

BIM & LEAN Teacher Competences

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Summary:	This deliverable describes how Teacher Competences for EU Building Standards were developed. It outlines the methodology, describes the implementation of the work, and presents the results in the appendix.		

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1 Introduction

This deliverable defines the professional competences that teachers in vocational education and training (VET) require to teach Building Information Modelling (BIM) and Lean Construction in alignment with European standards and labour market needs.

The outcome is a structured Teacher Competence Framework for BIM & Lean, designed to guide training design in Work Package 3. The framework ensures that educators are equipped to lead digital and process transformations in construction, reflecting EU policy goals under the Green Deal, Digital Europe, and New European Bauhaus initiatives.

The integration of Building Information Modelling (BIM) and Lean Construction represents a transformative step in the modernisation of vocational education for the construction sector. Both approaches are central to the European twin transition — digital and green — and essential for equipping teachers with relevant skills. This deliverable identifies and specifies the competences required by VET teachers to deliver BIM- and Lean-related content aligned with European frameworks and labour market demands. The main objectives are to define core competences, align them with EU frameworks, and support curriculum development within the VETpartEX project

2 Methodology

The methodology applied in this deliverable follows a simplified, context-specific approach due to the focus of available data. Four main activities formed the basis of competence identification and validation:

Step 1 Literature Review: The first phase of the methodology focused on a targeted literature review to establish the conceptual and theoretical foundation for competence identification in Building Information Modelling (BIM) and Lean Construction within vocational education and training (VET).

This review involved collecting and analysing relevant academic and institutional publications, EU-level project reports, and policy frameworks addressing digitalisation and process-based education in the construction sector. The analysis concentrated on three main dimensions:

The findings from this step provided the conceptual grounding for subsequent phases. Specifically, they informed the design of the course assessment and teacher needs analysis, ensuring that all competence definitions **were aligned with current European educational trends and VET priorities.**

Step 2 Assessment of existing courses at MENDELU: A detailed review of MENDELU’s BIM & Lean course modules was conducted to evaluate content relevance, structure, and competence alignment. Modules covered topics from BIM fundamentals and Lean principles to integrated digital workflows. The analysis provided a foundation for identifying transferable competences applicable in Ukrainian VET education. This dual-source methodology ensured that competence definitions were grounded in both teacher needs and proven European educational practice.

Step 3 Teacher needs assessment in Ukraine: Semi-structured interviews were conducted with Ukrainian VET teachers and workshop instructors participating in the VETpartEX project. The interviews aimed to identify teachers’ knowledge gaps, expectations, and training priorities related to BIM and Lean Construction. Findings highlighted limited exposure to BIM tools, a need for practical teaching methodologies, and high motivation to learn process-based and digital approaches.

Step 4 Identification of the intersection between course content and teacher needs:

The results from the MENDELU course review and the Ukrainian teacher interviews were cross-analysed to determine areas of alignment and discrepancy. This comparative mapping made it possible to define the competence intersection—the set of BIM- and Lean-related skills that are both already available in EU partner training resources and explicitly needed in Ukrainian VET