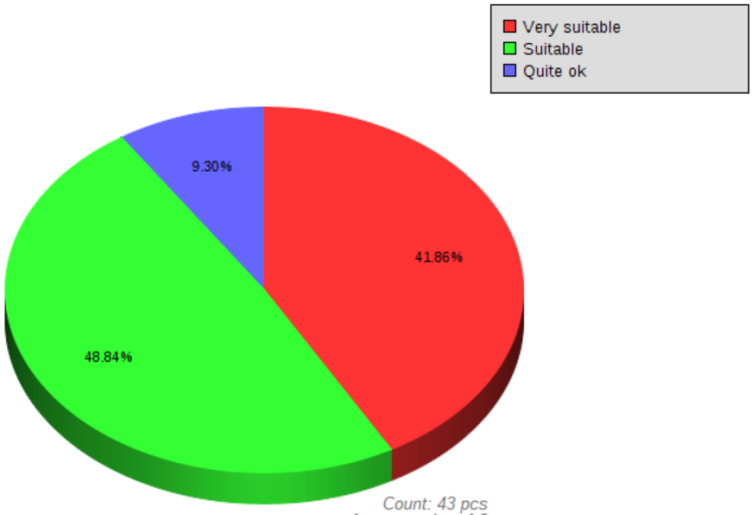
Absolute distribution of the responses



Count: 43 pcs
Average value: 4.4
Min: 1
Max: 5
Median: 5
Standard deviation: 0.78

Facilitations
The length of the training was

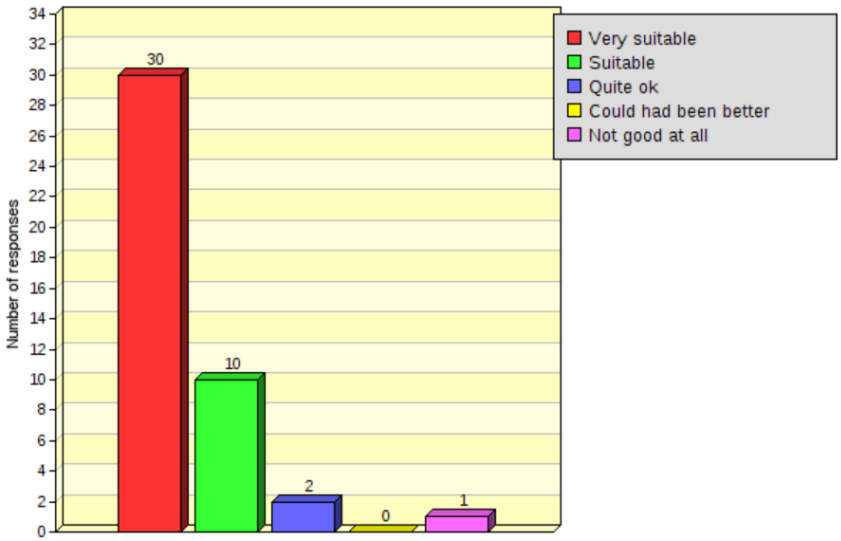
Relative distribution of the replies



Count: 43 pcs
Average value: 4.3
Min: 3
Max: 5
Median: 4
Standard deviation: 0.64

Facilitations
The schedule of the training was

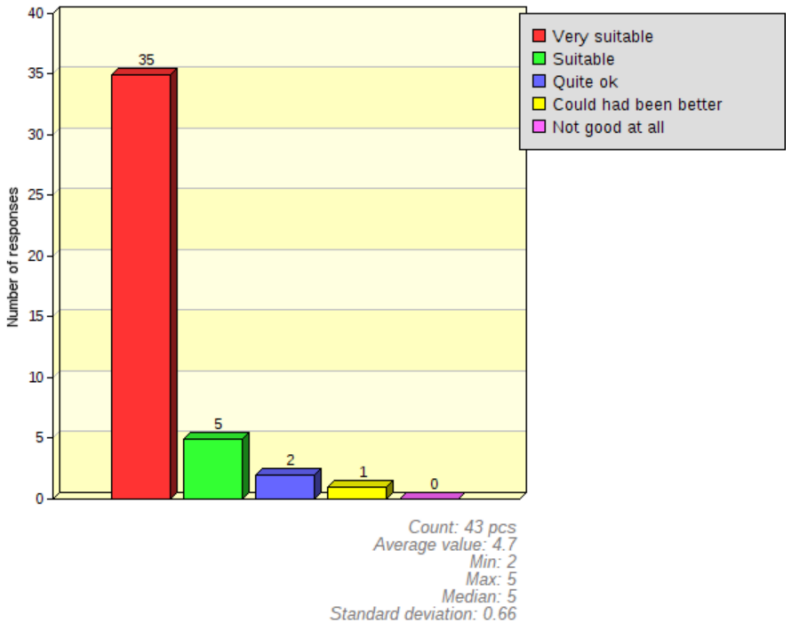
Absolute distribution of the responses



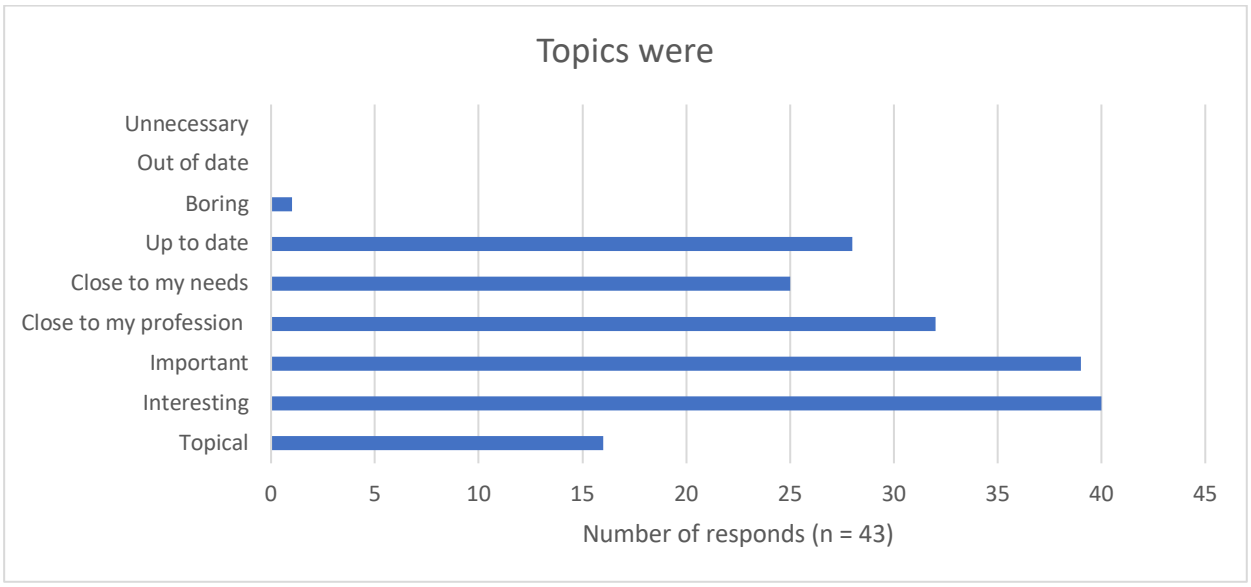
Count: 43 pcs
Average value: 4.6
Min: 1
Max: 5
Median: 5
Standard deviation: 0.78

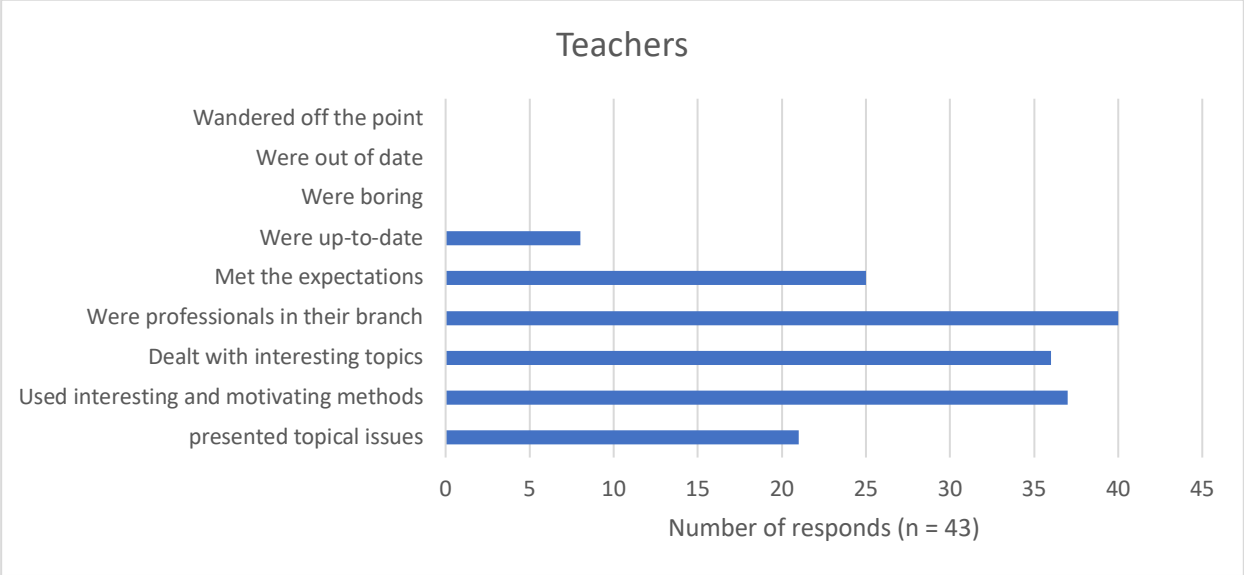
Facilitations
The facilitations (room, equipment etc) were

Absolute distribution of the responses

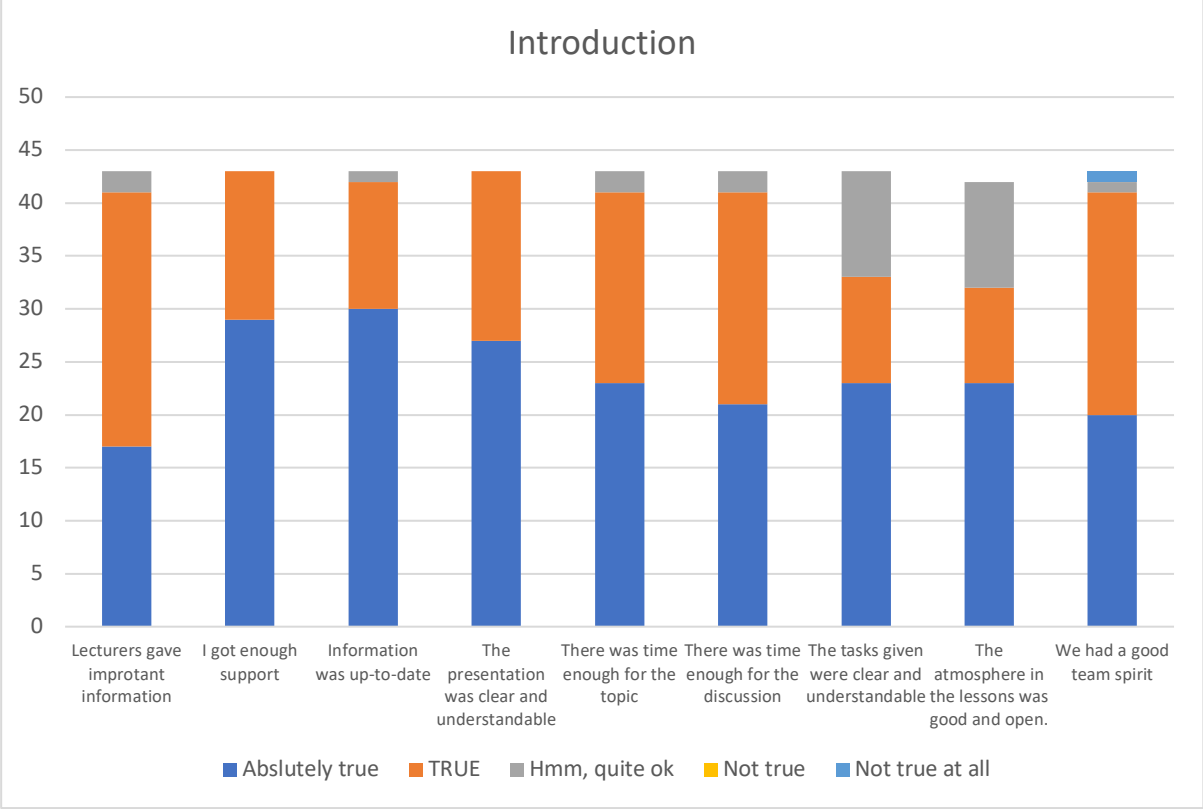


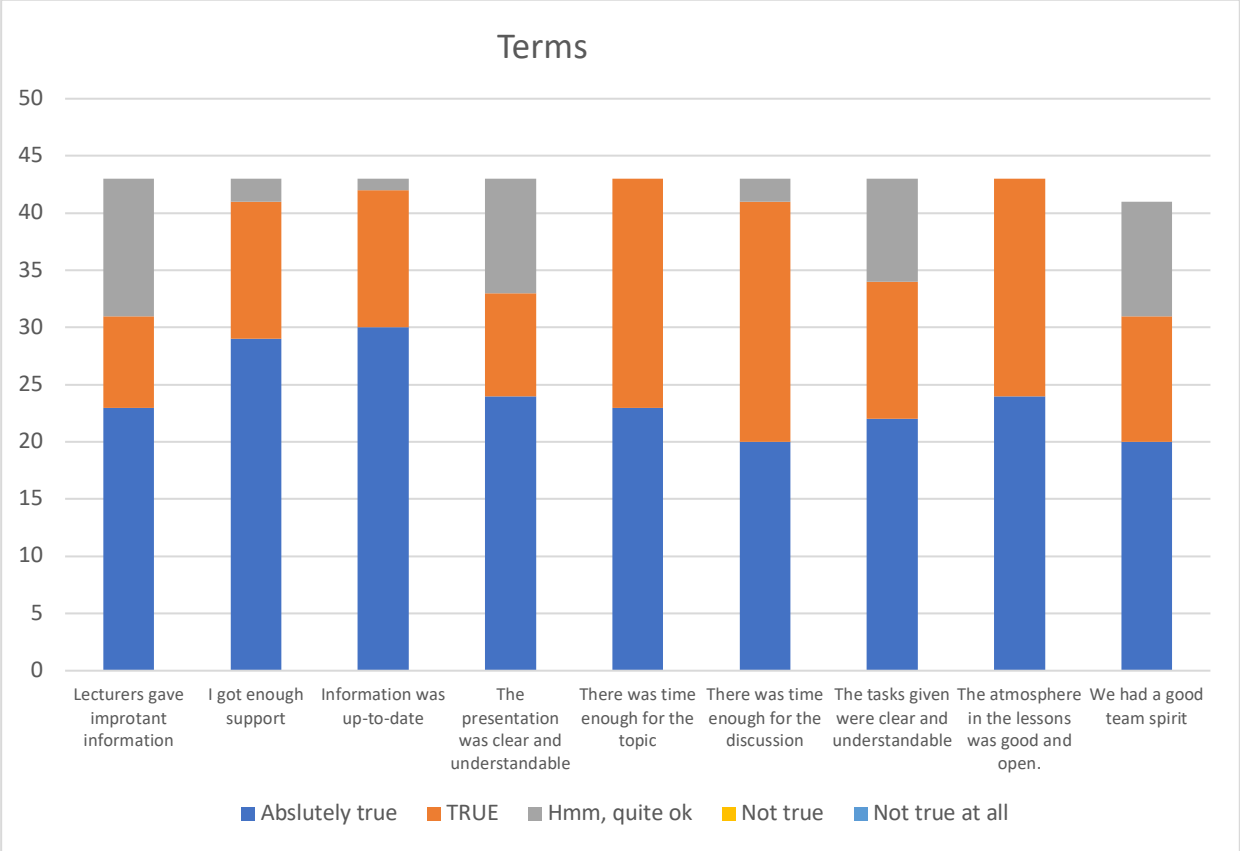
Count: 43 pcs
Average value: 4.7
Min: 2
Max: 5
Median: 5
Standard deviation: 0.66

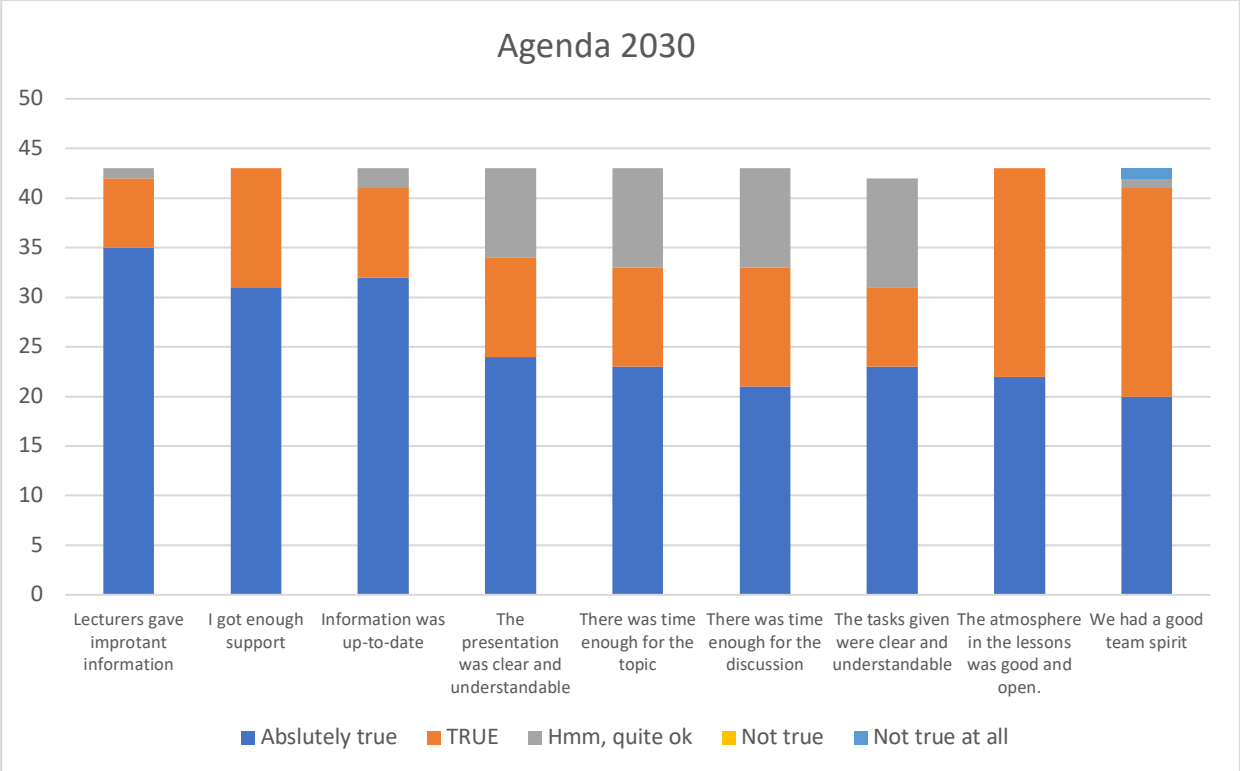


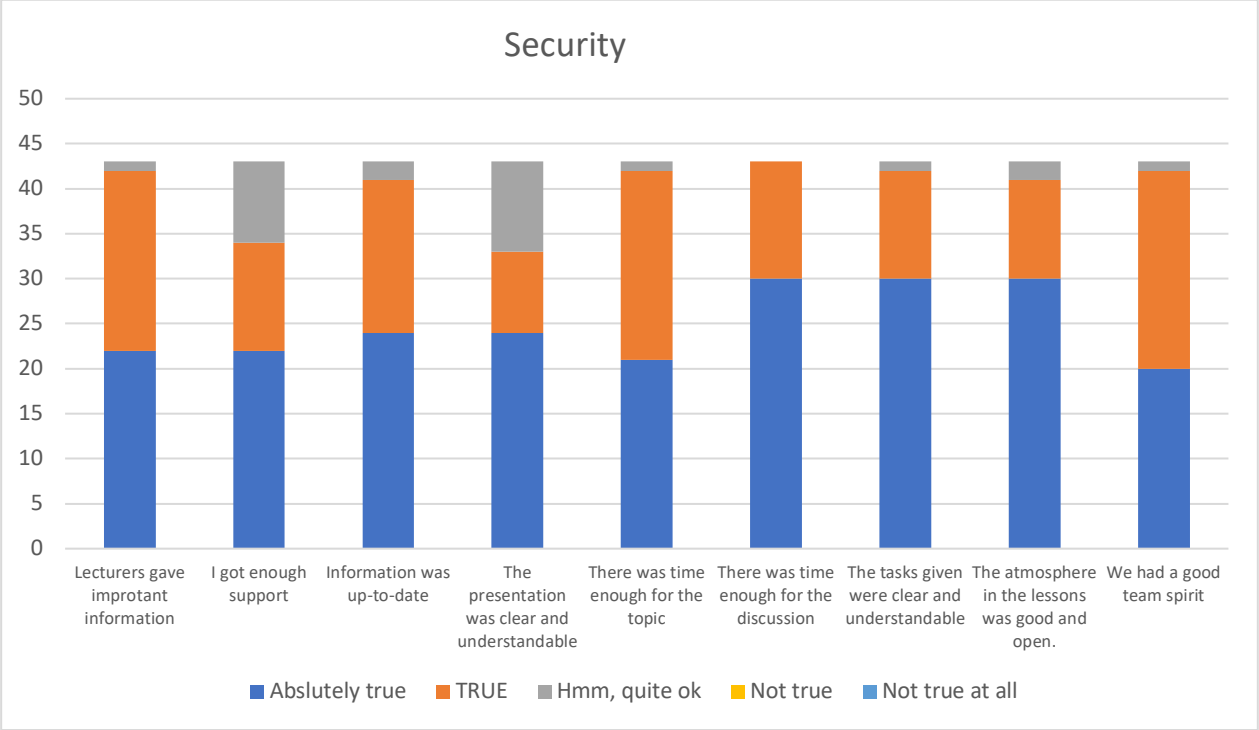

Teachers
Wandered off the point
Were out of date
Were boring
Were up-to-date
Met the expectations
Were professionals in their branch
Dealt with interesting topics
Used interesting and motivating methods
presented topical issues
0
5
10
15
20
25
30
35
40
45
Number of responds (n = 43)

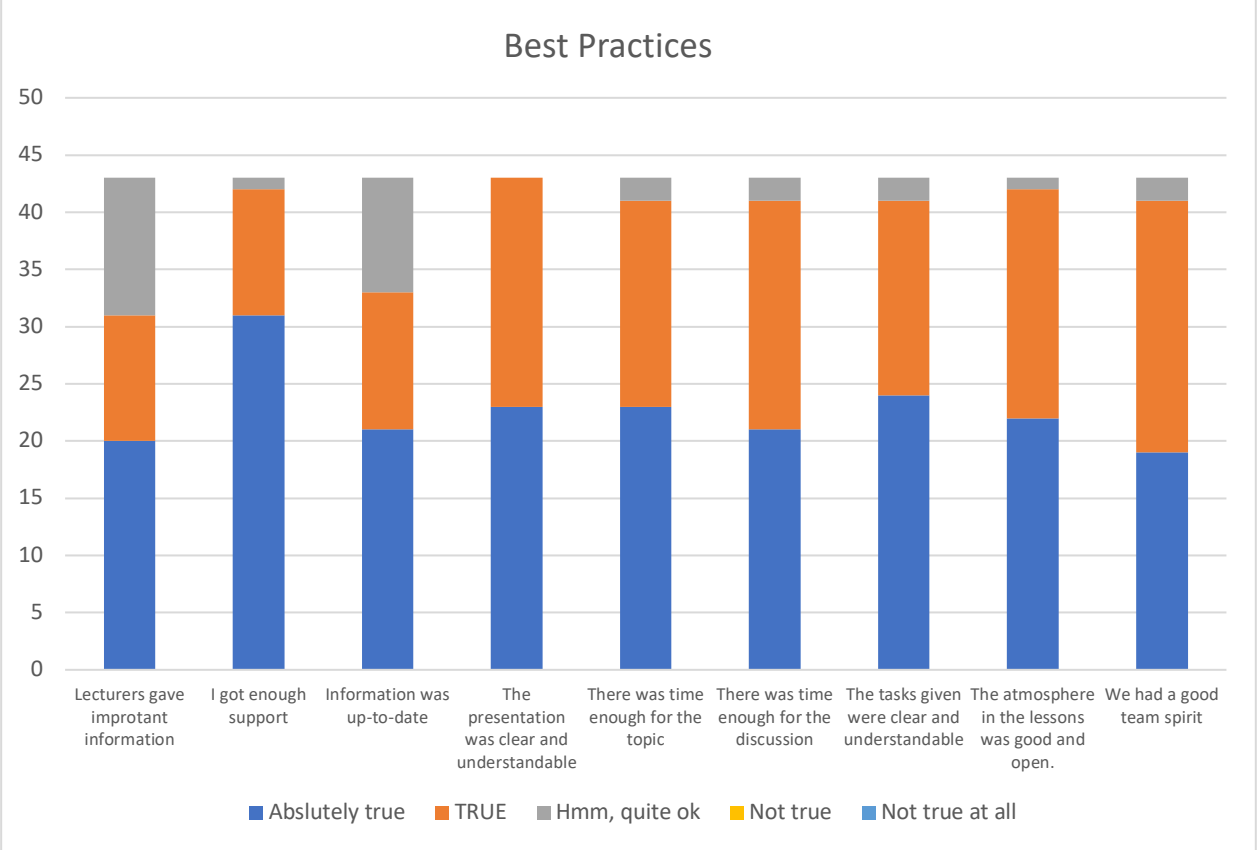
TRAININGS

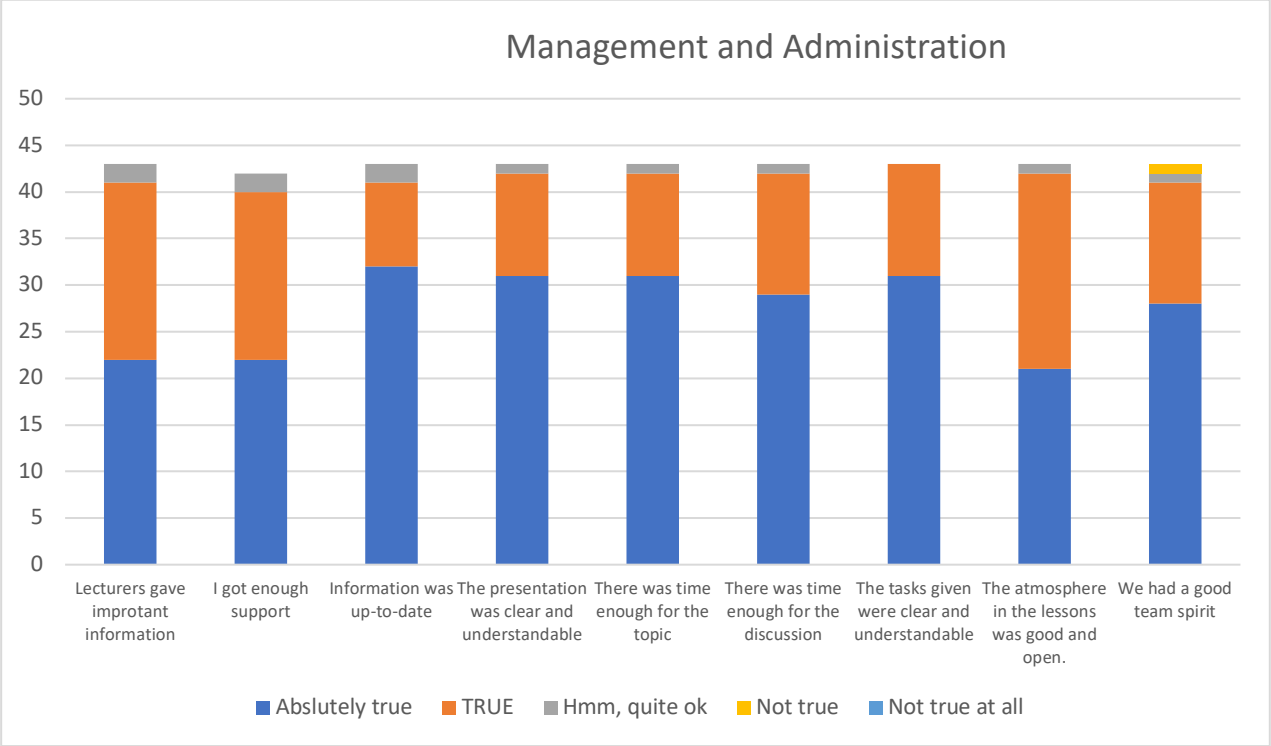

Introduction
50
45
40
35
30
25
20
15
10
5
0
Lecturers gave improtant information
I got enough support
Information was up-to-date
The presentation was clear and understandable
There was time enough for the topic
There was time enough for the discussion
The tasks given were clear and understandable
The atmosphere in the lessons was good and open.
We had a good team spirit
Abslutely true
TRUE
Hmm, quite ok
Not true
Not true at all

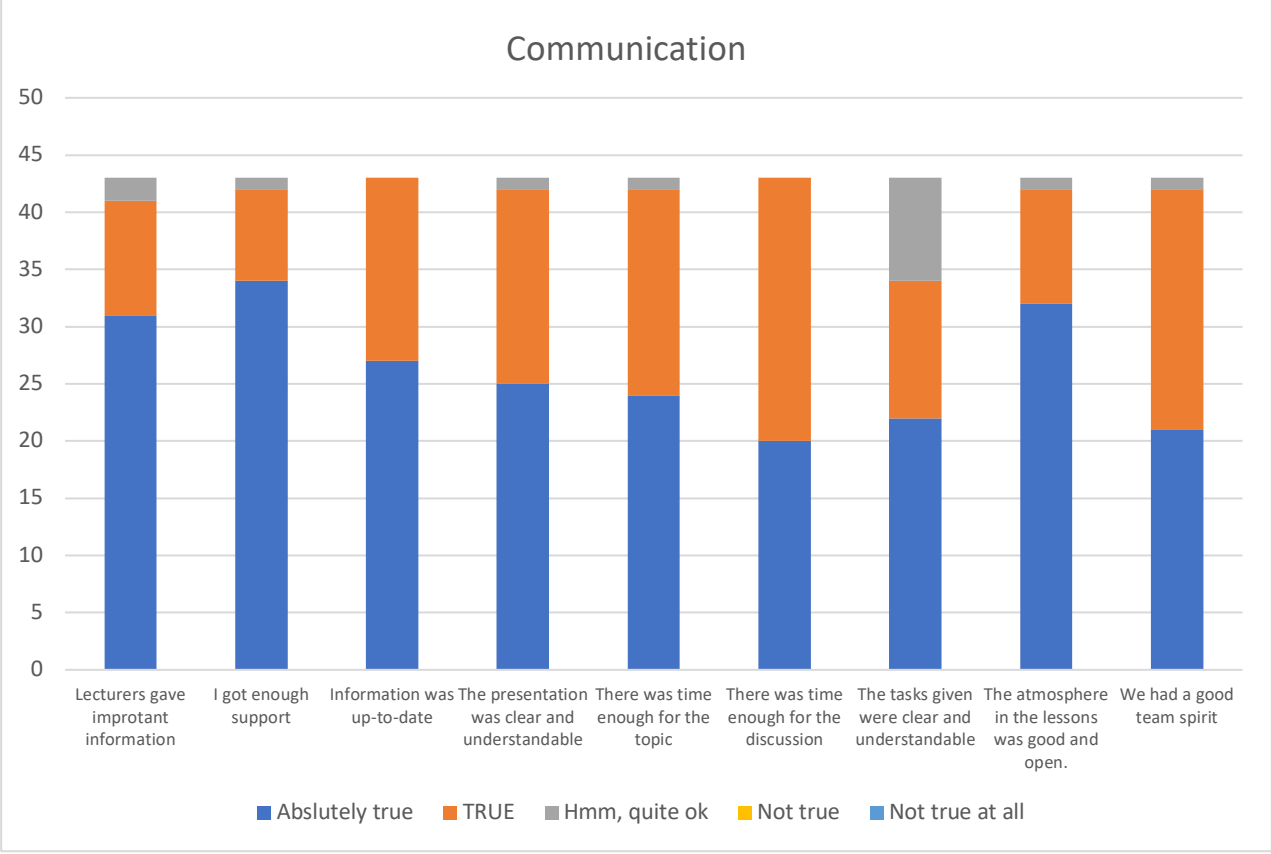

Terms
50
45
40
35
30
25
20
15
10
5
0
Lecturers gave improtant information
I got enough support
Information was up-to-date
The presentation was clear and understandable
There was time enough for the topic
There was time enough for the discussion
The tasks given were clear and understandable
The atmosphere in the lessons was good and open.
We had a good team spirit
Abslutely true
TRUE
Hmm, quite ok
Not true
Not true at all


Agenda 2030
50
45
40
35
30
25
20
15
10
5
0
Lecturers gave improtant information
I got enough support
Information was up-to-date
The presentation was clear and understandable
There was time enough for the topic
There was time enough for the discussion
The tasks given were clear and understandable
The atmosphere in the lessons was good and open.
We had a good team spirit
Abslutely true
TRUE
Hmm, quite ok
Not true
Not true at all


Security
50
45
40
35
30
25
20
15
10
5
0
Lecturers gave improtant information
I got enough support
Information was up-to-date
The presentation was clear and understandable
There was time enough for the topic
There was time enough for the discussion
The tasks given were clear and understandable
The atmosphere in the lessons was good and open.
We had a good team spirit
Abslutely true
TRUE
Hmm, quite ok
Not true
Not true at all


Best Practices
50
45
40
35
30
25
20
15
10
5
0
Lecturers gave improtant information
I got enough support
Information was up-to-date
The presentation was clear and understandable
There was time enough for the topic
There was time enough for the discussion
The tasks given were clear and understandable
The atmosphere in the lessons was good and open.
We had a good team spirit
Abslutely true
TRUE
Hmm, quite ok
Not true
Not true at all





Free speech answers:

- I think all things are okay for me
- It was very informative session.

- Awesome way to teach, feel into the study...
- Thank you for the important things hat you told to us.
- Everything is super all the lectures are best
- Such a wonderful class
- Everything is super all the lectures are best
- The way professors taught the class was soo good and also it is understandable and it makes easy to get some valid points. I hope the time management should be correct next time , thank you madam
- I think so that for the future it would be more interesting(better) if they give like group tasks or just some workshops with other students to practice communication and to share some knowledge with other people. Thank you so much! :)
- I had a great time in this course, the presentation of all professors were quite informative. The classes were very engaging.
- I had a great time in this course, the presentation of all professors were quite informative. The classes were very engaging.
- Everything was Perfect
- Thank you for your time
- Presented in very good way
- The method of teaching was absolutely amazing and it should not be changed.
- Great opportunity to learn ,it will definitely help me to get some advantage in my work. Thank you
- Thanking you for the wonderful sessions.
- It was a great training. Teachers were helpful
- Everything is good.
- Thank you for the informative and interesting lessons.
- Thank you for these courses, I enjoyed and found these lessons useful. One thing though, I believe it's better to have these courses in person!
- Just want to say Thank you
- Thank you for your teaching and explaining these topics

The feedback from participants regarding the course was positive in general, emphasising its effective teaching methods, engaging and relevant content, and significant personal impact, which fostered a high level of satisfaction and gratitude

among attendees. Especially, participants stressed out the instructors for their clarity and the practical knowledge, the engaging nature of the presentations and the overall quality of the educational experience. However, besides the positive feedback, participants also offered several recommendations for potentially improving the course. These included a call for more in-person sessions to foster better understanding and facilitate more dynamic exchanges between instructors and students. Also, there was a strong desire for incorporating interactive and practical activities, such as group tasks and workshops, to allow for the application of theoretical knowledge in real-world scenarios and improve communication skills among peers. Improved time management was suggested to ensure that all topics are adequately covered without feeling rushed. By implementing these improvements for the next round, the course could not only maintain its strengths but also evolve into a more comprehensive educational program that effectively meets the professional and personal development needs of its participants.

Chamber of Crafts and SME in Katowice, Poland[18]

Admission

The training is part of the work package 4 (WP4) of the DIG-CON project. It was developed by the Finnish partner SAMK, who wrote a proposal to conduct a course for partners implementing the training. In the curriculum, he proposed topics related to digitization in the construction industry, dividing lectures into 3 modules. In the document, he took into account the purpose, the target group and added links to supporting materials from which you can draw help in developing the training program. The SAMK partner has prepared evaluation questionnaires for the participants of the training, on the basis of which conclusions can be drawn from the course.

The first training on *Digitalization in Construction* was conducted in a conference room at the CCSK headquarters. Subsequent meetings were held using the Teams platform. The summary meeting was organized at the school. The form and dates were adapted to the target group.

The first training started on September 18, 2023, and the last meeting took place on October 20, 2023.

The training provided at the Chamber of Crafts and Crafts was not classified in the national continuing education system, it cannot be attributed directly to the EQF level. It is an out-of-school training for adults who want to expand their knowledge on the subject of digitalization. Introducing digitization into the construction sector is the most necessary knowledge for entrepreneurs and potential employees of the construction industry who operate on the labor market, so this type of training is useful. With the knowledge gained during the training, participants can implement the topics of digitalization in their daily work. This will facilitate communication between contractors

[18] Prepared by Anna Palowska, Chamber of Crafts and SME in Katowice, Poland

of the construction project, save working time, which translates into faster implementation of the project.

During the on-site meeting, the participants were able to check the operation of digital tools in the construction industry, asked more questions, and discussions were resolved. The possibility of taking an on-line course was also a good solution so that the participants could take part in the training at the same time without having to come to Katowice in the afternoon. The prize draw for the participants was encouraging. Presentation of the certificate of participation in the training.

Adoption and organization of the training course

In the curriculum, the target group could be: students after high school and students of vocational education and training institutes studying for a qualification in the field of construction and finishing, employees and entrepreneurs working in the construction and finishing industry, people interested in digital construction. We focused on young students from schools in the construction industry, who were able to expand their school knowledge with additional aspects. Of course, we did not limit the list of volunteers, but on the day of the training, there were mainly students and several employees of companies from the construction sector, who took part in discussions on the functioning of digitization in their company.

During the vocational exams in the construction industry, the students received information about the possibility of participating in training courses within the framework of the Hanse-Parliament project called "DIG CON". At the General Assembly of the Katowice Chamber of Crafts, training was announced, which will start in September 2023. Members of the Examination Committee for Construction Professions at the Chamber of Crafts in Katowice informed on their channels about design courses that will start after the summer holidays. We contacted the management of 3 trade schools with a request to allow students to participate in the training. A mailing was sent to the Guilds associated in the Chamber with a request to disseminate information among entrepreneurs about the possibility of participating in the training. After verification, 28 people applied, of which 25 were students and 3 were employees of construction companies. In the end, 26 people took part in the training.

Number of participants

Lp.	Name	Seks	Age
1.	Maksymilian Tobor	M	18-24
2.	Dominik Sznajder	M	18-24
3.	Adrian Horzela	M	18-24
4.	Aleksander Tobor	M	18-24
5.	Kacper Ledwoń	M	18-24
6.	Primoz Danisz	M	18-24
7.	Daniel Zonik	M	18-24
8.	Marcin Dziambor	M	18-24
9.	Oliwia Kęs	W	25-30

10.	Nadia Brzozowska	W	18-24
11.	Cezary Mazur	M	18-24
12.	Nikola Wieczorek	W	18-24
13.	Sabrina Samol	W	18-24
14.	Kamil Banaś	M	18-24
15.	Daniel Wieczorek	M	18-24
16.	Grzegorz Kandzie	M	18-24
17.	Magdalena Michalik	W	18-24
18.	Daria Czapla	W	18-24
19.	Maciej Mońka	M	18-24
20.	Mateusz Carbo	M	18-24
21.	Beniamin Kapica	M	18-24
22.	Krzysztof Suliga	M	18-24
23.	Małgorzata Franusik	W	18-24
24.	Martyna Siwocha	W	18-24
25.	Marceli Sekura	M	25-30
26.	Oskar Fredyk	M	25-30

The lecturer presented 10 topics from Digitalization in construction. 5 meetings were held: 2 on-site, 3 on-line. At the first meeting at the CCSK headquarters, the first 3 topics were discussed. During the on-line meetings, they presented two topics each, and at the final training, after the presentation of the last topic, the participants filled in the questionnaires they received in paper form. The time spent on self-study included the opportunity to check the functions of digital devices, digital programs that facilitate work on the construction site.

The implementation was organized by two parties. The staff of the Chamber of Crafts, through their own database of contacts of entrepreneurs and schools, informed about the date and subject of the training. The lecturer, as an experienced entrepreneur in the construction industry, also informed about the event through his channels. Thanks to the previously announced trainings during meetings with students, it was easier for entrepreneurs to return to the topic of the training, because we talked live about what the project is about and what training they can expect after the holidays.

The lecture was conducted by Mr. Artur Ledwoń, experienced in working with people as an entrepreneur and trainer. Since 2007, he has been associated with the construction industry as a company owner. The certified construction technician has won two master's titles. For personal and company development, he completed courses related to construction activities. Member of the Examination Committee at the Chamber of Crafts in Katowice in construction professions – supports the development of professionals, Member of the Board of the Guild – works for the promotion and development of construction craftsmanship, Member of the Committee of Construction and Building Materials in the Polish Craft Association in Warsaw – enables the shaping of industry policy. He takes an active part in study visits to European cities, where he can learn about and compare construction practices in other countries. Its aim is to develop

the construction industry by introducing new technologies and innovative solutions in the construction industry, promoting craftsmanship among young people, training and educating professionals, which will contribute to improving the quality of services in the construction sector. Thanks to his extensive practice, he conducts training on the basis of examples and technological novelties used in Poland on the construction site.

The lecturer answered questions on the spot. During the participants' own work, he gave advice. He showed how digital devices used on the construction site work. He asked questions to the participants so that the training would not be boring. He talked about interesting facts from life on the construction site. He used his own experience, which interested the listeners.

Profile of participants and organization of the training

Participants by age, gender, education, occupation, country of origin, etc.
Sectors of participating SMEs

Lp.	Name	Seks	Age		Nationality
1.	Maksymilian Tobor	M	<30	student	Polska
2.	Dominik Sznajder	M	<30	student	Polska
3.	Adrian Horzela	M	<30	student	Polska
4.	Aleksander Tobor	M	<30	student	Polska
5.	Kacper Ledwoń	M	<30	student	Polska
6.	Primoz Danisz	M	<30	student	Polska
7.	Daniel Zonik	M	<30	student	Polska
8.	Marcin Dziambor	M	<30	student	Polska
9.	Oliwia Kęs	F	<30	engineer	Polska
10.	Nadia Brzozowska	F	<30	student	Polska
11.	Cezary Mazur	M	<30	student	Polska
12.	Nikola Wieczorek	F	<30	student	Polska
13.	Sabrina Samol	F	<30	student	Polska
14.	Kamil Banaś	M	<30	student	Polska
15.	Daniel Wieczorek	M	<30	student	Polska
16.	Grzegorz Kandzie	M	<30	student	Polska
17.	Magdalena Michalik	F	<30	student	Polska
18.	Daria Czapla	F	<30	student	Polska
19.	Maciej Mońka	M	<30	student	Polska
20.	Mateusz Carbo	M	<30	student	Polska
21.	Beniamin Kapica	M	<30	student	Polska
22.	Krzysztof Suliga	M	<30	student	Polska
23.	Małgorzata Franusik	F	<30	student	Polska
24.	Martyna Siwocha	F	<30	student	Polska
25.	Marceli Sekura	M	<30	Construction worker	Polska
26.	Oskar Fredyk	M	<30	Construction worker	Polska

Implementation of the training

The training materials prepared by SAMK's Finnish partner, which the lecturer included in the training, proved to be very helpful. The training program was tailored to the group. The lecturer included the legal basis in force in Poland, adapted the theory to the current realities in Poland, as well as the different level of economic development. During the training, good practices that were created jointly by the project partners were also presented.

Content

1. Introduction to the course
2. Legislation and regulations
3. Digitalization in construction
4. Data models in construction
5. Autonomous machines at site
6. Digitalization in buildings
7. Maintenance and digitalization
8. Demolition
9. Management and administration
10. Communication and cooperation
11. Data models in construction
12. Autonomous machines at site
13. Digitalization in buildings
14. Maintenance and digitalization
15. Demolition
16. Management and administration
17. Communication and cooperation

Explanations were described in each paragraph. We are pleased with the fact that we were able to take part in the training on the above dates with such a large group.

We conducted surveys among the participants. At the last meeting, there was an open discussion about the usefulness of the training, conclusions, what was useful. The participants were satisfied with the course of the training, which is reflected in the surveys with positive feedback.

All participants received a certificate of participation in the training, a copy of which can be found in the attachment.According to the lecturer: The world of digitalization is with us every day. Young people entering the construction job market who have been working in this industry for several years are curious about how digitalization can be used in construction planning and the construction itself. The topics presented during the training were obviously interesting to them, which they proved during the discussions that were taken up at each meeting. Programs facilitating cooperation in the construction industry were not difficult for them. Apparently, it is easier for a young person growing up in the times of digitalization to use applications and computer

programs that are helpful in the construction industry. The participants were interested in the machines used on the construction site.

Strengths of the training in the eyes of the participants

Summarizing the questionnaires completed by the participants, it can be seen that the location, duration and program of the training were appropriate. The information provided during the meetings was up-to-date, interesting and close to the profession of the construction industry. The lecturer presented current issues, touched on important topics and demonstrated professionalism in his industry. The participants enjoyed the opportunity to test programs, applications and digital tools used on the construction site.

Weaknesses of the training in the eyes of the participants

Looking at the questionnaires filled out by the participants of the training and after personal conversations, on-site training was better compared to on-line.

Key findings and takeaways

In the previous paragraphs, we have summarized the training. With the participation of young people just entering the labour market, we were able to learn about digitalisation in everyday life and show how digitalisation has changed the construction industry. It will be easier for young people to get into work with new technologies because they do not know the world without these devices. That is why it is worth conducting training for young staff so that they know how to use digitization in the construction industry.

We managed to gather a large group. We had the opportunity to take part in the training stationary and online. The advantage is that the lecturer himself uses and implements digitalization in his company and during training for employees, so his knowledge is up-to-date and up to date. First of all, we are pleased that we were able to organize the training and were willing to participate.

In our opinion, it is very good that such trainings can be carried out as part of the project and the participants do not have to pay for them.

Due to the connection of the Chamber of Crafts with the construction and finishing industry by conducting journeyman's and master's vocational exams, we would like to continue the possibility of training for people choosing a profession. Career counsellors who know how to talk to young people would be best suited for this and they could present digitalisation in the construction industry as a good choice of career path related to this industry.

Attachments

Certificates,
https://ir.katowice.pl/wp-content/uploads/2023/12/certyficat.pdf
Signed list of participants
https://ir.katowice.pl/wp-content/uploads/2023/12/18.09.2023-Dig-in-constr.pdf
https://ir.katowice.pl/wp-content/uploads/2023/12/20.10.2023-Dig-in-constr.pdf

https://ir.katowice.pl/wp-content/uploads/2023/12/meetingAttendanceList-05.10.2023.csv
https://ir.katowice.pl/wp-content/uploads/2023/12/meetingAttendanceList-22.09.2023r.csv
https://ir.katowice.pl/wp-content/uploads/2023/12/meetingAttendanceList-28.09.csv
Photos,
https://ir.katowice.pl/wp-content/uploads/2024/01/Photos-1.pdf

Ipartestületek Országos Szövetsége, Hungary[19]

Introduction

This training was included in the WP4 package, many thematic elements of this training were developed by the Satakunta University of Applied Sciences (SAMK), project partner number PP4, and we tried to take it into account as much as possible when we implemented our training. Although our actual training has mainly involved the staff members of IPOSZ' local and branch organisations, this training is also suitable for micro and small businesses or even larger companies in terms of providing them with digital skills for the construction and finishing trades with special regard to the results of R1 „Best practices digital technologies and trainings".

The originally planned course was divided into three modules with contents and details of the curriculum were free for modifications and localizations to be compliant with the local legislation and circumstances.
Based on all this, the training carried out by IPOSZ adopted many elements from all three modules, in a way that the approach of course was practical, and considered the background of the participants.

During the course, following methods were used:

- Classroom lectures
- Online learning
- Learning tasks (Self -learning)
- Correction of tasks prepared at home accompanied by a teacher's explanation
- Online discussions
- Classroom discussions
- Assessments

We organized this training mostly for the staff members of our local and professional organisations but some entrepreneurs operating in construction and finishing trades also participated on the training.
166 local and professional organizations operate in IPOSZ. Our goal with this training was to lay down the foundations for the Virtual construction business support assistant training. The target group of this training is basically employees working in local and professional organizations who can help the daily operation and development of the

[19] Prepared by Tamás Rettich, Hungarian Association of Craftmen's Corporation

approximately 20,000 micro and small enterprises operating in various construction trades with the most modern digital tools that are members of the local and professional organizations.

Period of implementation

We received professional teaching materials and the collection of digital technologies and trainings best practices prepared by the project partners and delivered them to our member companies operating in the construction industry. The experiences and the training materials provided by the project partners were widely discussed with the membership of IPOSZ, as well as with professionals involved in the sector.

After the management of IPOSZ determined the target group of the training, we organized a two-day course preparation workshop on August 28-29, 2023 in Győr, to which we invited the education experts of our local and professional organizations. In order to ensure the success of this course preparation workshop, we limited the number of participants in this two-day preparatory workshop to 15 people.

The participants of the two-day workshop reviewed in detail the teaching materials prepared by the project partners and determined the main directions of the training to be implemented in Hungary.

It was also determined that the training must be flexible, if a part of the curriculum is deemed particularly important by the students, then it should be possible to integrate new digital curriculum.

As a result of this dialogue, a training material consisting of the main chapters of Modul 2 and one chapter of Modul 3 was created by IPOSZ, which was taught at the training days described below.

The timing of the trainings was adapted to the economic activities of the participants.

After the two-day preparatory workshop in August 2023, we held a total of 13 training days within the framework of this Work package. The exact schedule of the training days will be presented in detail later.

We hold our first training day in a hibryd form (October 17, 2023), however our experience was that the hybrid form does not work for this type of training, so we only tried it once. We held our second and third lectures in person (November 07 and 14, 2023). During the organization of the following training days, the demand arose from our members that not everyone could attend the training days in person due to the distance, so they asked us to hold online the rest of the training days, which process started on December 01, 2023. We supplemented the online training days with regular online tasks to be solved at home, thus ensuring that all participants were able to get involved with sufficient activity, despite the online format. The trainers regularly consulted with the participants online, along the homework assignments.

The training fits into the overall adult-education phase of the national system of trainings, but a direct EQF level can not be classified to it. It is an out-of-school training organized for the member organizations of IPOSZ and organised by IPOSZ.
This training perfectly explained the basics of the digital solutions that could help staff members of the SME associations as well as SME owners, entrepreneurs operating in construction and finishing trades. All the training participants acquired new skills and new knowledge, which are necessary for the everyday work of the construction companies in a digital world. The construction industry is currently one of the most dynamic sectors of the economy.
It is the fundamental interest of construction companies with membership in regional and professional trade associations to be aware of the new digital solutions emerging in the construction sector, to be able to apply and use them. Newly built apartments must meet new certifications and, above all, new energy requirements, so it is extremely important that both employers and employees in the construction industry should be aware of the changes and be able to apply the new digital tools and technologies in practice. The employees of local and professional organizations who participated in the training can help their own member companies with the new knowledge they have acquired, which they can also transfer in practice.

In addition to personal and online lessons, the participants in the training had the opportunity to complete self-learning tasks in many ways, where the instructors continuously gave feedback.

The topics used in the training could be used of course in the training of enterprises of different sizes. This training is valuable not only for micro-enterprises, but also for medium-sized enterprises. At the same time, it should be emphasized that the main target group of the training is the staff members working in regional and professional organizations who meet dozens of construction companies on a daily basis, and the main goal of the course material was to make these trained persons as up-to-date as possible in digital solutions. It should be emphasized that the training has elements that can be used to develop certain basic skills among the whole population and thus help to develop a better digitalized relationship between businesses and consumers. The success of this training also proves that there is a significant demand for practice-oriented trainings. It is recommended to introduce the training as a micro-certificate training, but at the same time it is worthwhile to divide the individual training materials into several, better explained parts so that even more detailed knowledge can be imparted.

Special features of the implementation

After reviewing and discussing the materials received from project partners with our member organizations, and then holding a separate two-day preparatory workshop on August 28-29, 2023, the decision was made to carry out slightly modified training, taking

into account the specific organizational form, network-like operation, which characterizes IPOSZ.
In the past, especially in a large company environment, we have already encountered the virtual assistant job, as a job that can achieve a very effective improvement in the work organization of the given company, with the professional and thoughtful application of the most modern digital solutions. In this training of the project, we set the goal of training Virtual construction business support assistants at some of our member organizations who, with the knowledge acquired during the training, can help the construction companies belonging to the organization as a kind of beginner virtual construction business support assistant in a much more effective way than before. In their daily operation and their development in digitalization.

The training, which originally consisted of 3 modules, was implemented as follows, and the following parts were taken from each module:

- First part, 40 hours, contains basics of digitalisation and is directed to those who have no or only little knowledge and experience on digital tools and digitalization.

Since in recent years we have provided a number of basic digitization training courses for our member companies and member organizations, we did not keep the first training module, since the people we wanted to involve already had their basic digital competences, as this is why we accepted their application for the Virtual construction business support assistant training.

- Second part, 80 hours, is obligatory for all and contains the issues that were arisen while the collection of best practices was gathered.

Based on the preliminary discussions, among the subjects included in this module, we considered the followings to be the most important from the point of view of Virtual construction business support assistant training, and we provided training in these topics in an increased number of hours:

  - Legislation and regulation
  - Digitalization in construction
  - Digitalization in buildings
  - Management and administration
  - Communication and collaboration

When selecting the parts of the curriculum, an important role was played by the fact that the participants in the training were employees of IPOSZ member organizations, who will be able to provide support to a large number of construction companies after completing the training. We considered it more important that they master fewer topics of the curriculum, but much more thoroughly. We felt that the available 80 hours would not have allowed them to acquire in-depth knowledge in all the originally listed training topics.

- Third part is optional and available for those needing certain special skills.

Among the training topics proposed here, we tried to present the different application possibilities of BIM to the participants in order to be able to pass on basic BIM application knowledge to the small construction companies that come to them in their

office, because its use will be of fundamental importance when the small construction companies want to connect to the larger construction contractor jobs.

Regardless of the size of the company, no one can be exempt from the effects of the digital changes, whether they are employees or employers. Everyone must learn new skills and new knowledge if they want to be actively involved in the more and more digitalized working environment, as more and more digitalized process affect the life of construction companies.
1.67% of companies operating in the Hungarian construction industry are medium enterprises, 5.52% are small enterprises and 92.3% are micro enterprises. And of this 92.3%, 90% are companies with less than 4 people. Typically, IPOSZ's membership comes from this circle of entrepreneurs. It is particularly characteristic of micro-enterprises that they do not have such specialized knowledge, they do not have experts who could use the most up-to-date digital knowledge and applications within the enterprise. This circle of micro-entrepreneurs needs external expert help. A consulting and service system is provided by the regional member organizations of IPOSZ and it is essential that the employees working in these regional organizations should have up-to-date digital knowledge in the field of the construction industry.
The main target group of the training was the staff members of IPOSZ’s local and professional member organisations, who can then help the thousands of micro and small businesses active in the construction industry who come to their office as to an Virtual construction business support assistants.
For them, the acquisition of digitalization skills is important, on the one hand, for the services that they provide directly to their member companies operating in the construction sector. In addition, perhaps even more emphatically, the acquisition of digital knowledge is important for these member companies when they develop subcontracting and supplier activities and various economic collaborations with large companies and service networks. This can only be done with high-level digital knowledge in the construction industry.

Admission and organisation of the training

The main target group of the training was employees working in IPOSZ's 166 regional and professional trade associations, who meet and provide services to micro and small enterprises operating in the construction industry on a daily basis.
In addition, the training provided the opportunity for the direct participation of micro and small businesses in small numbers, with the aim of revealing the current state of their digital maturity, as well as providing them with first-hand information about the areas to be developed in the field of digitalisation of the construction industry.
We consider the training to be of an experimental nature, since only a few of the 166 regional and professional organizations had the opportunity to join the training, those who on the one hand had the necessary basic digital knowledge and on the other hand were able to undertake to participate in the training, which lasted for several months.

In the long term, our plans definitely include the organization of new training courses, involving a much wider range of the target group.
A big advantage of the course was that, although the represented businesses were small companies, but they cover a very wide spectrum of the construction sector. This helped to crystallize the general elements of digitalization, which can then be used for a wide variety of construction professions and of course supplemented with professional specifics.
When we invited the training applicants, we assumed that the participants can handle their smartphones and laptops at an everyday users skill level, and that the participants would rather use the free of charge applications and services.
We started from the assumption that after getting to know the simpler tools, it will be more appropriate to explore the more complex applications.

IPOSZ member organizations are present throughout the country, we have offices in a total of 140 cities in the country and more than 20 professional organisations belong to IPOSZ.
IPOSZ provided the opportunity for participants to take part in the training, actually from every part of Hungary.
The training was advertised on the IPOSZ' websites. Direct marketing strategies (phone calls and e-mails and many face-to-face conversations) were used to reach most of the participants. Most of the training took place in online form. Our 140 local member organisations were notified about the planned course, and we also informed our national branch organizations about the training several times. The participants were gathered via this way. Most of the participants came from different member organisations of IPOSZ where they as staff members provide services on a daily base for micro and small companies arriving from many professions of the construction sector.

Ohe individual training days, xx people participated:

- On August 28, 2023, 15 people participated in the training
- On August 29, 2023, 15 people participated in the training
- On October 17, 2023, 28 people participated in the training
- On November 07, 2023, 15 people participated in the training
- On November 14, 2023, 17 people participated in the training
- On December 01, 2023, 20 people participated in the training
- On January 12, 2024, 16 people participated in the training
- On January 19, 2024, 19 people participated in the training
- On January 26, 2024, 15 people participated in the training
- On February 02, 2024, 22 people participated in the training
- On February 09 2024, 11 people participated in the training
- On February 16 2024, 16 people participated in the training
- On February 23 2024, 18 people participated in the training
- On March 01 2024, 24 people participated in the training
- On March 08 2024, 15 people participated in the training

Amount of lessons, amount of teaching hours:

- On August 28, 2023, preparatory workshop with 7 teaching hours
- On August 29, 2023, preparatory workshop with 7 teaching hours
- On October 17, 2023, with 6 teaching hours
- On November 07, 2023, with 6 teaching hours
- On November 14, 2023, with 6 teaching hours
- On December 01, 2023, with 6 teaching hours
- On January 12, 2024, with 6 teaching hours
- On January 19, 2024, with 6 teaching hours
- On January 26, 2024, with 6 teaching hours
- On February 02, 2024, with 6 teaching hours
- On February 09 2024, with 6 teaching hours
- On February 16 2024, with 6 teaching hours
- On February 23 2024, with 6 teaching hours
- On March 01 2024, with 6 teaching hours
- On March 08 2024, with 6 teaching hours

Most of the training days were followed by self-study practices, and was supplemented with further student-teacher online conversations.

The organization of the implementation was carried out by the staff members of the IPOSZ together with the experts of regional and branch member organisations of IPOSZ which were involved in the implementation.
The trainers came from IPOSZ and from IPOSZ' affiliates whose are experts of various construction digital solutions and could gave lectures, and present the possibilities offered by digital solutions. For some topics, we invited external experts as trainers. The presentations given by the experts fit into the curriculum, some of the training materials are attached.

Considering the already mentioned wide network of IPOSZ and its member organisations, the selection, appropriate notification and preparation of the training participants and the conduct of the training itself required more time and energy than usual. The organization was also complicated by the fact that we had to carry out extensive background information activities beforehand in order to explain the objectives and essence of the project, since the the duties of a virtual construction industry support assistant are a completely new duty and it is expected that their duties will constantly develop and change.

During the preparation and planning of the training, we also asked the opinion of our member organizations about the possible trainers, since we definitely wanted to invite trainers who know the world of construction micro and small businesses. Besides of it most of the selected trainers maintain excellent professional relations with several leading companies providing digital solutions for the construction sector. Several

experts from these digital companies were involved in certain parts of the training so that the companies participating in the training could gain even broader knowledge of the latest digital methods in the field of construction.

Our basic expectation for the training was that the local and professional member organizations of the IPOSZ would create a team of well-prepared staff capable of helping the digital transition of micro and small enterprises in the construction industry. In addition, we expect these trained colleagues to provide guidance to other member organizations as to how the services and consulting systems provided to construction member companies should be developed..
This training, on the one hand, defined the main digital aspects for the participating staff members of our member organisations and prepared them with specific implementation methods, based on which they are able to further develop their own business support activities, even as a virtual construction business support assistant. Of course, in the future, we will try to ensure that all those who took part in the training can maintain professional contact with the instructors, so that if they later need help during their business support assistant activities, they can receive this help from the instructors.

The peculiarity of the member organizations of IPOSZ is that the employees working here are in constant, daily contact with the construction companies, who turn to them for advice and many kind of service in a wide variety of matters.
As a general comment, it can be stated that during the implementation, we reviewed an extremely wide range of digital solutions and adapted them to the needs of the participating staff members and businesses.

See attached curriculum and ppt. We must point out that the training materials prepared by the project partners helped us a lot in designing the training, many elements of them we took into account in our trainings. We must also note, however, that for the training in Hungary we had to take into account the existing economic and technical environment, and the often different development level and economic opportunities exist in Hungary for small businesses. We always do our utmost to ensure that the good practices of other countries could be continuously implemented in Hungary, and we consider this to be a priority task and benefit of the project.

Observations and feedback from lecturers
The participants were extremely interested..
It was very good to teach people who live in the world of businesses on a daily basis and were able to support what was said during the course with practical examples and to think further with the trainers.
The instructors through different online channels were in constant contact with the participants during the entire duration of the training. Therefore, they dealt with them along individual themes.

One of the most effective answers to tachle the challenges of the present digitalised world is the further training of enterprises. In view of the current situation of the staff members of IPOSZ member organisations, the potential participants, further training should also reach the population over 40 years, which age group is currently the most burdened on the labour market, apparently has a lot of work to do, so it is difficult to convince them that in 5-10 years time they as service providers may disappear from the market, if they do not get acquinted with new digital skills.
Convincing this layer of consultants and service providers will be a very serious task for IPOSZ.

Strengths of the training as seen by the participants

Based on the completed evaluation forms, it can be concluded that the participants were largely satisfied with the training. The training was rated as a useful tool what encouraged them for further develop their digital skills.
The training had the advantage that the instructors presented the curriculum through numerous practical examples and the tasks prepared for the participants greatly helped the involvement of all participants.
Since most of the participants came from various local and professional member organizations of the IPOSZ, the colleagues working there, so the group covered a very wide circle and the training had a very serious added value that participants coming from far away from each other got to know the developments and problems experienced in other regions, and also the good examples. One of the main strengths of the training was this organizational development effect.

Weaknesses of the training as seen by the participants

The participants typically came from the local and professional organizations of IPOSZ, the employees working there, in which organizations the member companies are typically micro and small enterprises.
These member companies contact the staff of the local member organizations with the most unexpected topics and times, from whom they typically expect immediate help. Because of this, it unfortunately happened that some participants were unable to attend one or two training days or had to withdraw from the training after a while..
One of the goals and future goals of the virtual construction business support assistant training would actually be that in such cases, even an avatar of the assistant, an application would contact the entrepreneur requiring immediate service and help. However, this training has not yet reached this level. And typically, the construction companies themselves are not at the level where they would fully accept and use a digital service system of this type.

Main Findings and Conclusions

1.67% of companies operating in the Hungarian construction industry are medium enterprises, 5.52% are small enterprises and 92.3% are micro enterprises. And of this 92.3%, 90% are companies with less than 4 people. Typically, IPOSZ's membership comes from this circle of entrepreneurs. It is particularly a characteristic of construction micro-enterprises that they do not have such specialized knowledge, they do not have experts who could use the most up-to-date digital knowledge and applications within the enterprise. This circle of micro-entrepreneurs needs support from external experts. A consulting and service system is provided by the regional member organizations of IPOSZ and it is essential that the employees working in these regional organizations should bear up-to-date digital knowledge in the field of the construction industry.
The main target group of the training was the staff members of IPOSZ's local and professional member organisations, who can help thousands of micro and small businesses active in the construction sector who come to their office as to an Virtual construction business support assistants.

Despite the fact that micro-enterprises have significantly smaller financial and human resources than large enterprises, they still see one of their possible breaking points if they themselves can work as subcontractors in larger construction works. For this, however, they must have digital knowledge that can be used, without this digital knowledge they cannot perform the tasks expected of large companies at an adequate level.
In the local and professional member organizations of IPOSZ, these micro and small enterprises are typically the member enterprises. These local and professional membership organizations are able to operate service systems that these small businesses do not have on their own. These service and advice systems cover the entire construction industry and the employees working here can be excellent mediators of the latest digital solutions. Based on this consideration, we decided to launch the virtual construction company support assistant training.
The target group we targeted with this training would not have been able to acquire real, practical knowledge in all the planned topics of the curriculum in such a relatively small number of training hours. They had the necessary pre-training knowledge for certain topics, but in order to learn deeply other parts of the curriculum, they would have to participate in a much longer training than the planned 80-hour training, in order to have real usable knowledge. Therefore, we have selected several topics from the suggested topics, like the Legislation and regulation, or Digitalisation in construction, also Management and administration, and Communication and collaboration and rather we provided more thorough training in these topics.
The weighting of the training topics in this way was confirmed by the positive feedback of the participants.

In addition to these conclusions, we must emphasize that much more projects, support, information and services are needed in order to speed up the catching up of the construction micro business sector to the digitalisation.
We are convinced that if we are not able to address the many thousands of family and micro businesses on a wider scale in time with appropriate training, then an employment crisis may arise, as they will not be able to perform their construction work at a high level. Digitization is bringing new devices and technical solutions to the market and into the hands of wide circles of the population. The repairing, programming, and operation of these new devices require new digital knowledge. There are signs that problems are already starting to appear in this area due to the lack of professionals. Therefore, trainings in this direction, such as those implemented in our present project, can contribute to the prevention of problems in the field of employment. These type of trainings help to avoid or reduce the occurrence of employment crisis situations.

Strengths and advantages of training

The strength of the training, in our opinion, is exactly what we explained earlier, that we managed to attract staff members working with small companies from the most diverse professions in the construction sector on a regular daily base to the training. Another strength of the training was that we were able to do this taking into account the experiences of the international project partners.
For this training, the trainers basically came from the micro companies' world as we selected them on the recommendation of our member organizations. It was a very significant experience for us.

Hints for future use, suggestions for possible improvements or further developments
The use of digital solutions in construction processes in the case of such small businesses sometimes exceeds their financial capabilities, although it is clear that most of the digital solutions are available for them and their use can be really effective for the micro companies. For some digital solutions, they need external service providers who can provide immediate assistance. Fortunately, profit-oriented companies nowadays offer solutions for this, but business associations such as IPOSZ are still often needed so that new solutions can reach to the right place at the right time.
It is an obvious fact that short-term, practice-oriented training courses, where small businesses can improve their digital skills, can help a lot here. Having a young person in the family who can bring these digital skills into the operation of the business can help a lot also. There is still a need for more similar trainings offering industry-specific solutions in order to convince the masses of micro and small enterprises. For this, it would be very important to start state support programs in this area as well.

Will the training be continued by the partner in the future? For which target groups?
What we were able to do in this project was to create the training material for a short-term practice-oriented training for our entire base of members associations to carry out similar training in their own region or profession, and we can also provide specialists and

topics for their trainings. The extraordinary advantage of our industry associations' network is that they usually have the necessary premises and infrastructure for such trainings and their network is nationwide.

We consider the training to be of an experimental nature, since only a few of the 166 regional and professional organizations had the opportunity to join the training, those who on the one hand had the necessary basic digital knowledge and on the other hand were able to undertake to participate in the training, which lasted for several months.
In the long term, our plan is definitely to launch the organization of new training courses, involving a much wider range of the target group.

The training materials have been prepared and tested, the instructors/teachers are available, and if adequate financial support can be gained, this short-term training that has just been implemented can be implemented in many other times as well.
We have selected such instructors who are capable of holding similar trainings later in the future.
Such short-term training courses as we provided in this project must be strengthened in adult education. The experiences of this project could help making decision-makers aware of the need to finance similar short-term trainings for construction micro companies.

Attachments

- Signed participant lists
- Curriculum
- Photos taken at the trainings
- Printscreens

5. Evaluation Concept[20]

Introduction

The term evaluation is commonly used to refer to studies implemented to assess and report on the strengths and weaknesses of policies, programmes, curricula, etc., and in that way give an opportunity to improve their effectiveness (Hafeez, et al., 2022). Applying the ideas of Jody Fitzpatrick (e.g. (2004)), we can distinguish three different levels in the evaluation process. *Macro level* evaluation concerns on framework and facilitations of entire education programme, *Medium level* evaluation, that some authors call *Meso level* evaluation, approaches the individual course or curriculum, its content and facilitation, and *Micro level* evaluation is interested in individual student or trainee, his / her experiences and feelings, and success in the learning process. In common, evaluation covers all levels, but the focus depends on goals of the process evaluated. If the aim is to develop an education policy, the main focus is on the frameworks, concepts and facilities planned. If the task is to develop a curriculum inside the programme, the focus should be set on the content and facilitations of this course, and finally, if the interest lays on results of the training, the individual experience and feelings should be emphasized.

Concerning the evaluation there is also another dimension that is often forgotten: Timeline and the opportunity to impact. If the aim of the evaluation is to help and enable developing and improving the training, the evaluation should be focused on such issues that in a way or another tell us, how to change the process and that are under our control, thus, the focus should be directed to the future. If the goal of the evaluation is to find out how did the policy, programme or course succeed, an approach should have a look at backward and concentrate on outcomes, that not necessary are under supervision.

It is very rare, that an evaluation would focus on only one level and have a look at either the future or the past. In common, evaluations tend to be multilevel and have a look at both towards and backwards. In this case the aim of the evaluation is to support implementing and improving of the training, thus, the evaluation is multilevel, and the focus is on issues that we have an opportunity to impact on.

The evaluation should be scheduled so, that the whole course is still in the memory of respondents. If the course is single activity like lecture, practical training, or e-learning session, this is no problem. The evaluation survey or interview can be conducted immediately after the training without any risk on confusions concerning the target of the evaluation. But if there are more activities, the course lasts weeks or months, or consists of many meetings with certain interval, the risk of bias, caused by uncertainty about which part the survey or interview deals with, increases. This means that in such cases either the survey should be conducted separately after each phase or questions should be written so, that the risk of bias becomes minimized.

[20] Compiled by Dr Kari Lilja and Dr Sirpa Sandelin, Satakunta University of Applied Sciences, Finland

The process

In best cases, the evaluation survey and the report cover the evaluated course as a whole. This is not always possible, because e.g., the training may have been divided into parts with long periods between each, or parts of the course are quite different from each other. In such cases, it is recommendable to conduct the evaluation and write the report separately in each phase to avoid bias caused by time. These individual reports can then be summarised in concluding report.

This evaluation concept covers different types of courses. Some of these can be evaluated as a whole, but some must be evaluated phase by phase or can be evaluated only partially. However, the evaluation method, phases and tools are similar in each case. The evaluation will be conducted using the online survey application E-lomake, which enables the anonymity of the respondents, and – If needed – follows the sent invitations and sends reminders to those who have not responded. The questionnaire will be pre-prepared and saved as a template (Appendices A - C) that will be copied and modified for each survey so that specific details of each curriculum and training will be considered. The prepared survey will be tested to see if the questionnaire is working, and if the reporting will be possible in a desired way. (Figure 8)

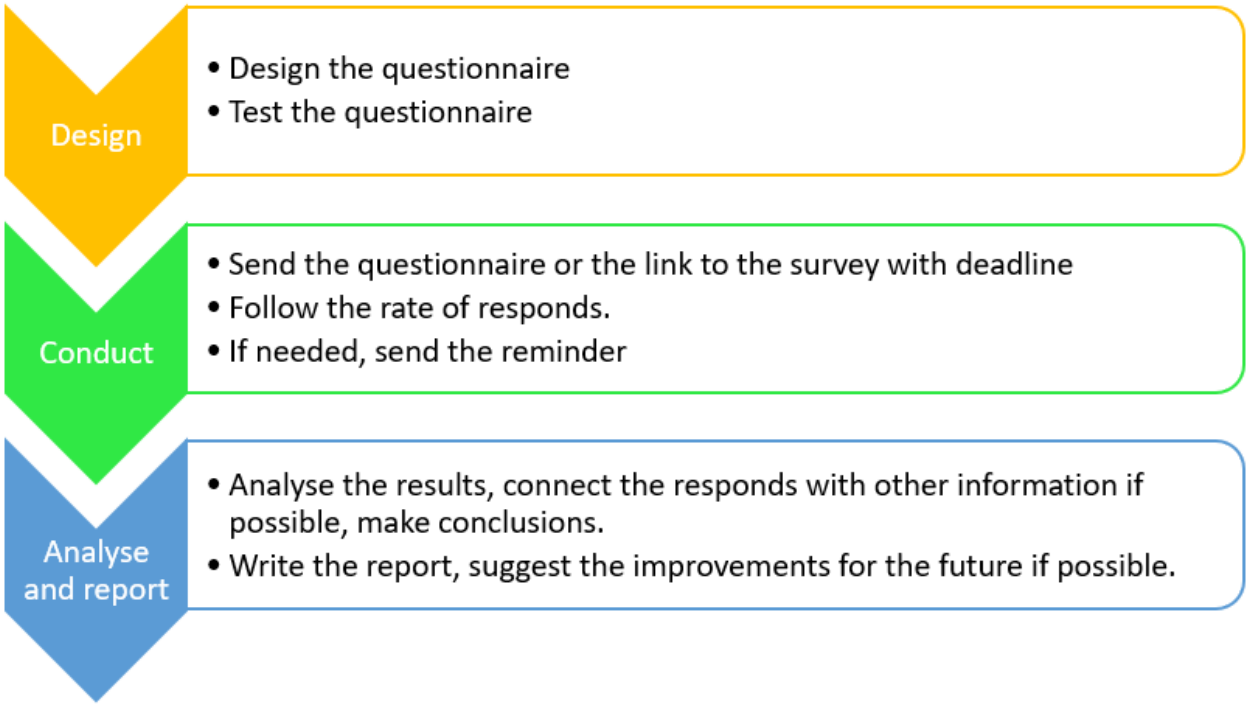


Figure 8: Phases of the evaluation

If there is a need to follow the responds and to send reminders, an invitation to participate to the survey will be sent by e-mail (sent by the survey application) in the end of each course / training. Otherwise, the link to the survey will be given during the last lecture / training session. At the same time, the deadline for responding will be announced.

In this case, there is no reason to follow the responding, thus, the latter named procedure will be in use. After the deadline of responding to the survey has passed by, the results will be downloaded and analysed, and the report will be written.

Target groups of the evaluation

The main target group is those participating the courses, i.e., students and in the Train the Trainer course the teachers, coaches and consultants participating the course. In some cases, like in the Training for SMEs (WP4 A5), also the teachers teaching in the course and representatives of those enterprises sending their employees to the course will be interviewed. The interviews will be conducted online using online questionnaires. Each target group has a questionnaire of their own.

Online questionnaires and duties of each test facilitator

The online questionnaires will be prepared course by course using the templates presented below. The finishing of each questionnaire will be made when the programme of the course to be tested and evaluated is available (Table 1). The facilitator of the test sends the programme to SAMK early enough so that SAMK has at least two weeks to finish the questionnaire for the training in question. SAMK will send the links to each questionnaire to the facilitator who delivers the links and instructs the target groups to complete the questionnaire.

Needs to translate the questionnaire?

If the questionnaire needs to be translated to domestic language, a facilitator should announce this at least a month before the training starts. SAMK will then send a preliminary questionnaire of each target group to be translated. Facilitator will send the translated (or proofed, if SAMK has made the translation) version to SAMK together with the training programme latest two weeks before the planned test course starts.

When the course starts

In the beginning of each course, the facilitator informs, that the course will be evaluated, and that participants will receive a link to the evaluation questionnaire in the end of the course. Participants should be informed that the evaluation helps the facilitators to develop and improve the course in the future.

When the course ends

In the end of the course, facilitator gives the link to the survey to students, reminding them that each answer is important, and informs the period when the evaluation survey is active. In common, this period is one week, if there are no needs for longer responding period. Also, teachers and employers should be given links to their own surveys, if such are required in the training in question.

After the responding period has finished, SAMK will collect the results from the system, analyse them and write a report.

Table: Summary of the duties, process and schedule of the test

Deadline and responsible party	Task
Latest one (1) month before the start of the course / training facilitator of the course should	• inform SAMK about the schedule of the course, • inform SAMK whether the questionnaires should be translated or not. If translation is needed, return the questionnaires included with translations written on the form. • send SAMK a brief info about the curricula (only **names** and **e-mail addresses** of the teachers, and **topics** they will teach are required).
Within one (1) month calculated from receiving the information listed above, SAMK will	• create the specific survey for this course, • translate the questionnaire – If needed – according to given instruction, and • send the links to surveys to the facilitator and inform the deadline for the responding.
When the course starts, facilitator will Inform the participants, teachers, and enterprises that	• the course will be evaluated, • the link to the evaluation survey will be given or sent in the end of the course or phase of the course, and • that it is important for developing the course that everyone complete the questionnaire.
When the course or phase of the course ends, facilitator will	• deliver the links to survey to each group of respondents (participants, teachers, enterprises) either by e-mail or in other acceptable way, • inform the respondents about the deadlines, and • remind them about the importance of the evaluation.
When the given deadline has been passed, SAMK will	• open the database and collect and analyse the results, • write a report, and • send the report to be discussed.

The report

In the report, following issues will be reported: A rough description of the group of respondents, have they been satisfied with the facilitations, topics, teachers, and their group, do they believe that the training has been beneficial, and what could have been made in other way. Furthermore, in certain courses and trainings also teachers' and employers' opinions will be surveyed and reported. These cases will be agreed together and announced separately.

In the end of each report there will be a concluding section that summarizes the findings and gives some suggestions concerning the opportunities to improve and develop the curriculum and / or facilitations. If wanted and agreed, all the evaluations will be summarized together.

References

Fitzpatrick, J. L., 2004. Exemplars as Case Studies: Reflections on the Links Between Theory, Practice, and Context. *American Journal of Evaluation,* 25(4), pp. 541-559.

Hafeez, M., Naureen, S. & Sultan, S., 2022. Quality Indicators and Models for Online Learning Quality Assurance in Higher Education. *The Electronic Journal of e-Learning,* 20(4), pp. 374-385.

Appendices

Appendix A The template of the questionnaire for students	E-Lomake_Survey_for_Students.pdf
Appendix B The template of the questionnaire for teachers	E-Lomake - Teachers_questionn
Appendix C The template of the questionnaire for enterprises	E-Lomake_Survey_for_enterprises.pdf

6. Evaluation Report[21]

Introduction

The term evaluation is commonly used to refer to studies implemented to assess and report on the strengths and weaknesses of policies, programmes, curricula, etc., and in that way give an opportunity to improve their effectiveness (Hafeez, et al., 2022). Applying the ideas of Jody Fitzpatrick (e.g. (2004)), we can distinguish three different levels in the evaluation process. Macro level evaluation concerns on framework and facilitations of entire education programme, Medium level evaluation, that some authors call Meso level evaluation, approaches the individual course or curriculum, its content and facilitation, and Micro level evaluation is interested in individual student or trainee, his / her experiences and feelings, and success in the learning process. In common, evaluation covers all levels, but the focus depends on goals of the process evaluated. If the aim is to develop an education policy, the focus is on the frameworks, concepts and facilities planned. If the task is to develop a curriculum inside the programme, the focus should be set on the content and facilitations of this course, and finally, if the interest lays on results of the training, the individual experience and feelings should be emphasized.

This evaluation concerns on developing the curriculum thus, the focus is on the content and facilitations, without forgetting the feelings and experiences of students, their employees, and lecturers of the course.

Concerning the evaluation there is also another dimension that is often forgotten: Timeline and the opportunity to impact. If the aim of the evaluation is to help and enable developing and improving the training, the evaluation should be focused on such issues that in a way or another tell us, how to change the process and that are under our control, thus, the focus should be directed to the future. If the goal of the evaluation is to find out how did the policy, programme or course succeed, an approach should have a look at backward and concentrate on outcomes, that not necessary are under supervision. It is very rare, that an evaluation would focus on only one level and have a look at either the future or the past. In common, evaluations tend to be multilevel and have a look at both towards and backwards.

In this case, the aim of the evaluation is to support implementing and improving of the training, thus, the evaluation was multilevel, and the focus of this report is on issues that we have an opportunity to impact on, and that will help us in developing the course in the future.

The evaluation should be scheduled so, that the whole course is still in the memory of respondents. If the course is single activity like lecture, practical training, or e-learning session, this is no problem. The evaluation survey or interview can be conducted immediately after the training without any risk on confusions concerning the target of

[21] Compiled by Dr Kari Lilja, MSc Anastasija Dmitrijeva, and Dr Sirpa Sandelin, Satakunta University of Applied Sciences, Finland

the evaluation. But if there are more activities, the course lasts weeks or months, or consists of many meetings with certain interval, the risk of bias, caused by uncertainty about which part the survey or interview deals with, increases.

In this evaluation, to minimize the bias caused by passing time, the surveys have been conducted immediately after each test course has ended.

In best cases, the evaluation survey and the report cover the evaluated course as a whole. This is not always possible, because e.g., the training may have been divided into parts with long periods between each, or parts of the course are quite different from each other. In such cases, it is recommendable to conduct the evaluation and write the report separately in each phase to avoid bias caused by time. These individual reports can then be summarised in concluding report.

This evaluation report covers three courses implemented in three countries and run by three educational institutes. Each of these courses has been evaluated as a whole. The evaluation method, phases and tools have been similar in each case. The evaluation was conducted using the online survey application E-lomake, which enables the anonymity of the respondents, and – If needed – follows the sent invitations and sends reminders to those who have not responded. The questionnaire was pre-prepared and saved as a template (Appendices A - C) that was copied, translated, and modified for each survey so that specific details of each curriculum and training were considered. The prepared survey was tested to ensure that the questionnaire is working, and that the reporting is possible in a desired way. (Figure 1)

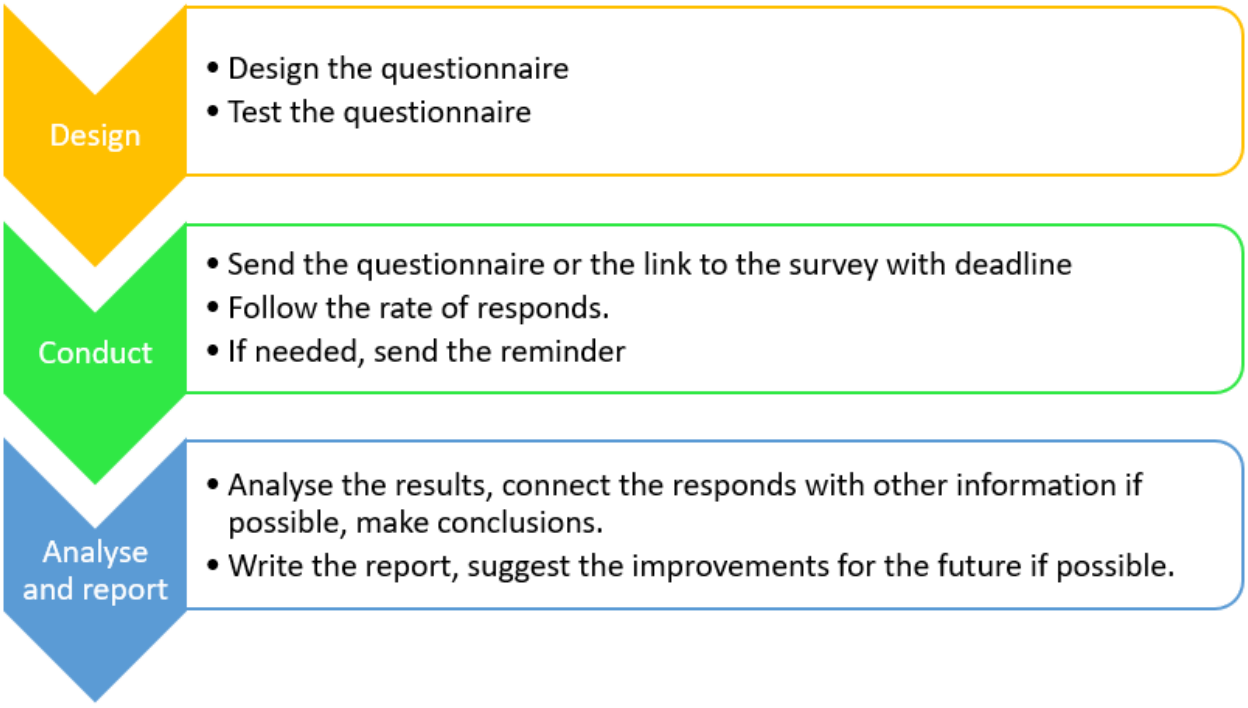


Figure 9: Phases of the evaluation

No need to follow the responds and to send reminders was found, thus, the survey was possible to be conducted with full anonymity. The link to the survey was given during the last lecture / training session or sent afterwards. At the same time, the deadline for responding was announced. After the deadline of responding to the survey has passed by, the results were downloaded and analysed, and the report was written.

Target groups of the evaluation

The main target groups were those participating the courses, i.e., students, the teachers teaching in the course and representatives of those enterprises sending their employees to the course. These groups were interviewed online by using online questionnaires. Each target group had a questionnaire of their own.

Online questionnaires and duties of each test facilitator

The online questionnaires were prepared course by course using the templates presented below. The finishing of each questionnaire was made when the programme of the course to be tested and evaluated was available. The facilitator of the test sent the programme to SAMK, SAMK finished the questionnaire for the training in question and sent the links to each questionnaire to the facilitator who delivered the links and instructed the target groups to complete the questionnaire.

Needs to translate the questionnaire?

If there was a need to translate the questionnaire to domestic language, a facilitator announced this month before the training started, SAMK sent a preliminary questionnaire of each target group to be translated and facilitator sent the translated (or proofed, if SAMK had made the translation) version to SAMK together with the training programme latest two weeks before the planned test course was supposed to start.

When the course started

In the beginning of each course, the facilitator informed, that the course will be evaluated, and that participants will receive a link to the evaluation questionnaire in the end of the course. Participants were also informed that the evaluation helps the facilitators to develop and improve the course in the future.

When the course ends

In the end of the course, facilitator delivered the link to the survey to students, reminding them that each answer is important, and informed the period when the evaluation survey was active. In common, this period was one week, if there were no needs for longer responding period. Teachers and employers were be given links to their own surveys.

After the responding period had ended, SAMK collected the results from the system, analysed them and wrote a report.

The results of the evaluation

In this report, the results of evaluations of three test course implemented in Latvia, Poland, and Hungary will be reported. The country-specific findings will be first presented and summarized, and after this, there will be a concluding section that summarizes the findings and gives some suggestions concerning the opportunities to improve and develop the curriculum and / or facilitations.

Latvia

Students

Demographics

The evaluation survey was responded by 43 of 43 students who participated the course, thus, the response rate was 100 per cent. The age distribution of students skews towards youth, with a majority being under 30 years old (91%) and minority of respondents (9 per cent) falling within the age range between 30 and 60 years. In terms of gender representation, males dominate the sample with proportion of 63 per cent, while females comprise the remaining portion (37%). 67% of students are currently engaged in studying, meanwhile 30% of students are employed. Just a minor proportion of 2% reported being unemployed (Figure 10).

minor proportion of 2% reported being unemployed (*Figure 10*).

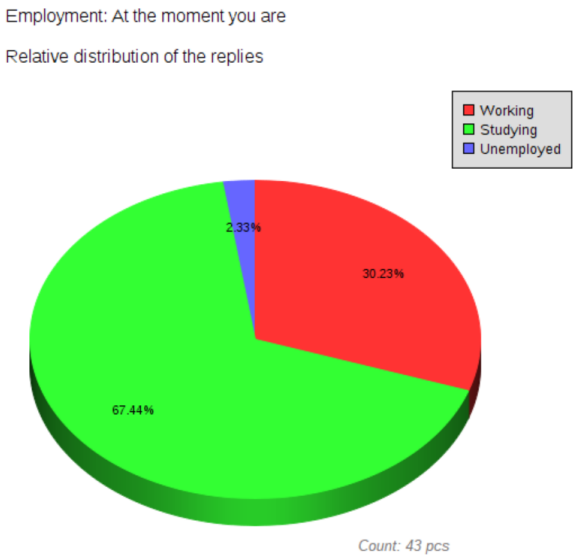


Figure 10: Employment

In terms of education, almost half of students holds bachelor's degrees (47%). Another significant share of students has only completed comprehensive school (35%). Other have pursued higher degrees like Master VET (5%), Master of Science (7%), and doctorates (2%). A small fractions accounting of 2% each reported having no formal education and successfully passed matriculation exam. (Figure 11).

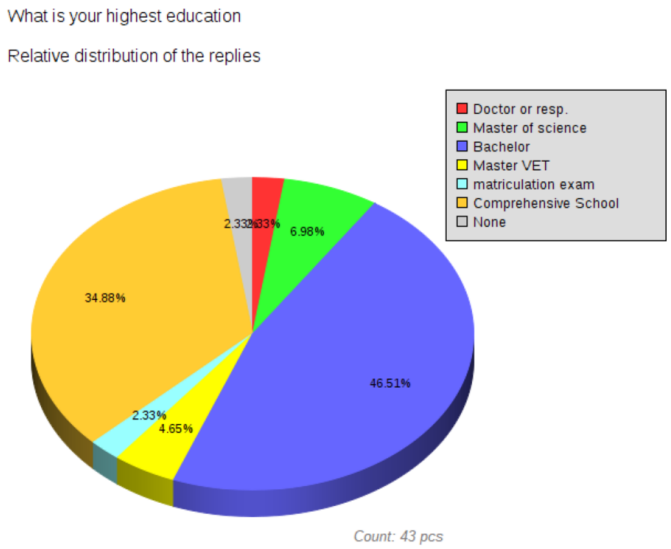


Figure 11. Highest education

In terms of field of study or work, the students are distributed across education and training (26%), consulting (26%), and other branches (49%), showcasing a diverse range of interests and expertise (Figure 12). A vast majority of students (98%) boast substantial experience ranging from 6 to 10 years, with a smaller portion (2%) having less than 5 years of experience.

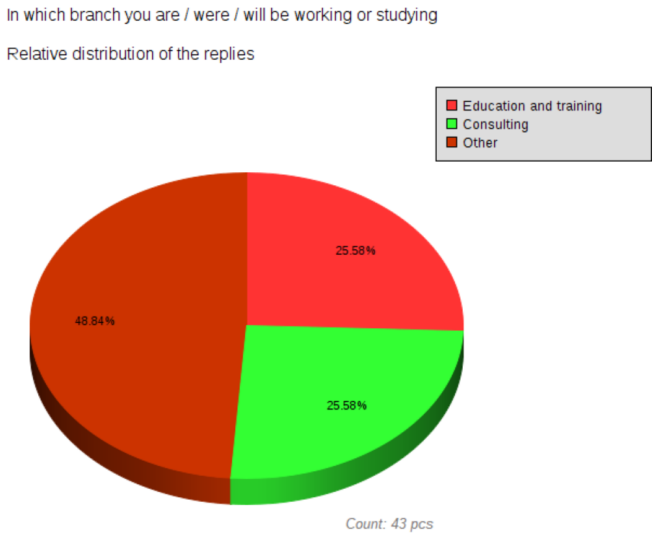


Figure 12. Working or studying branch

Facilitations

Overall, the feedback on facilitations indicates a generally positive perception among students, with a majority rating various aspects as "suitable" or "very suitable." However, there were also a few dissenting voices who expressed dissatisfaction or suggested room for improvement. These dissatisfactions included concerns about the time, date and schedule of the training (Figure 13 and 6), with some students finding it less than ideal, and certain aspects of the facilitations such as room and equipment (Figure 15). Despite this, the data suggests that most students found the facilitations to be satisfactory.

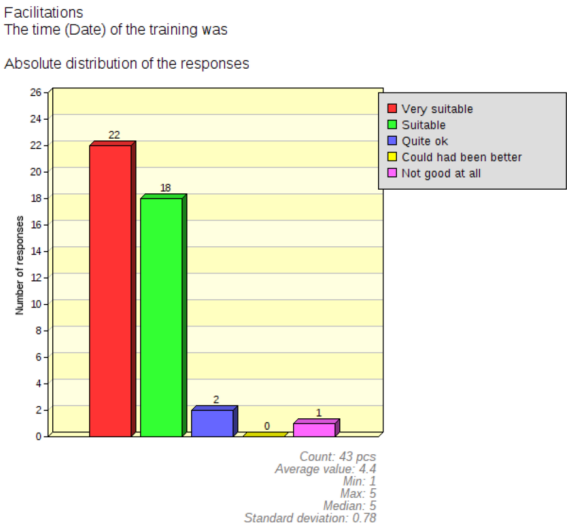


Figure 13. Time of the training

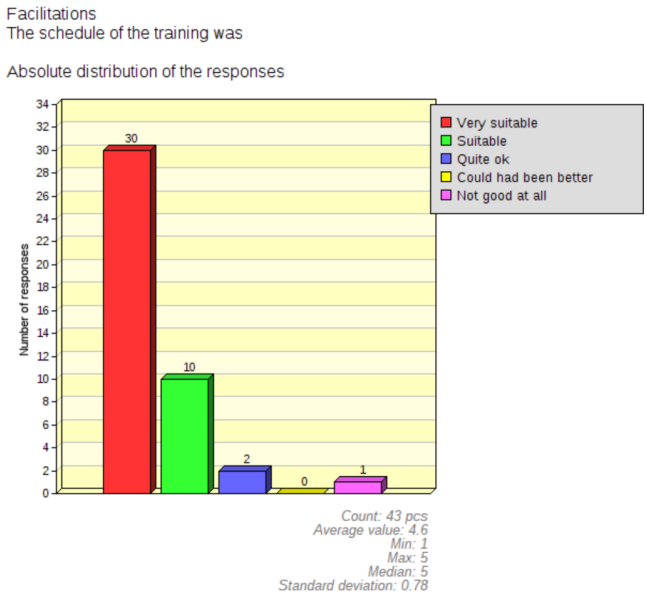


Figure 14. The schedule of the training

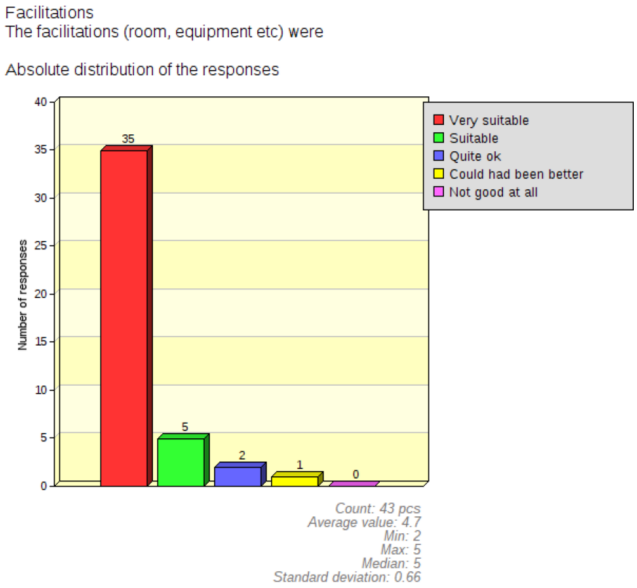


Figure 15. Facilitations

Topics and teachers

Students also shared their perceptions on topics and teachers. Majority of students expressed positive views finding the topics interesting, important, close to their profession (Figure 16), and the teachers professional, dealing with interesting topics and using motivating teaching methods (Figure 17). Half of the students found the presented topics to be topical, up to date, and relevant to their needs (Figure 16), while also perceiving the teachers as meeting expectations (Figure 17). Just a minority perceived the topics as boring and the teachers as not being up-to-date.

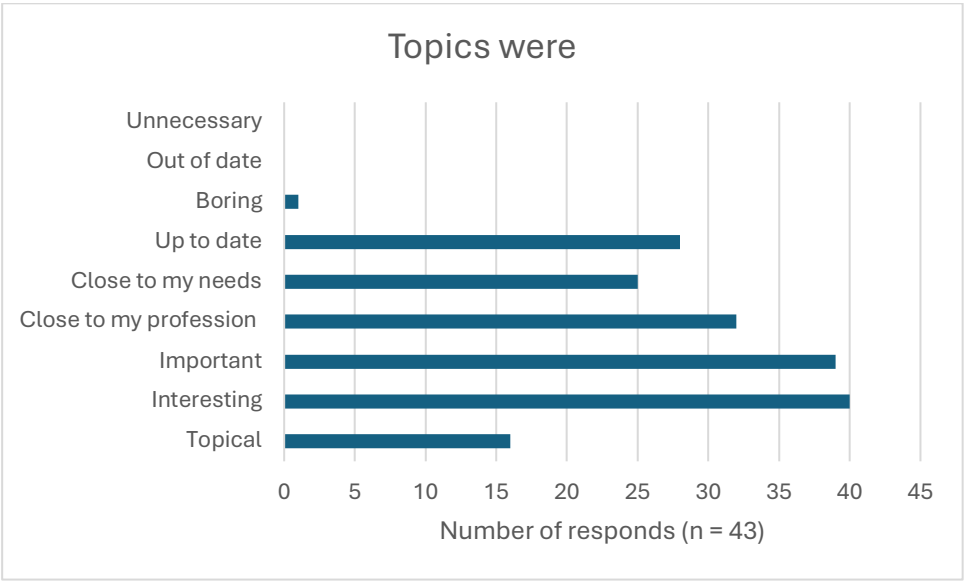


Figure 16. Topics

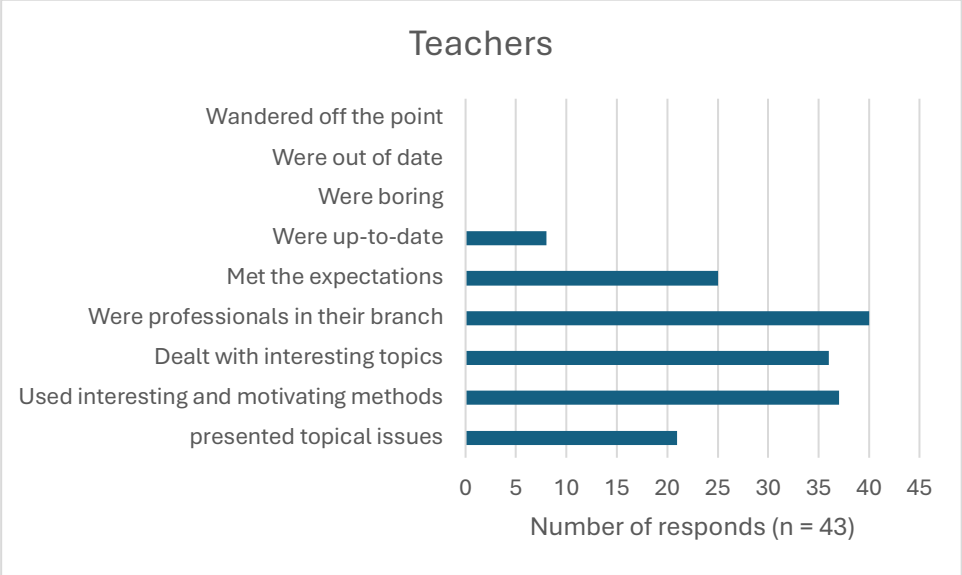


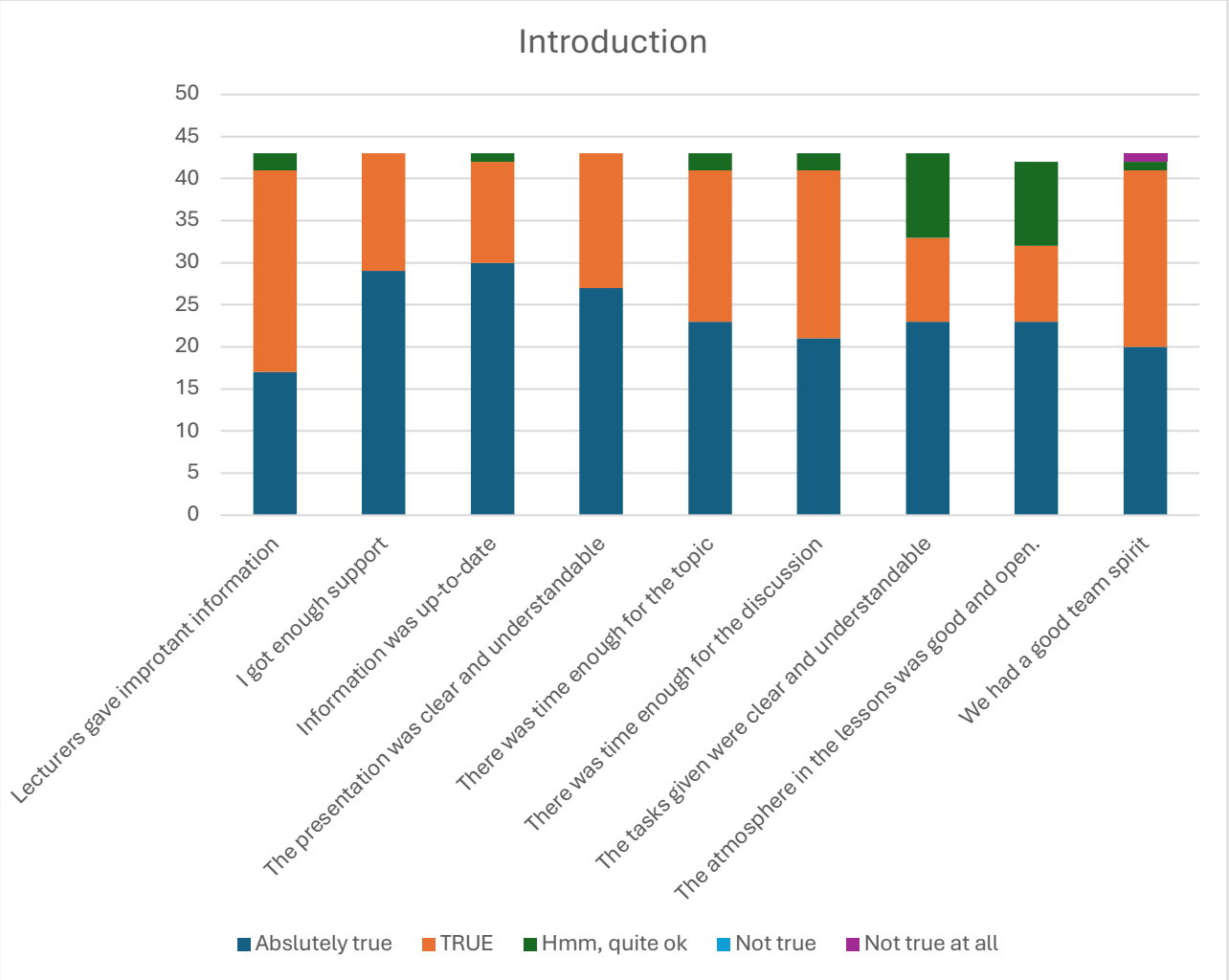
Figure 17. Teachers

Courses

Overall, data indicates a positive reception from students in all courses. However, some differences in student evaluations between courses are noticeable. In the following, evaluations for each course will be discussed separately.

Introduction

Collected responses indicate a generally positive but mixed sentiment among students towards their learning experience in the Introduction course. The majority agreed that the information in the course was up to date and the presentation clear. While a considerable number of students found the lecturers' information provision and support to be satisfactory, some variability existed in perceptions of task clarity and time allocation for topics and discussions. Additionally, a few students expressed dissatisfaction with the team spirit, with one student strongly disagreeing. (**Fehler! Verweisquelle konnte nicht gefunden werden.**).



Terms

Like in the previous course, students agreed that the course information was up to date. Student responses also emphasized good and open atmosphere in lessons. Meanwhile, opinions on team spirit appeared to be mixed, with some students indicating satisfaction and others expressing neutrality. While a significant number of students found the lecturers' time allocation and support to be satisfactory, there was also variability in perceptions of task clarity and importance of given information. Additionally, some students found the presentation to be only "Quite ok". (*Figure 18*).

Agenda 2030

A significant majority of students reported that lecturers provided important information, with 35 students indicating it was "Absolutely true". Similarly, a significant proportion felt they received enough support and the atmosphere in the lessons was good. The majority agreed that the information was up to date and there was a good team spirit in the lessons. However, opinions were more divided on the clarity of presentation and tasks given, sufficiency of allocated time for both topics and discussion, with a notable number of students rating

them as "Quite ok". A few students expressed dissatisfaction with the team spirit, with one student strongly disagreeing. (*Figure 19*).

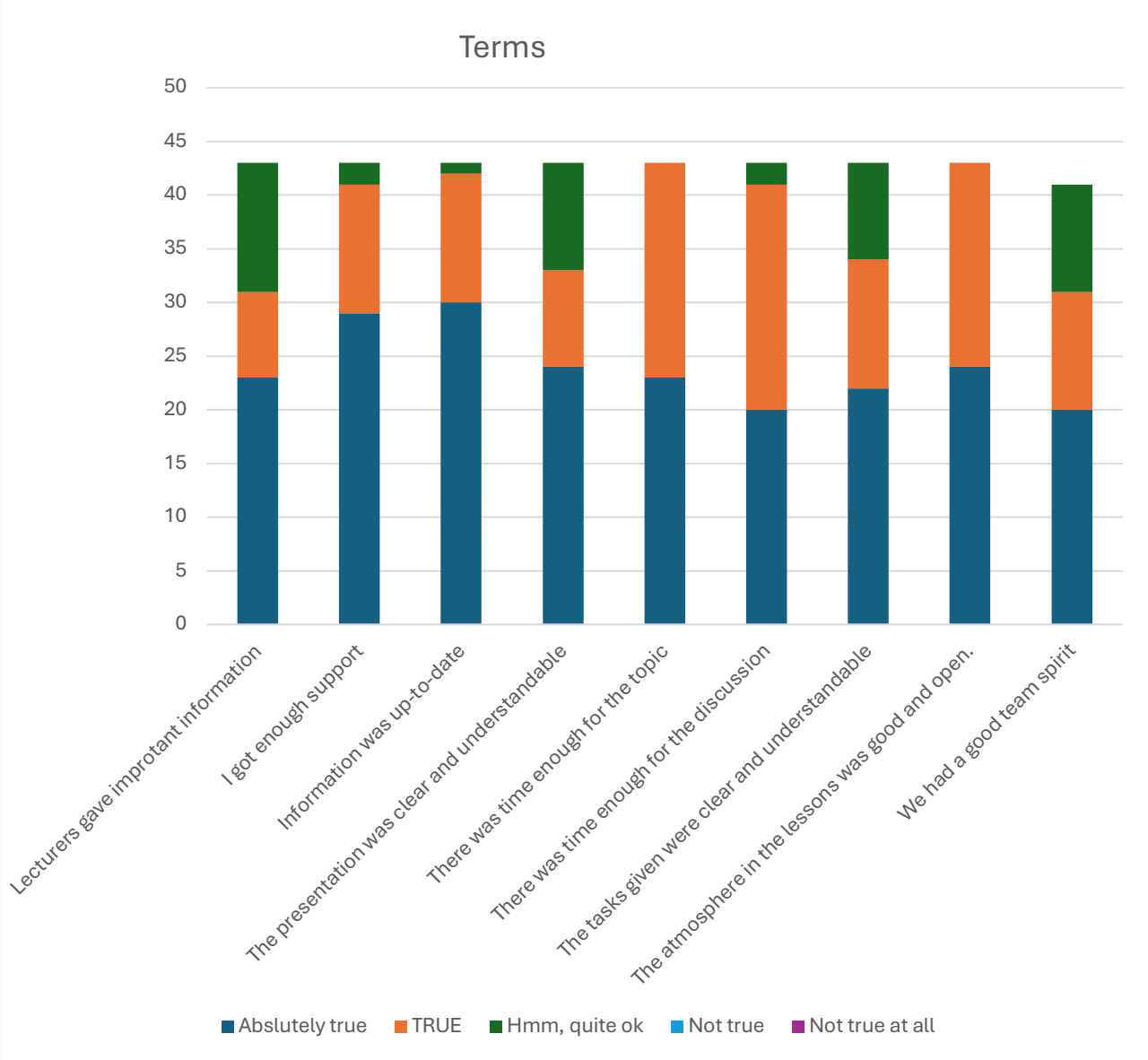


Figure 18. Terms course

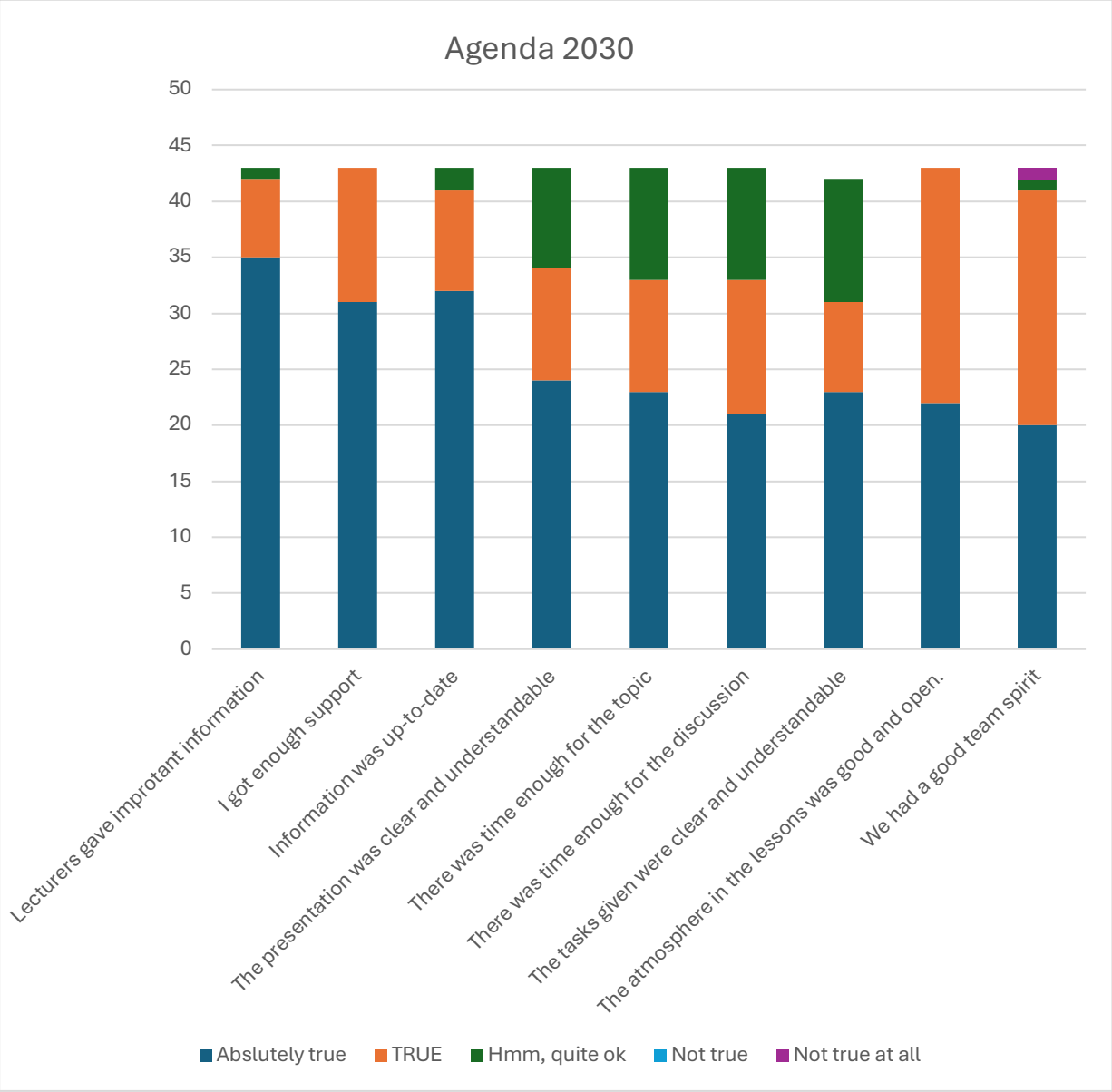


Figure 19. Agenda 2030 course

Security

Feedback on the Security course also generally reflects a positive trend. A significant majority reported that lecturers provided important and up to date information, gave clear tasks, and allocated sufficient time for both topics and discussion. Additionally, a significant proportion of students agreed that the atmosphere in the lessons was good, and they had a good team spirit. The opinions were found to be divided on the feeling of getting enough support and the clarity of presentation. (*Figure 20*).

Best Practices

On the Best Practices course, the students were most satisfied with clarity of both presentation and given tasks, allocated time for both discussion and topic,

atmosphere in the lessons. A significant proportion of students agreed that they had enough support and a good team spirit in the lessons. Meanwhile, approximately one-third of students found the importance and up-to-datedness of the information provided by lecturers to be only "Quite ok". (*Figure 21*).

Management and Administration

Student feedback on the Management and Administration course appeared to be the most positive. A significant majority of students found the given information important and up to date, the presentation and the tasks clear, allocated time for discussion and topic sufficient. Almost all students considered given support to be enough and the atmosphere in the lessons good. Only one student disagreed with a good team spirit in the lessons. (*Figure 22*).

Communication

A reception from students on the Communication course also indicates a strong positive trend. Almost all students agreed that the given information was important and up to date, the presentation was clear, allocated time for discussion and topic was sufficient. They also considered given support to be enough and the atmosphere and team spirit in the lessons good. Meanwhile, several students found the clarity of the tasks given to be only "Quite ok". (*Figure 23*).

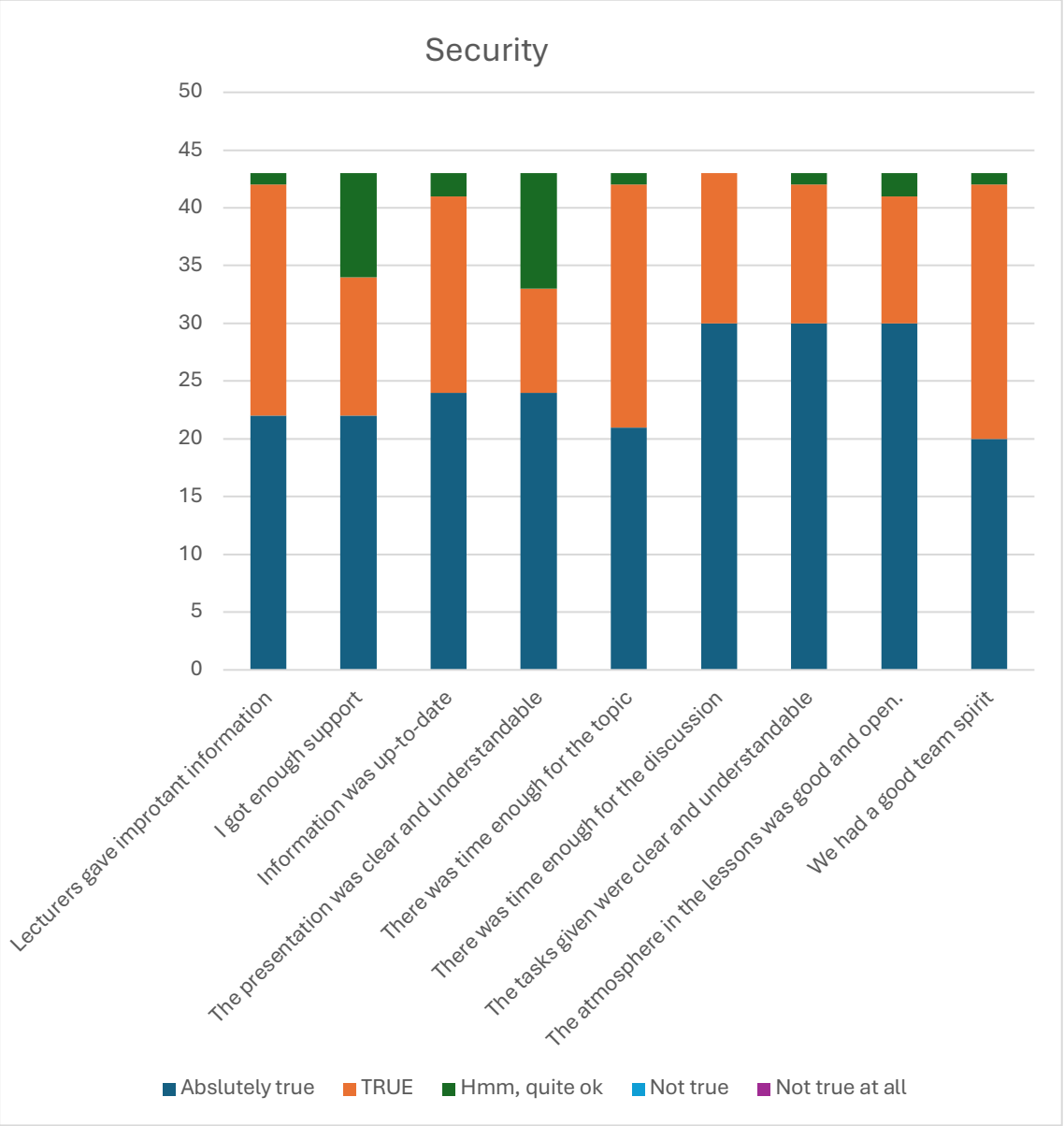


Figure 20. Security course

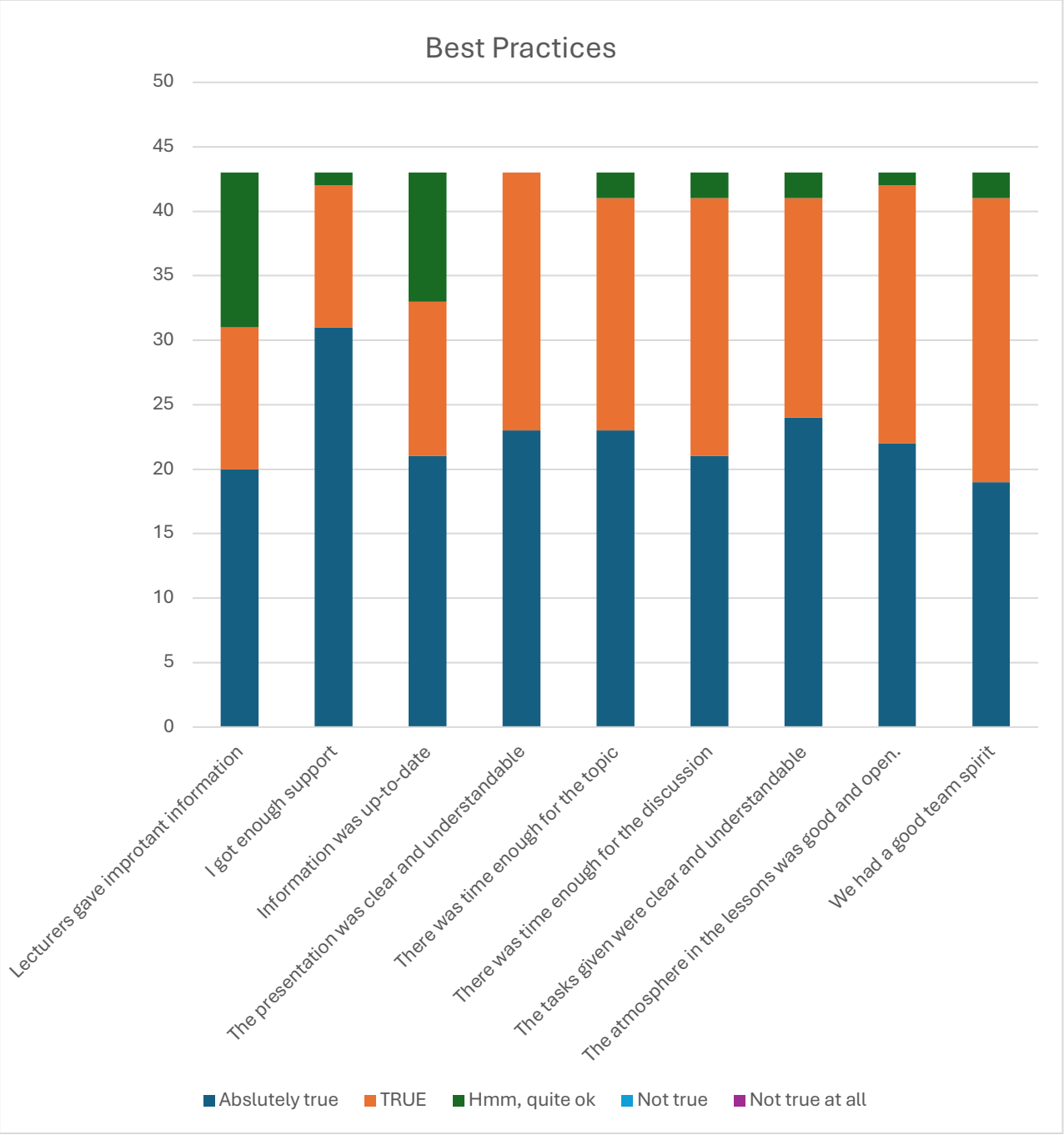


Figure 21. Best practices course

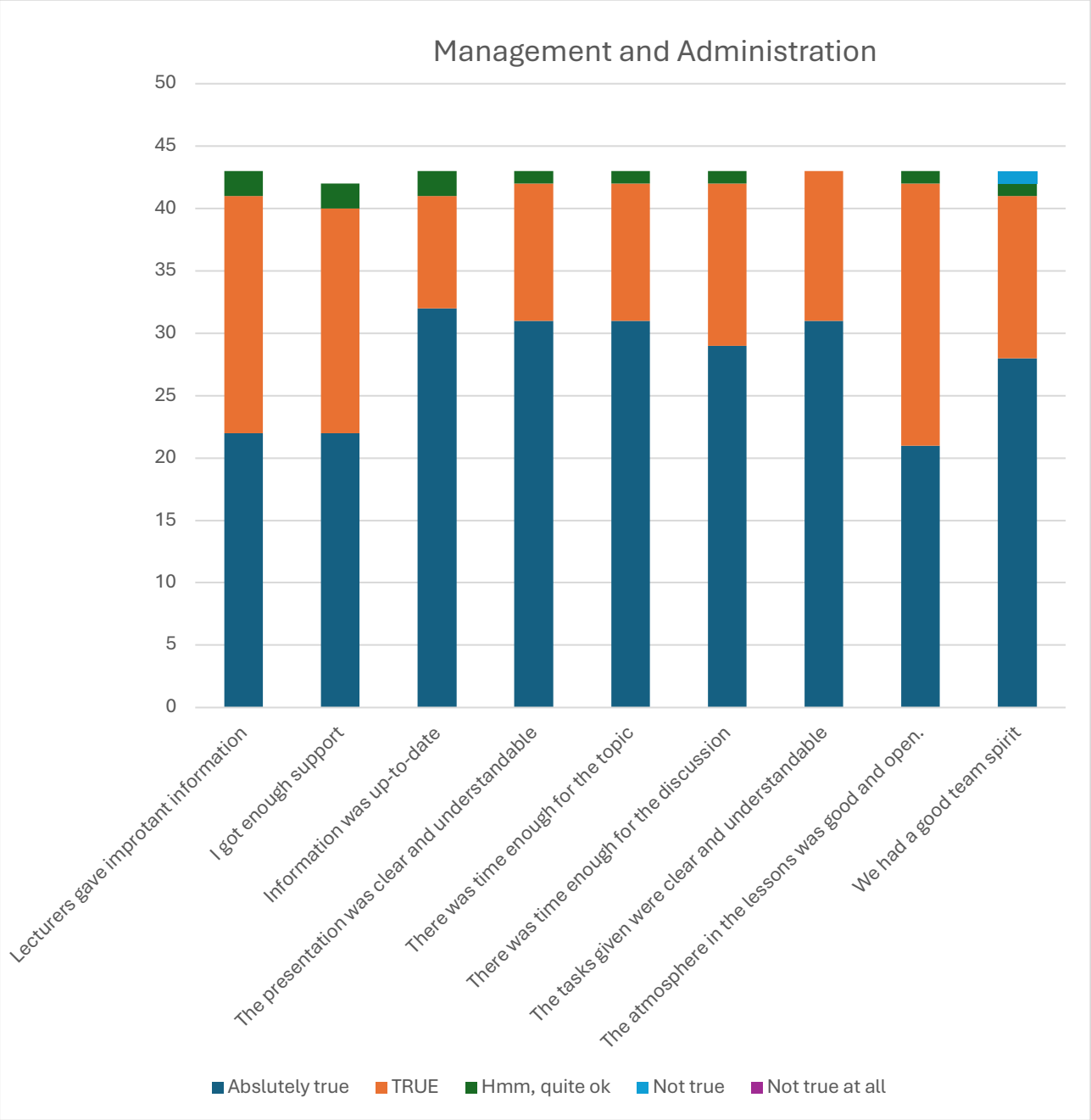


Figure 22. Management and administration course

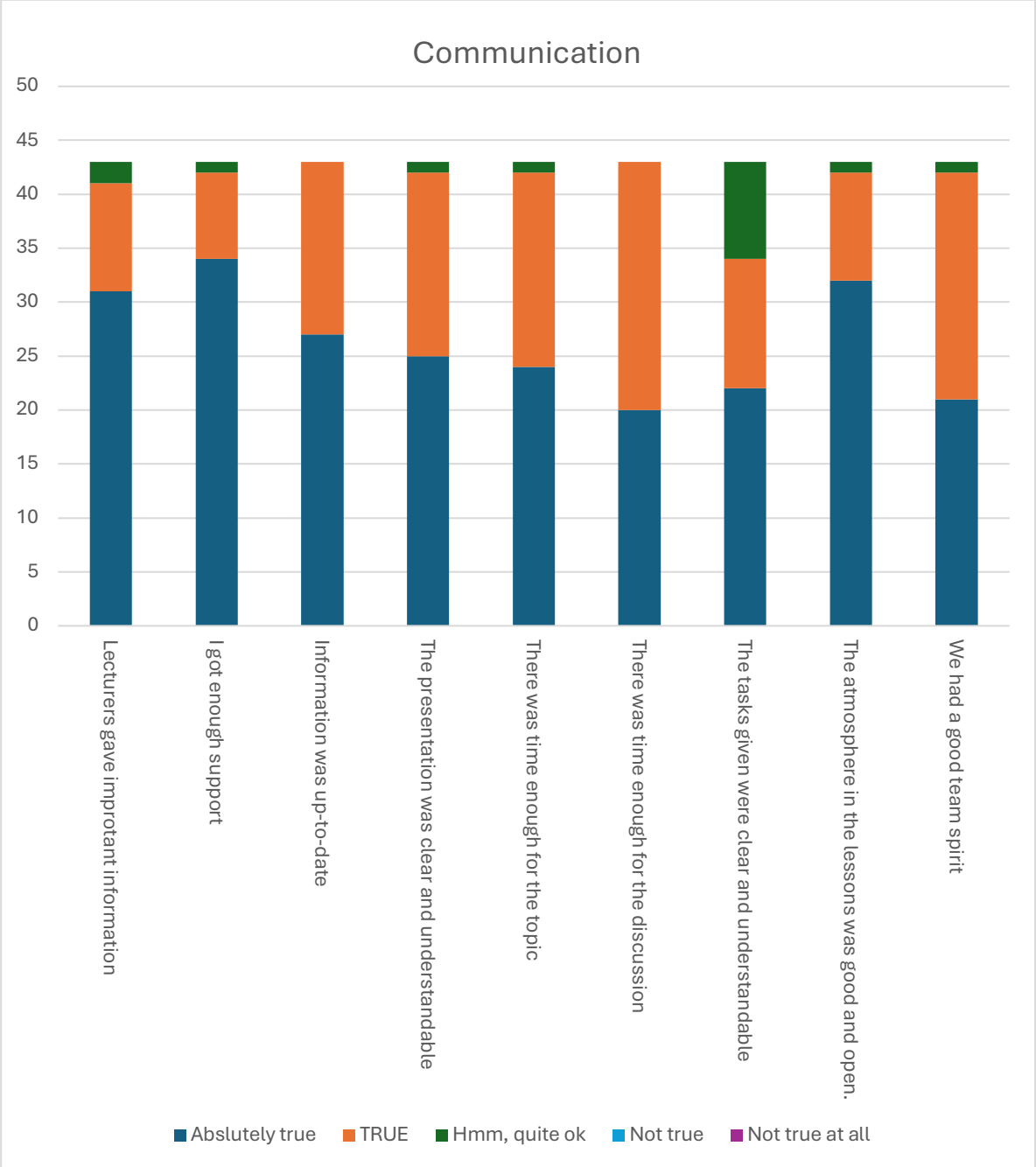


Figure 23. Communication course

Conclusion

In summary, while students generally express high levels of satisfaction with all courses appreciating their content, importance and relevance of the given information, some responses clearly indicate the need for more effort in fostering a more positive team spirit. Additionally, a few courses show room for improvement in the clarity of presentation and tasks.

Free speech answers (Appendix D) support these conclusions by indicating that students enjoyed the classes, found the lectures interesting, useful, and

informative, the presentation and teaching manner of professors engaging and supportive. Meanwhile, some students recommended integrating group work into classes to practice communication on the learned topics and share knowledge with peers. Additionally, one student expressed a preference for in-person participation in classes to deepen their understanding of the learned issues.

Employers – the Latvian enterprises

Four Latvian enterprises completed the questionnaire. Two of them were very small companies with less than 10 employees, one had between 11 and 30 employees, and one was located among the biggest of SME-businesses (*Figure 24*).

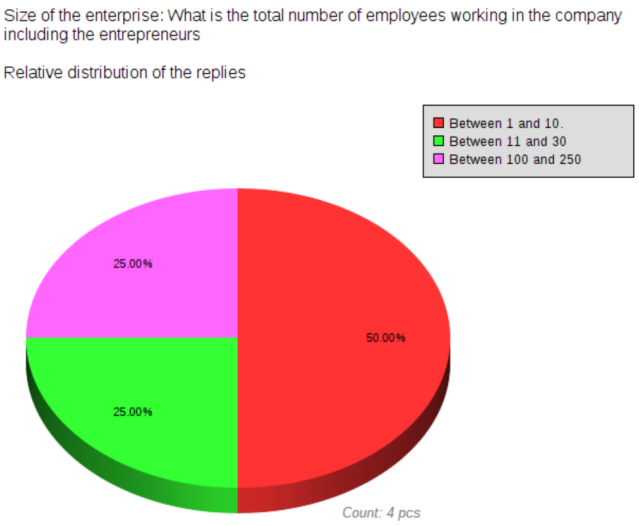


Figure 24: Size of Latvian enterprises

Three of the companies were 6 - 10 years old and one more than 25 years old. Three enterprises were operating in other field, and one in the property development branch, and their experience in the branch matched to their age. Among the respondents (the representatives of companies), there were two employees, one supervisor and one leader, mostly between 30 and 60 years old, but one was under 30 years old. Three of them had less than five years of experience and one had more than 20 years of experience. Two of them were males, and two females. The persons who participated the course were either satisfied (50 per cent) or very satisfied (50 per cent). The topics the course dealt with were considered to be topical, up-to-date, important, and interesting. However, only one of the enterprises responded that the topics were close to the participants' needs. The place, time, length, and schedule of the training

were considered to be either excellent or good. However, according to one respondent, the schedule could have been better. On point of view of the company, the course was seen beneficial, and participants were satisfied with it.

In free speech, the greetings were “Everything was fine, thank you very much”.

As a conclusion it can be said that both the employers and employees gained beneficial information and skills during the course, which was well implemented, also considering the place, time, and other facilitations.

Lecturers

Demography

The evaluation survey received responses from all three lecturers who taught the courses, resulting in a response rate of 100 per cent. All lecturers fall within the age range of 30 to 60 years old, with two females and one male. Regarding profession, two lecturers identified themselves as teachers, while one selected the answer “Other.”

In terms of education, 2 lecturers hold Master of Science degrees, while 1 lecturer has a Doctoral degree. Branch of working varied: 1 lecturer responded Development Industry, 1 lecturer Electrical Engineering, and 1 selected the answer “Other”. 2 lecturers responded that their experience in the branch ranges from 0 to 5 years, while the third has 11 to 20 years of experience. Regarding teaching experience, one lecturer has 0 to 5 years, another has 6 to 10 years, and the third has 11 to 20 years of teaching experience.

Facilitations

Feedback on facilitations reveals a notably positive perception among the lecturers, with all respondents rating every aspect as either “very good” or “very suitable.” Each lecturer consistently rated the place for the training and all associated facilitations, including room and equipment, as highly suitable. Moreover, they highly appraised aspects such as the timing, duration, and scheduling of the training sessions. This collective feedback underscores the overall satisfaction and effectiveness of the facilitations provided, reflecting a strong affirmation from the lecturers involved.

Topics and students

Lecturers provided insights on both topics and students. All lecturers agreed that the topics were interesting, topical, and up-to-date (Figure 25). Similarly, students demonstrated a commitment to completing the given assignments, seeking information, and displaying interest in various (Figure 26). Additionally, according to all lecturers, students exhibited helpfulness, mutual respect, and a clear understanding of assignments.

The majority of lecturers shared the opinion that topics closely aligned with their profession and addressed the needs of the students (Figure 25). They also agreed that students actively participated in discussions, asked relevant questions, were active in lessons and practical sessions (Figure 26), and possessed fundamental knowledge about the topic (Figure 27). Just one lecturer considered the topics as important.

All lecturers strongly agreed that all students understood the tasks, the presentation delivered was clear and understandable, and the provided information remained up-to-date. Furthermore, lecturers expressed confidence in adhering to the established plan. The majority of lecturers strongly approved their ability to support students in learning. However, in other aspects, the level of agreement among lecturers was not as robust. Only one lecturer strongly agreed that the students had a good team spirit, the atmosphere in the lessons was positive and open, and that sufficient time was allocated for both discussion and topic, while the others merely agreed (Figure 28).

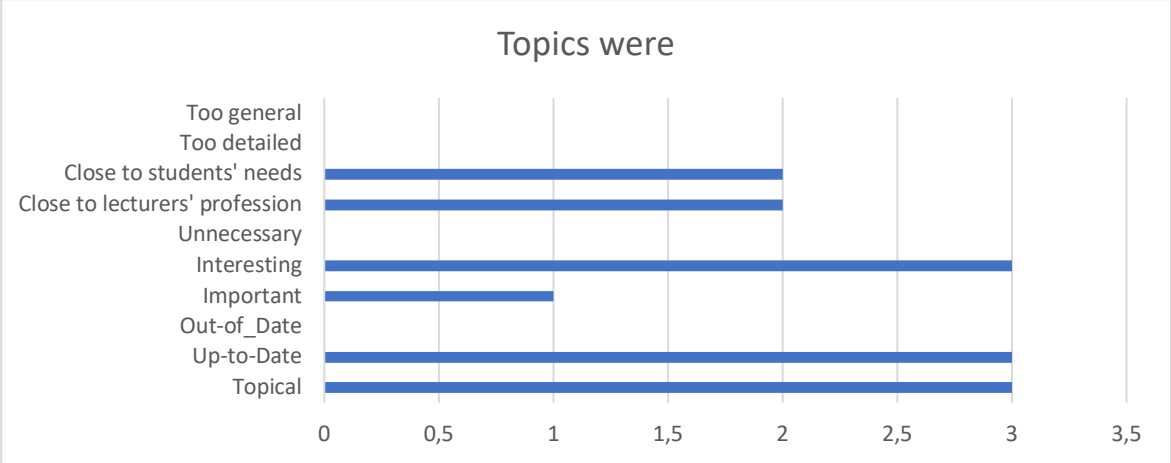


Figure 25. Topics

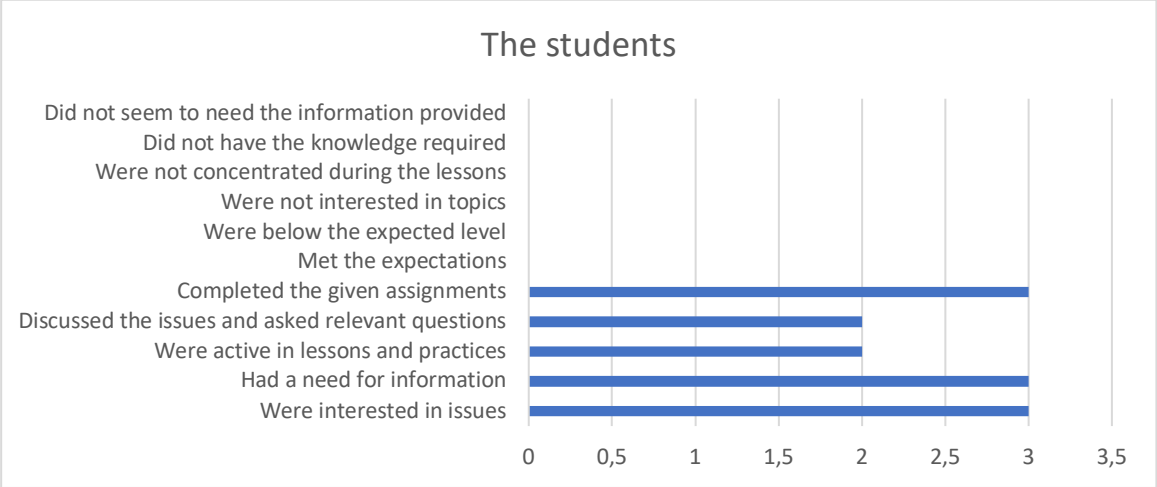


Figure 26. Students

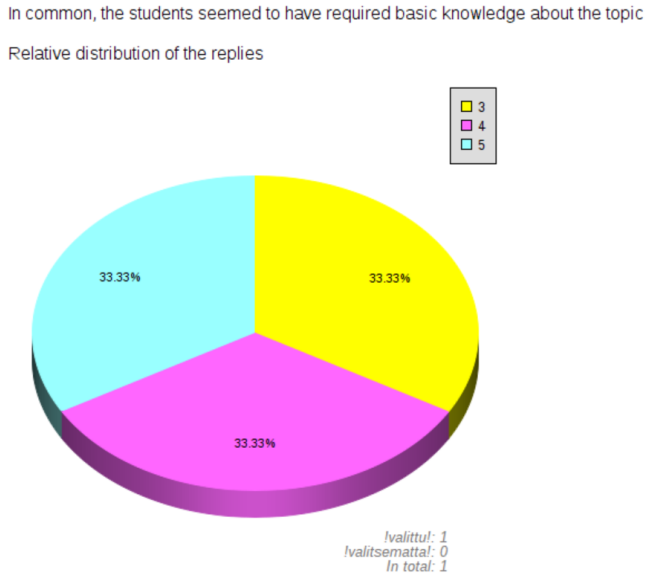


Figure 27. Basic knowledge about the topic (5 = totally agree, 4 = agree, 3 = neutral)

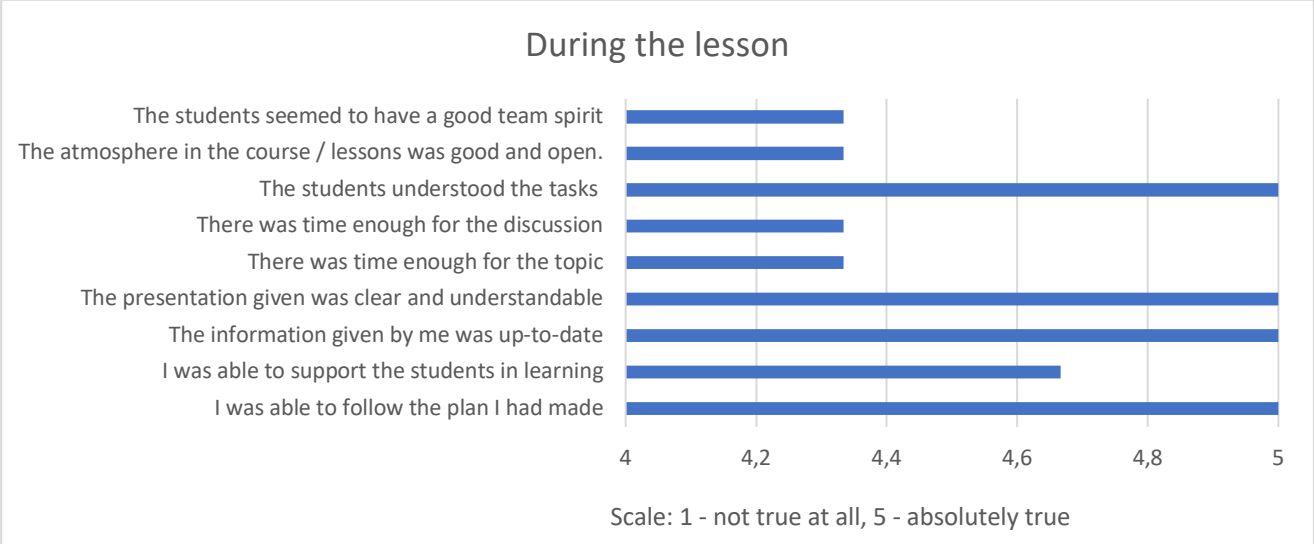


Figure 28. During the lesson

Conclusion

Overall, the feedback from lecturers provides valuable insights for improving curriculum delivery and student engagement in future courses. All lecturers agreed on the relevance and interest of course topics, the suitability of facilitations and noted students' active engagement. While consensus was strong on certain aspects like task clarity and information delivery, variations in opinions were observed in areas such as team spirit and lesson atmosphere. Thus, to enhance the learning experience for both students and teachers, it is crucial to focus on improving the classroom atmosphere and fostering a stronger sense of teamwork.

Poland

Students

Demographics

The evaluation survey was responded to by all 26 students who participated the course, resulting in a response rate of 100 per cent. All students were under the age of 30. In terms of gender representation, males dominated the sample with proportion of 65 per cent, while females comprised the remaining portion (35%). Regarding employment status, 12 per cent of students reported being employed, while 8 per cent of students reported being unemployed. The rest of the students selected a different type of occupation (Figure 29).

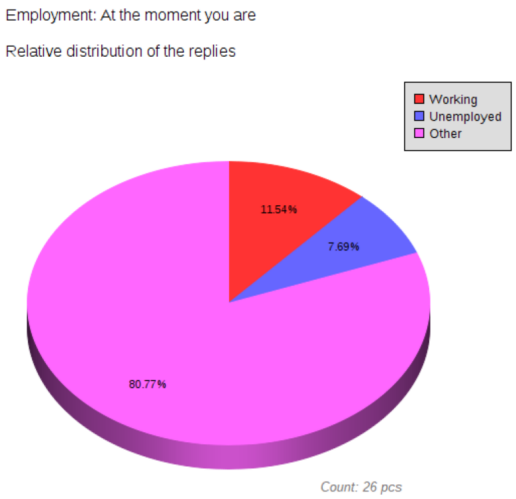


Figure 29. Employment

In terms of education, approximately 70 per cent of students have no education. Among the remaining students, 8 per cent of students completed comprehensive school, 19 per cent of students have vocational education and 4 per cent of students holds bachelor's degrees (Figure 30).

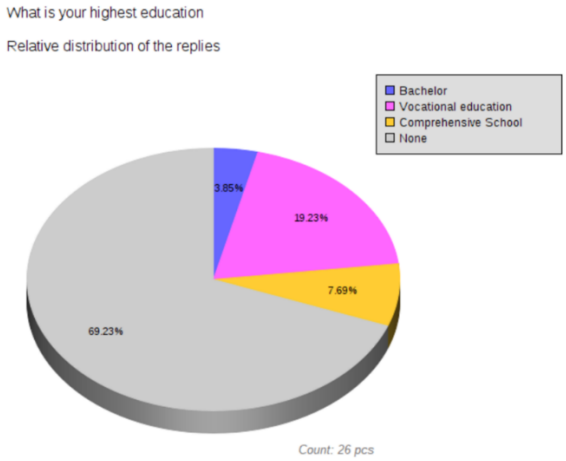


Figure 30. Highest education

In terms of field of study or work, the students illustrate a diverse range of interests and expertise. Their areas of study or work are distributed across various sectors: construction (39%), education and training (19%), consulting engineering (19%), architecture (12%), and other branches (12%) (Figure 31). A vast majority of students (96%) have less than 5 years of experience in their respective fields, with a smaller portion (4%) having experience ranging from 6 to 10 years.

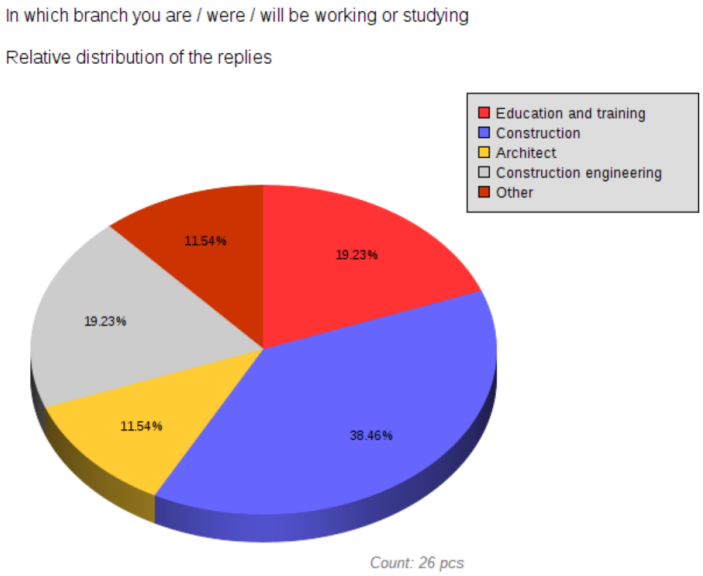


Figure 31. Working or studying branch

Facilitations

Overall, the feedback on facilitations reveals a generally positive perception among students, with a majority rating various aspects as “suitable” or “very suitable.” Students positively assessed the place, the length, and the schedule of the training as well as the facilitations such as room and equipment. However, a few dissenting voices expressed dissatisfaction concerning the time or date of the training, with some students finding it less than ideal (Figure 32).

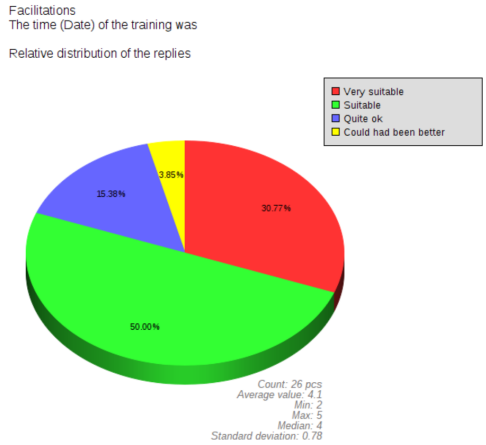


Figure 32. Time of the training

Topics and teachers

Students also shared their perceptions on topics and teachers. The majority expressed positive views, finding the topics important, interesting, topical, and relevant to their profession (Figure 33), while also considering the teachers professional and adept at presenting topical issues (Figure 34). Approximately half of the students found the presented topics to be up-to-date and relevant to

their needs (Figure 33), while also perceiving the teachers as being up-to-date, using motivating teaching methods, and meeting expectations (Figure 34). Just a minority perceived the topics as ordinary and the teachers as out of date and boring.

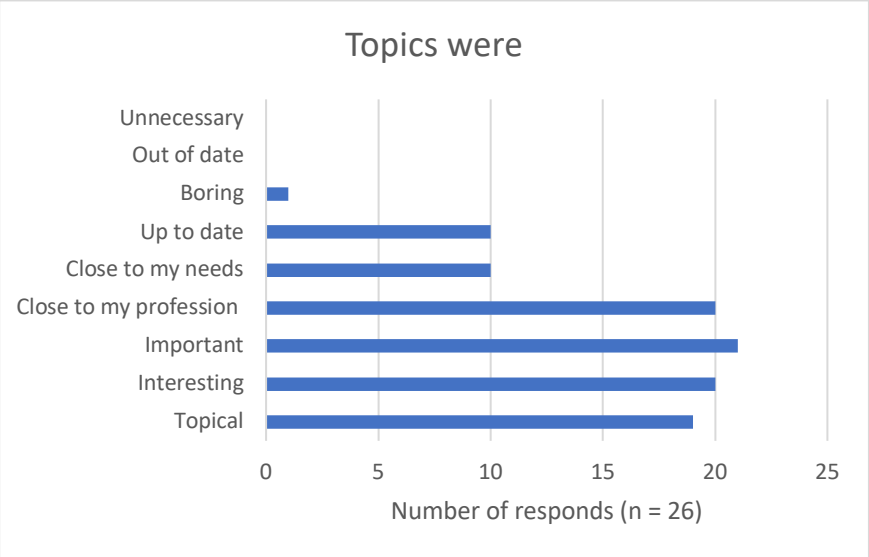


Figure 33. Topics

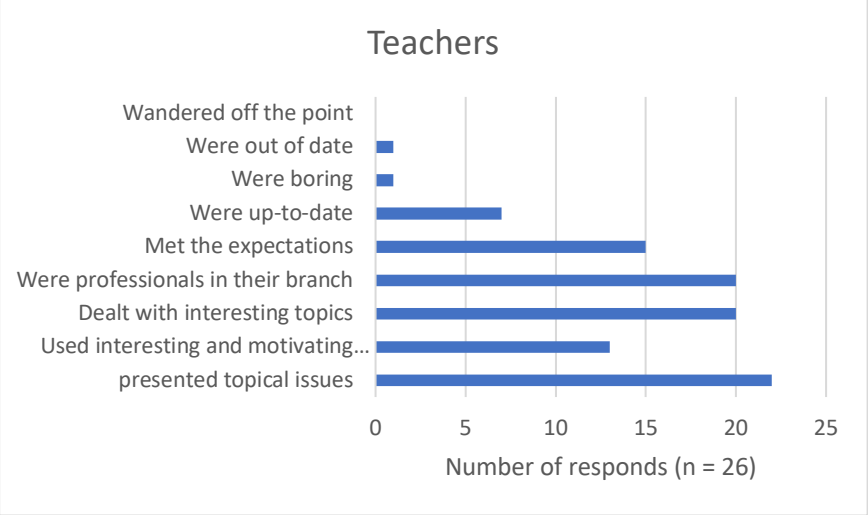


Figure 34. Teachers

Courses

Overall, student feedback on courses illustrates a positive reception in all courses. However, in some courses more neutral responses than in other courses can be found in data. In the following, evaluations for each course will be discussed separately.

Introduction

Responses collected indicate a positive sentiment among students towards their learning experience in the Introduction course. All students agreed that the information in the course was important and up-to-date. They appreciated

the atmosphere in the lessons, along with sufficient time allocated for the topic. Additionally, a considerable number of students found the support provided by the lecturers to be satisfactory, the allocated time for discussion to be adequate, and the presentation and tasks to be clear (Figure 35).

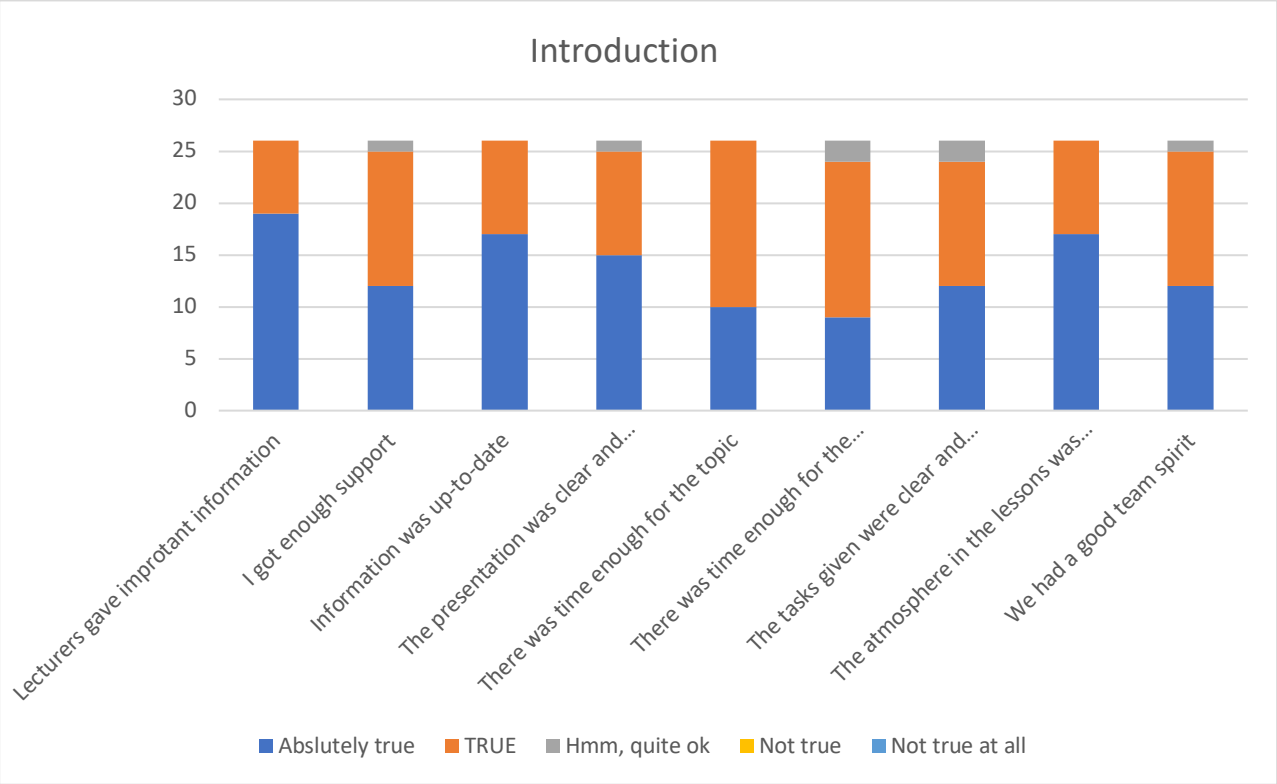


Figure 35. Introduction course

Legislation and regulation

Like in the previous course, students shared positive perceptions on this course. All students agreed that the course information was important, up-to-date, the atmosphere in the lessons was good and open, and allocated time for the topic was enough. Just few students found provided support, clarity of presentation and tasks, team spirit, and allocated time for the discussion to be only “Quite ok” (Figure 36).

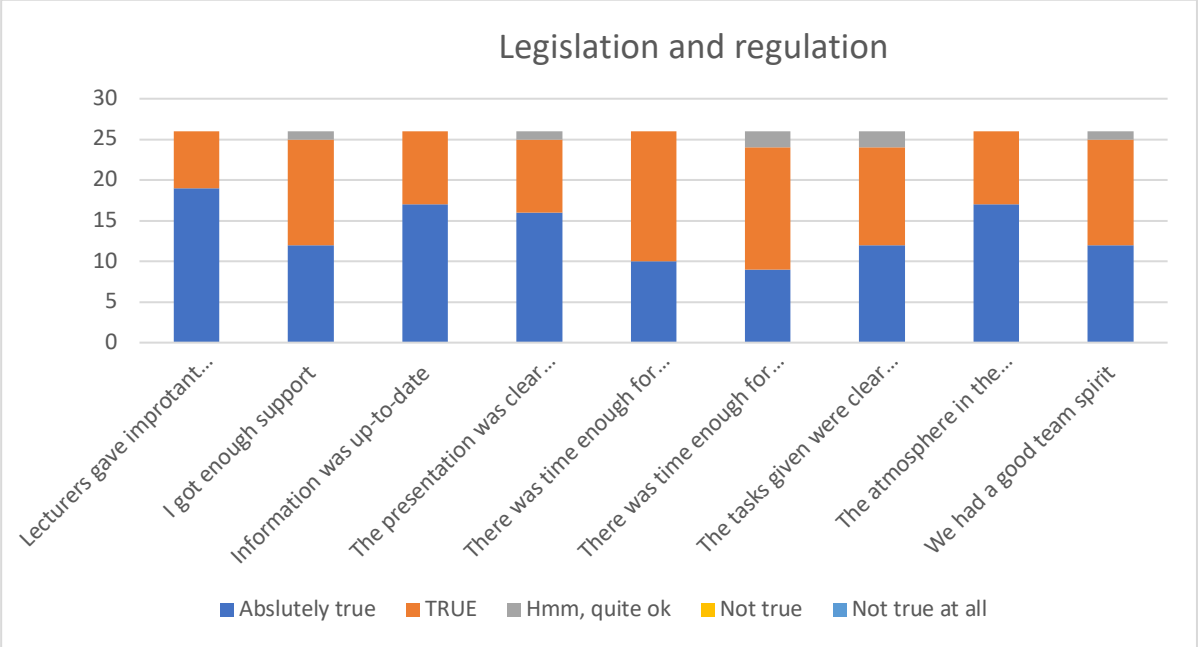


Figure 36. Legislation and regulation course

Digitalization in construction

This course was also evaluated positively by the students. They particularly valued the importance and up-to-dateness of the information presented, the atmosphere during lessons, and the allocated time for topics. However, only a few students rated the support provided, clarity of presentations and assignments, team spirit, and discussion time as satisfactory (Figure 37).

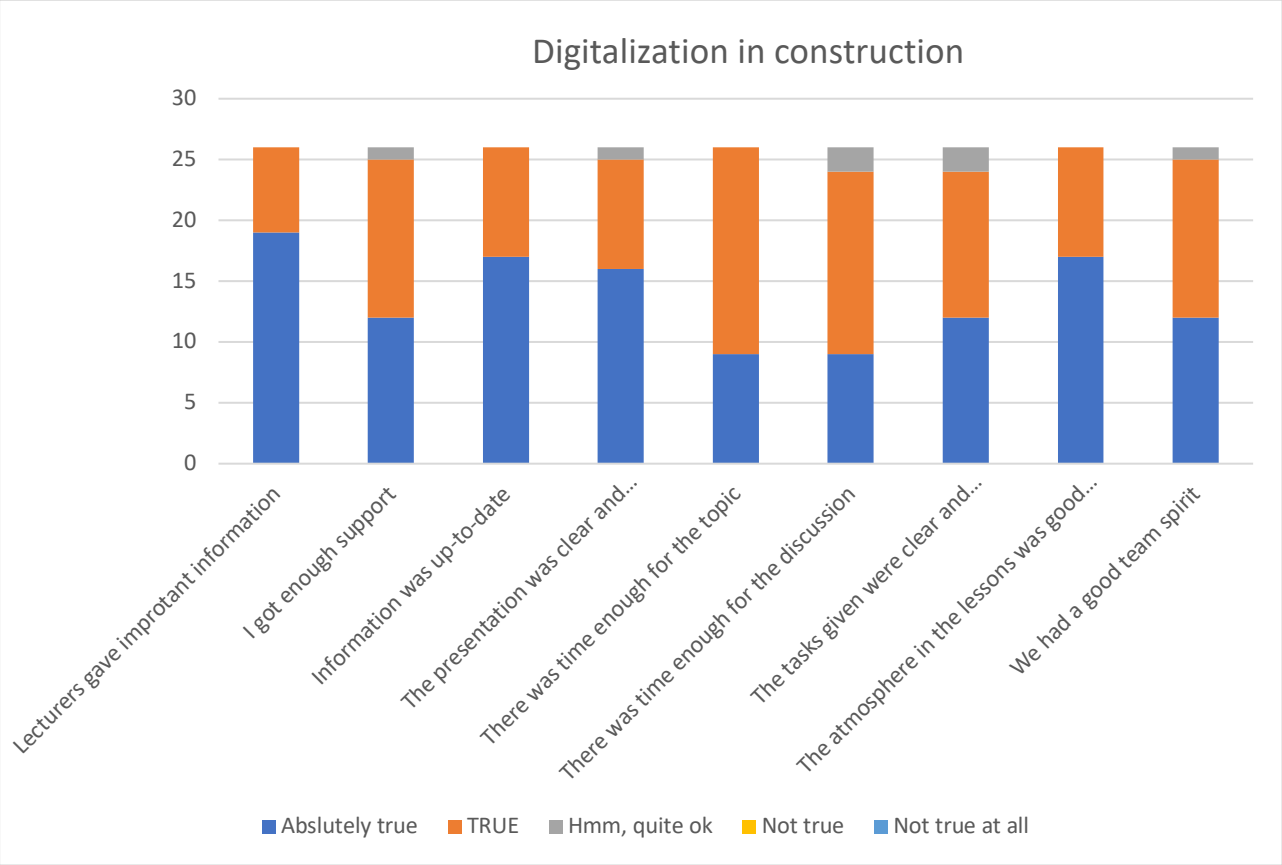


Figure 37. Digitalization in construction course

Data models in construction

Student responses on this course also reflects a generally positive trend. All students shared the opinion that the information presented in the lessons was both important and up-to-date. Few students evaluated the clarity of presentation and team spirit as “Quite ok”. More neutral responses were also provided in relation to the provided support, allocated time for discussion and topic, clarity of the tasks, and the atmosphere in the lessons (Figure 38).

Autonomous machines at site

Similar to previous feedback, the students agreed that the information on the course was important and up-to-date. Few neutral opinions surfaced regarding the clarity of presentation, allocated time for the topic, atmosphere in the lessons, and team spirit. Furthermore, the provision of support in the lessons, allocated time for discussion, and clarity of tasks received several neutral responses (Figure 39).

Digitalization in Buildings

All students agreed that the information in the lessons was important and up-to-date. All students also shared the opinion that the atmosphere in the lessons was good and open. Few neutral responses were given in relation to the sufficiency of provided support, team spirit, clarity of presentation and tasks.

Several neutral responses were given in relation to allocation of time for the discussion and topic (Figure 40).

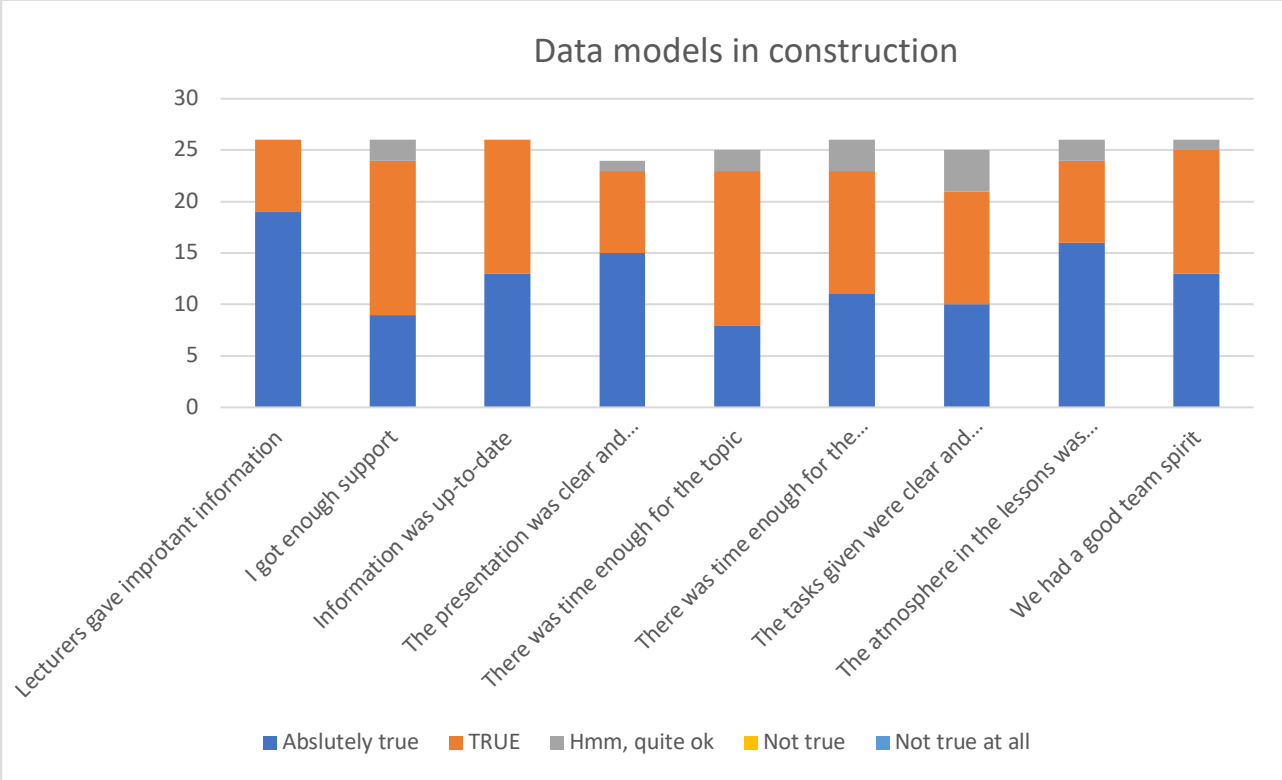


Figure 38. Data models in construction course

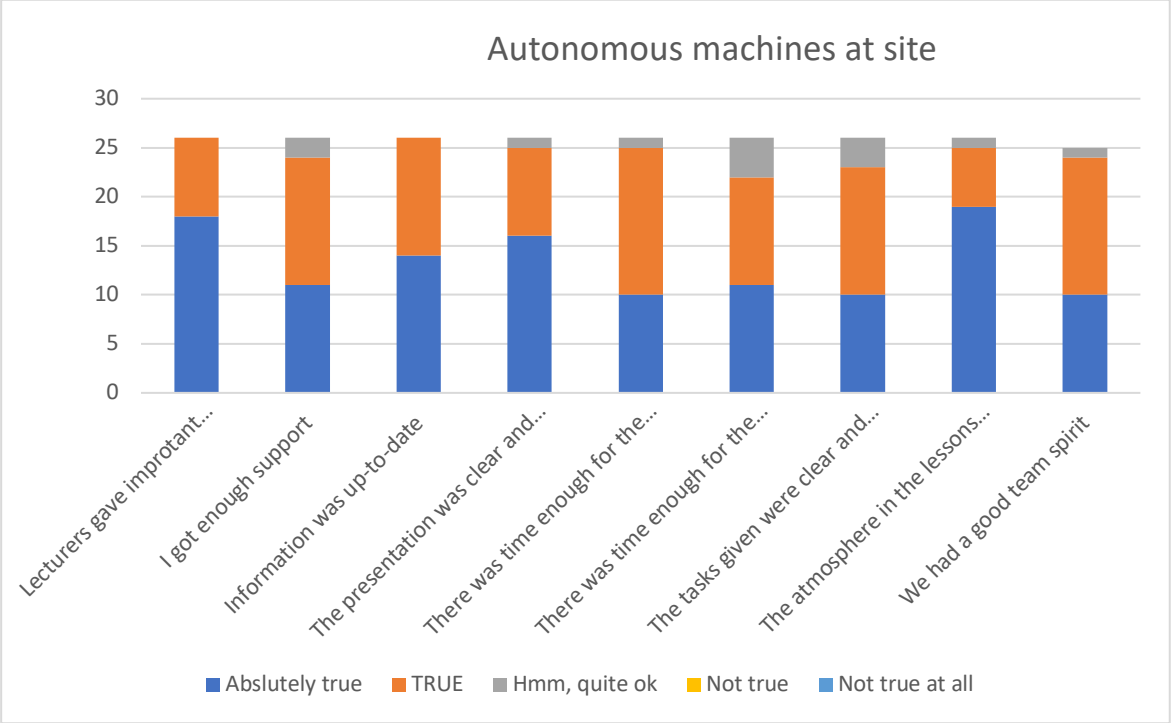


Figure 39. Autonomous machines at site course

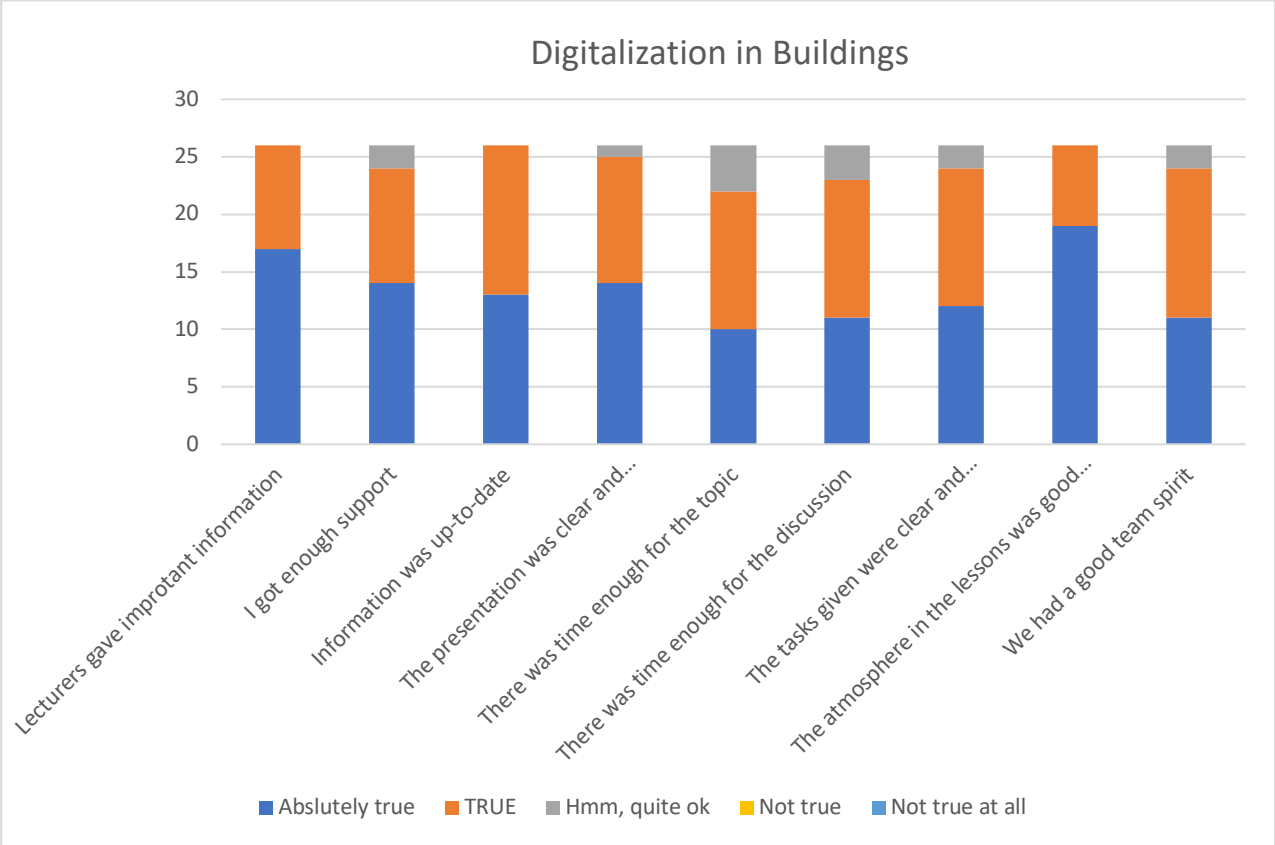


Figure 40. Digitalization in Buildings course

Maintenance and digitalization

The consensus among all students was that the course information remained up-to-date, and the lesson atmosphere was positive and open. Nearly all students agreed on the importance of the lesson content, although one student rated this aspect as only “Quite ok.” Additionally, more neutral opinions expressed regarding the sufficiency of provided support, clarity of presentation and tasks, allocated time for discussion and topic, as well as team spirit (Figure 41).

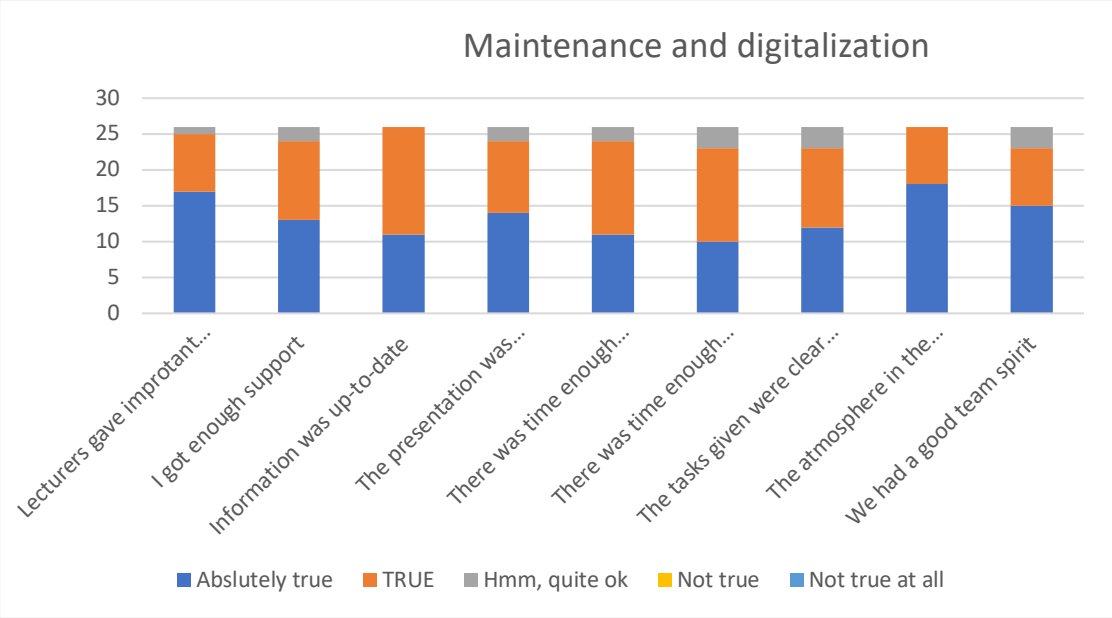


Figure 41. Maintenance and digitalization course

Demolition

The majority of students reported that lecturers provided important information, with 18 students indicating it was “Absolutely true”, and they found the atmosphere in the lessons to be good and open. Additionally, all students agreed that the lecture content was up-to-date and the allocated time for the topic was sufficient. However, a few students found the sufficiency of the provided support, time for discussion, team spirit, clarity of the presentation, and tasks to be only “Quite ok” (Figure 42).

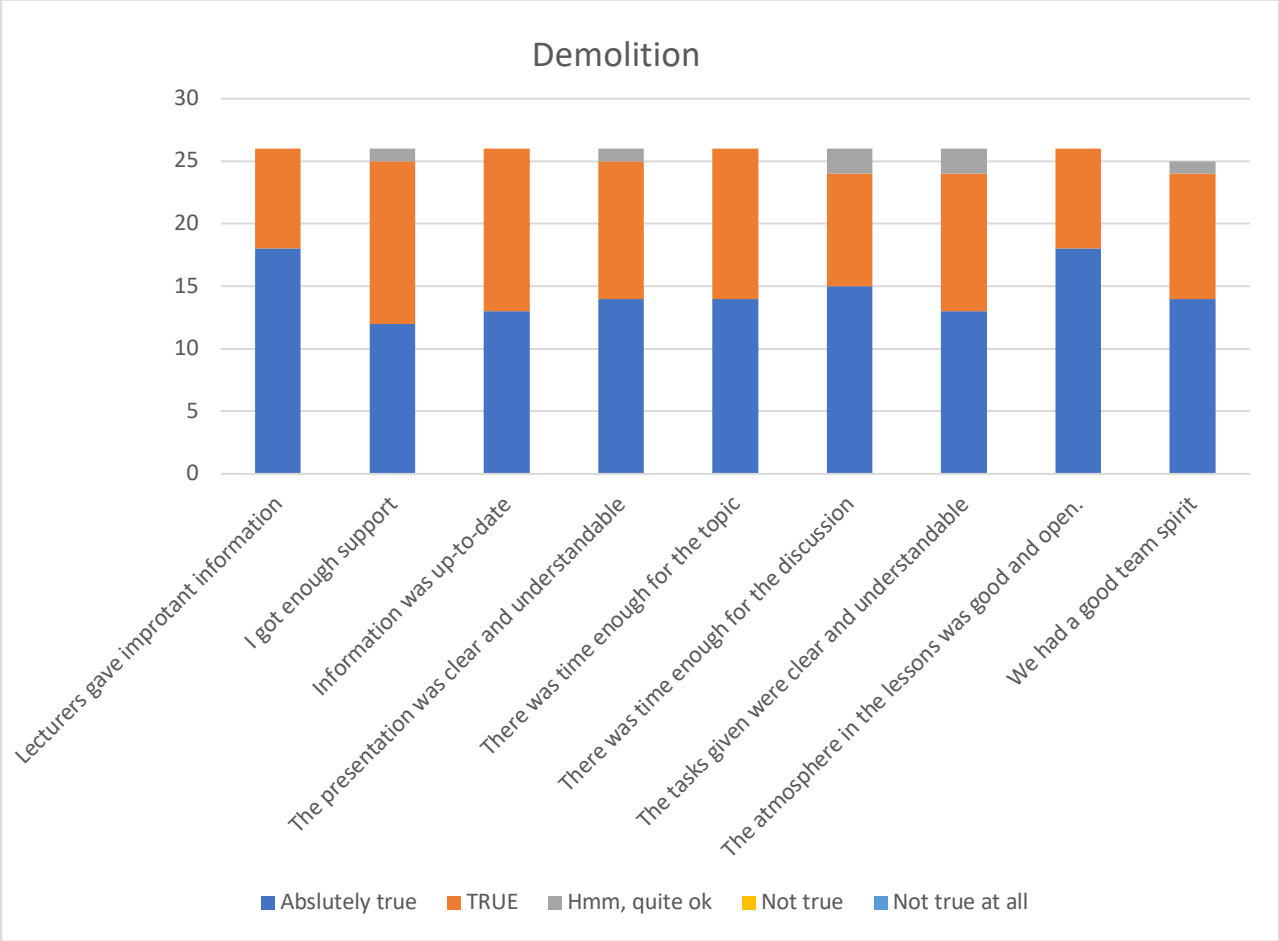


Figure 42. Demolition course

Management and Administration

In the Management and Administration course, all students agreed that there was sufficient time allocated for the topic. Nearly all students positively evaluated the importance and up-to-dateness of the information presented in the lessons, the atmosphere during the lessons, and the support provided. The majority of students also agreed that the team spirit was adequate, and that both the presentation and tasks were clear. Additionally, most students felt that the allocated time for discussion was sufficient. However, a few students found these aspects to be only “Quite ok” (Figure 43).

Communication and collaboration

A significant majority of students strongly agreed that lecturers provided important information. All students also reached a consensus that the atmosphere in the lessons was positive, the information presented in the lectures was up-to-date, and the presentation was clear. However, one neutral response was expressed regarding the team spirit and sufficiency of the provided support. Student opinions were more divided on the clarity of the tasks, and the allocated time for the topic and discussion, with a number of students rating them as “Quite ok” (Figure 44).

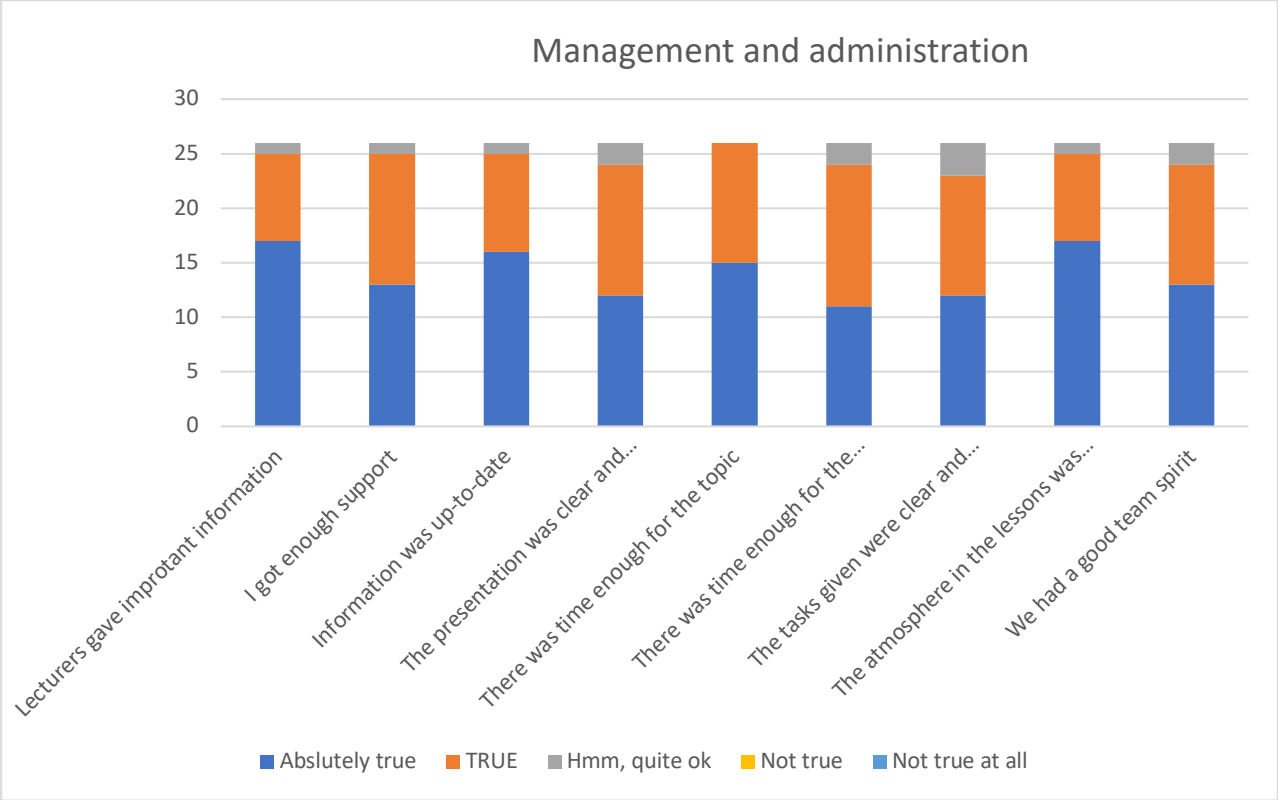


Figure 43. Management and administration course

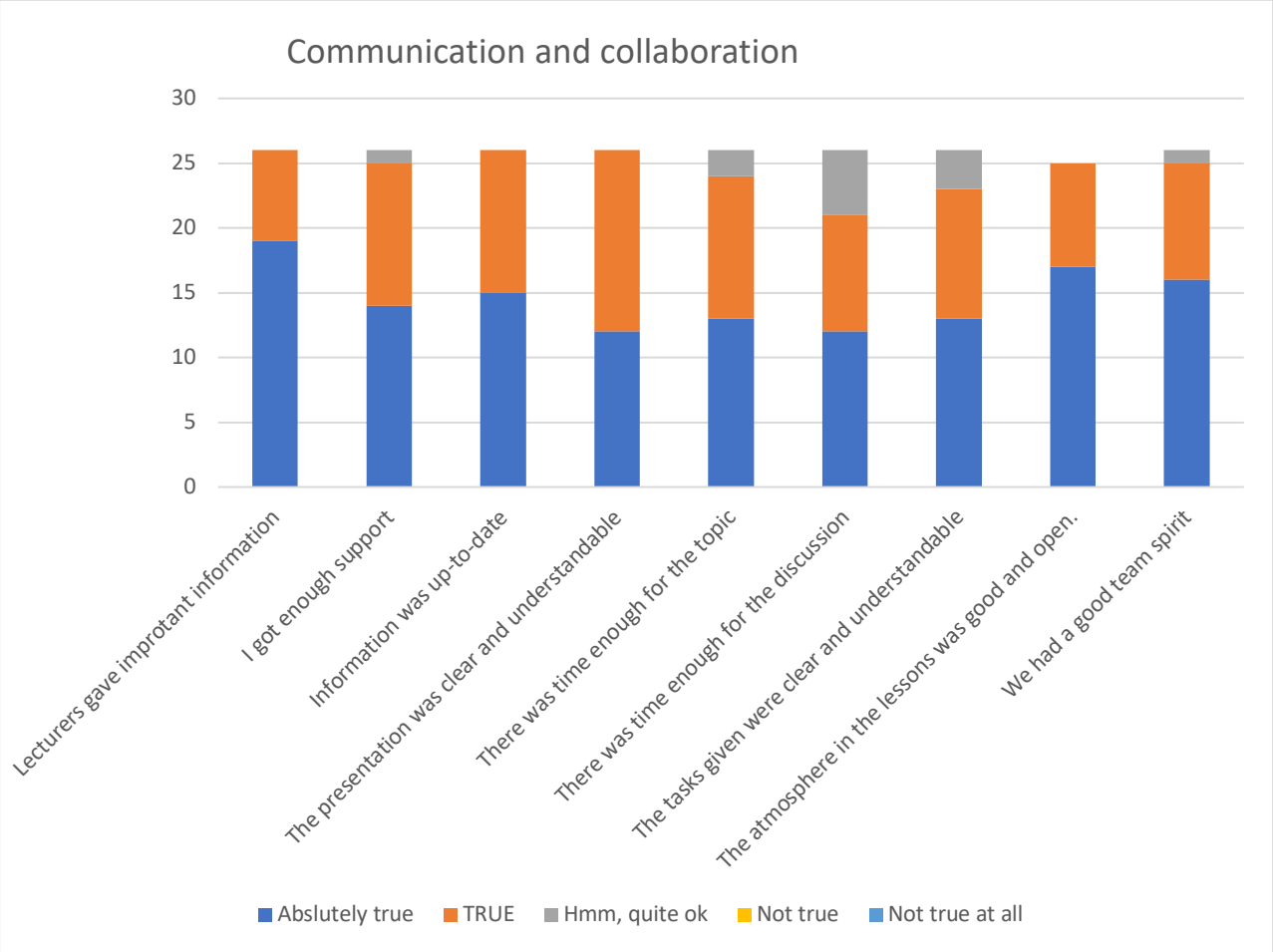


Figure 44. Communication and collaboration course

Conclusion

In summary, while students generally expressed a high level of satisfaction with all courses and positively evaluated their own learning experience, each course received multiple neutral responses. The majority of these neutral responses from students are linked to the allocated time for discussion and the clarity of tasks, indicating areas for improvement. Additionally, a few students responded neutrally to the feedback of every course regarding the sufficiency of provided support, clarity of presentation, and team spirit in the lessons.

According to the free speech answers (Appendix E), students enjoyed the classes, particularly highlighting the friendly atmosphere in the lessons, the clear and engaging lectures, and the professionalism of the teachers. However, a few students also shared suggestions for improvement in future courses. One student remarked on the significant volume of learning material, suggesting a need for adjustment. Another student mentioned the insufficient time allocated for the presentation and discussion of topics, such as live equipment, thermal imaging cameras, and drones. Lastly, one student proposed an organizational improvement by suggesting meetings be held at different times.

Enterprises – Employers

In Poland, only one small (1-10 employees) enterprise, working at construction sector and having from 6 to 10 years of experience, responded to the survey. They were very satisfied with the course and found that the topics were up-to-date, interesting, and close to the needs of the participants. The place and date of the training were found to be excellent, and the schedule and length were found to be good. The person who participated in the training was an employee, under 30 years old, and having less than 5 years of experience in the company / field.

Teacher

In Poland, only one teacher had completed the questionnaire. This lecturer was an entrepreneur in engineering branch, having more than 20 years of experience in branch and in teaching, and age between 30 and 60 years. According to him, the facilitations (place, time etc.) were excellent, and topics were topical, interesting, and close to both his profession and student's needs. The common level of students was evaluated to be average (3 in the scale from 1 to 5), they were interested in issues, active in lessons and practice, and they completed the given assignments.

The students also seemed to have required basic knowledge about the topic, they were helpful and respected each other and seemed to be satisfied with the lessons.

Lessons and topics

During the lesson I. Introduction to the course, teacher was able to follow the plan he had made, and he was able to support the students in learning. Information given by lecturer was up-to-date and the presentation given was clear and understandable. There was time enough for the topic and for the discussion, and the students understood the tasks. The atmosphere in the course was good and open and students seemed to have a good team spirit.

During the lesson II. Legislation and regulations, lecturer was able to follow the plan he had made, and he was able to support the students in learning. Information given by teacher was up-to-date and the presentation given was clear and understandable. There was time enough for the topic and for the discussion, and the students understood the tasks. The atmosphere in the course was good and open and students seemed to have a good team spirit.

During the lesson III., Digitalization in construction, lecturer was able to follow the plan he had made, and he was able to support the students in learning. Information given by teacher was up-to-date and the presentation given was clear and understandable. There was time enough for the topic and for the

discussion, and the students understood the tasks. The atmosphere in the course was good and open and students seemed to have a good team spirit.

During the lesson IV., Data models in construction, lecturer was up to certain level able to follow the plan he had made, and he was also up to certain level able to support the students in learning. Information given by teacher was up-to-date and the presentation given was clear and understandable. There was time enough for the topic and for the discussion, and the students understood the tasks. The atmosphere in the course was good and open and students seemed to have a good team spirit.

During the lesson V., Autonomous machines at site, teacher was able to follow the plan he had made, and he was able to support the students in learning. Information given by lecturer was up-to-date and the presentation given was clear and understandable. There was time enough for the topic and for the discussion, and the students understood the tasks. The atmosphere in the course was good and open and students seemed to have a good team spirit.

During the lesson VI., Digitalization in buildings, lecturer was up to certain level able to follow the plan he had made, and he was up to certain level able to support the students in learning. Information given by teacher was close to up-to-date and the presentation given was clear and understandable. There was time enough for the topic and for the discussion, and the students understood the tasks. The atmosphere in the course was good and open and students seemed to have a good team spirit.

During the lesson VII., Maintenance and digitalization, teacher was able to follow the plan he had made, and he was up to certain level able to support the students in learning. Information given by teacher was close to up-to-date and the presentation given was almost clear and understandable. There was time for the topic and for the discussion, and the students understood most of the tasks. The atmosphere in the course was good and open and students seemed to have a good team spirit.

During the lesson VIII., Demolition, lecturer was able to follow the plan he had made, and he was able to support the students in learning. Information given by teacher was close to up-to-date and the presentation given was quite clear and understandable. There was time enough for the topic and for the discussion, and the students understood the tasks. The atmosphere in the course was good and open and students seemed to have a good team spirit.

During the lesson IX. Management and administration, lecturer was up to certain level able to follow the plan he had made, and he was up to certain level able to support the students in learning. Information given by teacher was close to up-to-date and the presentation given was clear and understandable. There

was time enough for the topic and for the discussion, and the students understood most of the tasks. The atmosphere in the course was relatively good and open and students seemed to have relatively good team spirit.

During the lesson X., Communication and cooperation, lecturer was able to follow the plan he had made, and he was able to support the students in learning. Information given by teacher was up-to-date and the presentation given was clear and understandable. There was time for the topic and for the discussion, and the students mostly understood the tasks. The atmosphere in the course was relatively good and open and students seemed to have a relatively good team spirit.

As a conclusion it can be said, that implementation of the course seems to be successful, but considering a) the time available, and b) that the atmosphere and team spirit were worsening during the latest topics, it could have been better, if there had been one or two topics less to be dealt with. It could also have been a good idea to have more than only one teacher in the course.

Hungary

Enterprises

In the Hungary, students did not complete the survey of their own, but – because everyone was representative of an enterprise – they completed only survey of the enterprises. The number of participants was 12, the majority of them came from smallest companies (under ten employees), and from companies that have been existing between 11 and 25 years.

The biggest part of the companies was working in fields of construction and finishing, but the whole scale was very wide (Figure 45). 75 per cent of the companies had more than 10 years of experience in their branch.

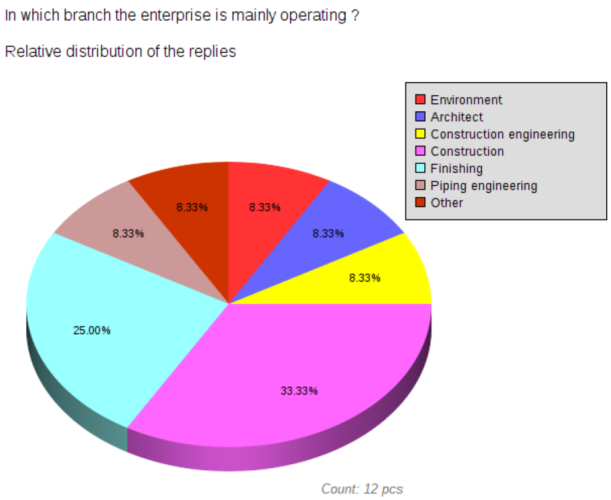


Figure 45: Branches of the companies

The majority of those participating in the course were entrepreneurs (68 per cent). Others were either leaders or managers. 75 per cent of the participants were males, their age was mostly between 30 and 60 years, and their experience in the company was well balanced between 5 and 25 years. The persons who participated to the course were mainly either satisfied or very satisfied with the course (Figure 46)

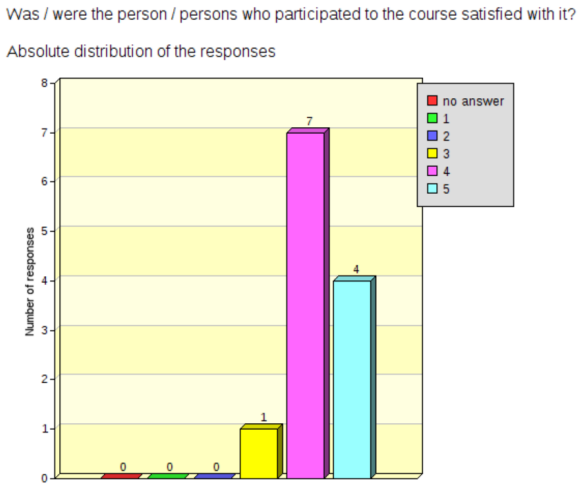
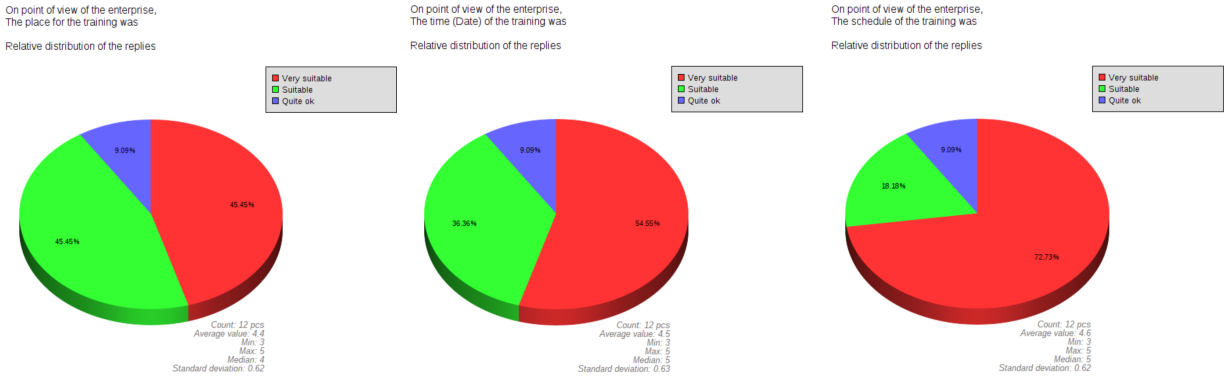


Figure 46: The satisfaction of participants

Most of the participants were satisfied with the facilitations (Figure 47), and the training was found to be beneficial on point of view of an enterprise. Respondents were also relatively satisfied with the skills and knowledge gained from the course.



The topics were found to be important, up-to-date, interesting, close to participant's needs and the branch of the company, and topical (Figure 48).

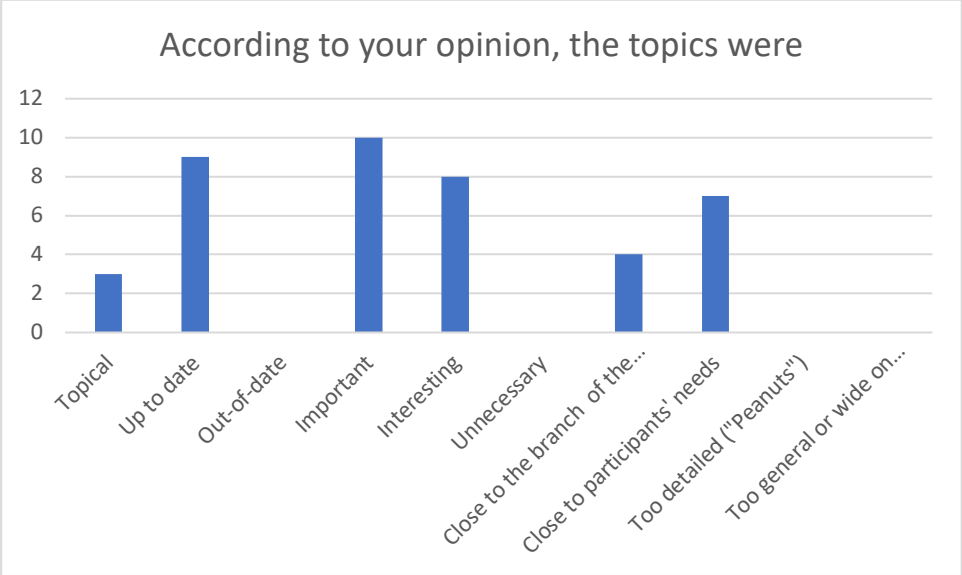


Figure 48: The topics of the course.

Summarizing the findings, it can be concluded that topics of the course were well selected, and the course was well implemented and facilitated. Enterprises and entrepreneurs have felt that they could benefit from the knowledge and skills gained during the course.

Teachers

There were three lecturers in the course, two of them had MSc-level graduation and one was BSc. At the moment, two of them were working as teachers and one as consultant. One of the lecturers was working in an architectural branch, one in public authority and one in another branch. All the lecturers had more than ten years of experience in the branch, and one had over ten years of experience in teaching, one less than 5 years, and the third less than ten years. All teachers were between 30 and 60 years old, and two of them were male and one female.

The place, time, length, and schedule of the training were found to be excellent, as well as facilitations too. The topics lectured were found to be up-to-date, important, close to lecturer's profession, topical, close to student's needs, and interesting (Figure 49).

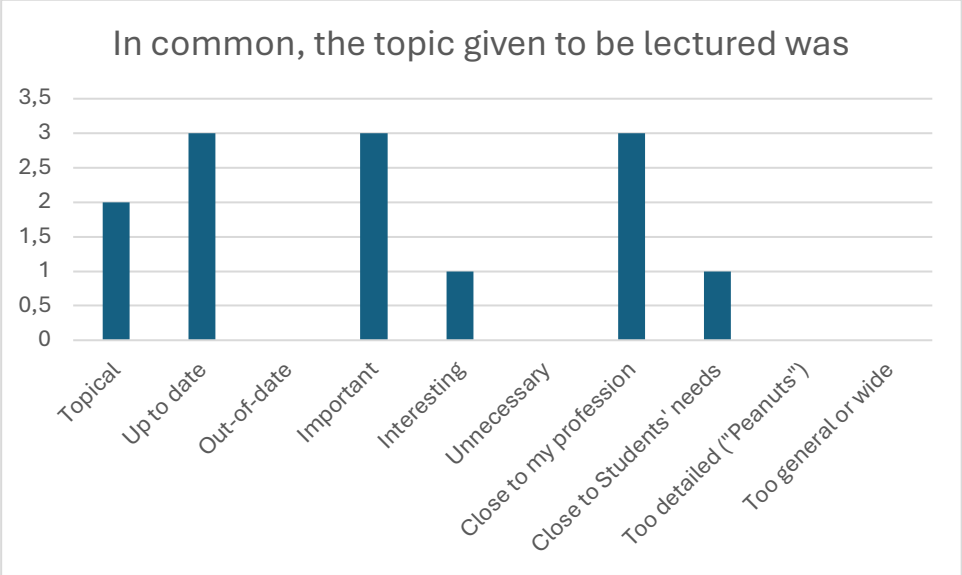


Figure 49: Topics lectured were:

The students were found to be interested in issues, active in lessons and practices, discussing and asking relevant questions, and completing the given assignments. They also seemed to have the need for the information (Figure 50).

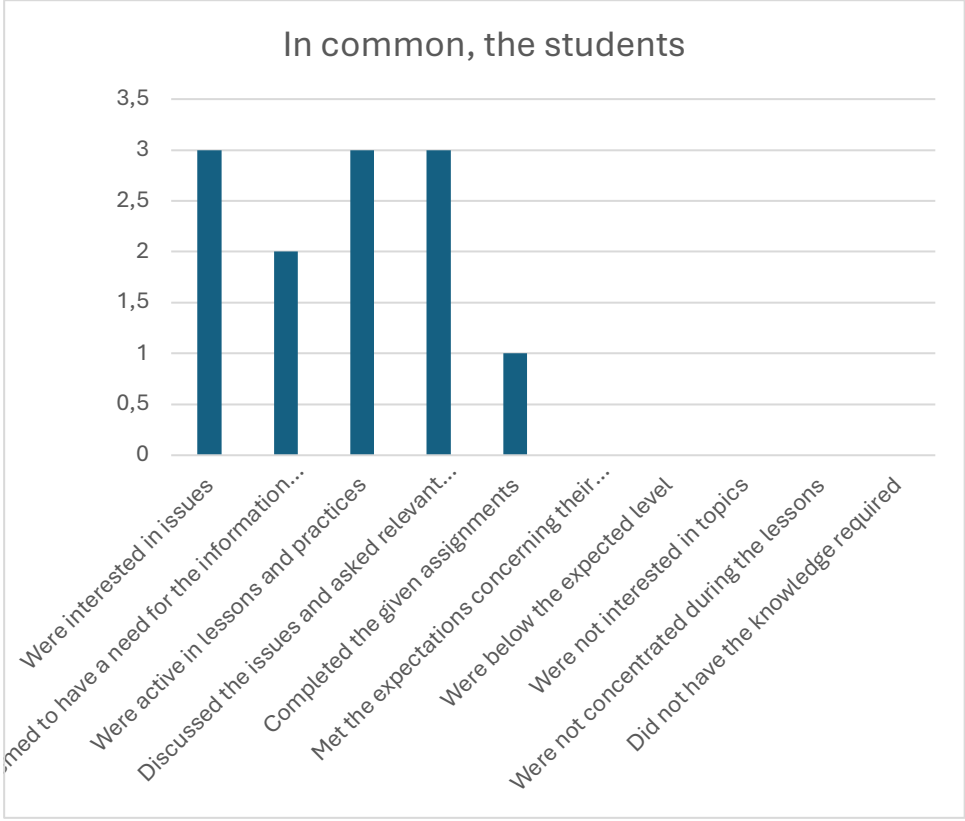


Figure 50: Students were

During the lessons, the atmosphere in the lessons was good, and the students seemed to have a good team spirit. The information given was up-to-date, and the presentations were clear and understandable. Lecturers were able to follow the plans and to support the students. There was time enough reserved for topics, and the students understood the tasks (Figure 51).

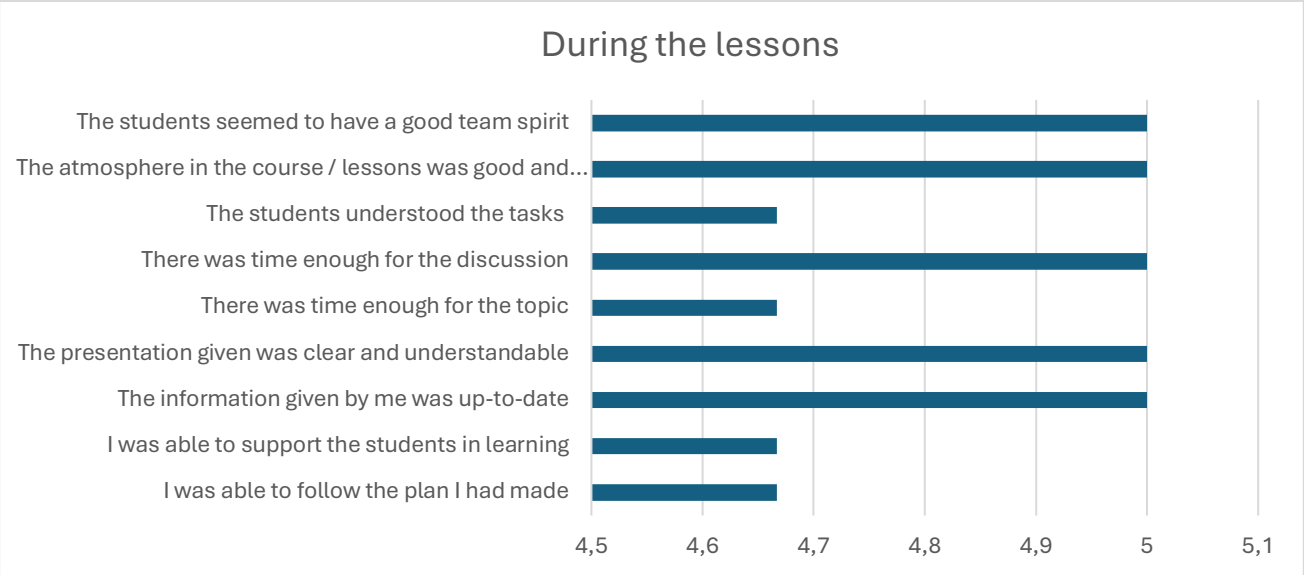


Figure 51: Students in the course

in free speech, one lecturer wished, that there would be “many more similar trainings”.

Conclusions and recommendations for future development

The implementations of test courses were successful. Both participants, teachers and enterprises were satisfied with the results. The skills and knowledge the training gave to participants were found to be beneficial both for participants and their employers. However, from the results of evaluations, some minor needs for improvement have arisen. If the implement contains many topics and many separate sub-courses, it is recommended that the schedule will be paid more attention, and more time will be reserved for both teaching and discussion. Furthermore, the wider the implementation is, the more recommendable it is to have more teachers. The topics are so wide, that it will be very hard for one teacher to prepare and lecture all the topics.

References

Fitzpatrick, J. L., 2004. Exemplars as Case Studies: Reflections on the Links Between Theory, Practice, and Context. *American Journal of Evaluation,* 25(4), pp. 541-559.

Hafeez, M., Naureen, S. & Sultan, S., 2022. Quality Indicators and Models for Online Learning Quality Assurance in Higher Education. *The Electronic Journal of e-Learning,* 20(4), pp. 374-385.

Appendices

Appendix A The template of the questionnaire for students	E-Lomake_Survey_for_Students.pdf
Appendix B The template of the questionnaire for teachers	E-Lomake - Teachers_questionn
Appendix C The template of the questionnaire for enterprises	E-Lomake_Survey_for_enterprises.pdf

Appendix D: Free speech answers of Latvian students

Table 1: Free speech answers

I would have preferred to participate in all the classes in presence in order to have a better understanding in some parts.
I think all things are okay for me
It was very informative session.
Awesome way to teach, feel into the study...
Thank you for the important things hat you told to us.
Everything is super all the lectures are best
Such a wonderful class
Everything is super all the lectures are best
The way professors taught the class was soo good and also it is understandable and it makes easy to get some valid points. I hope the time management should be correct next time , thank you madam
I think so that for the future it would be more interesting(better) if they give like group tasks or just some workshops with other students to practice communication and to share some knowledge with other people. Thank you so much! :)
I had a great time in this course, the presentation of all professors were quite informative. The classes were very engaging.
I had a great time in this course, the presentation of all professors were quite informative. The classes were very engaging.
Everything was Perfect
Thank you for your time
Presented in very good way
The method of teaching was absolutely amazing and it should not be changed.
Great opportunity to learn ,it will definitely help me to get some advantage in my work. Thank you
Thanking you for the wonderful sessions.
It was a great training. Teachers were helpful
Everything is good.
Thank you for the informative and interesting lessons.
Thank you for these courses, I enjoyed and found these lessons useful. One thing though, I believe it's better to have these courses in person!

Just want to say Thank you
Just want to say Thank you
Thank you for your teaching and explaining these topics

Appendix E. Free speech answers of Polish students

Table 2: Free speech answers of Polish students

The atmosphere was very friendly, but there was a lot of material
The atmosphere was fine, nothing needs to be changed
In my opinion everything was fine, it should not be changed
The whole course was very well done, nothing needs to be changed, there was a lot to learn and learn
Everything was fine.
In my opinion everything was good organized
In my opinion, more time should be spent on the presentation and discussion of live equipment and discussion about them, for example, thermal imaging camera, drones, etc.
In my opinion, the meetings themselves were fine, but it would have been better if they had been held at different times
In my opinion, all lessons took place in a very good atmosphere, the information provided by the teacher was very well understood.
Everything was ok.
In my opinion everything was good organized.
Nothing could have been done better, everything was clear, interesting and professional. Thank you for the nice training, I am very satisfied.
The training had interesting topics.
Very nice training. Lessons was interesting.
Everything was fine.
The whole training was adequate, in my opinion I wouldn't change anything about it.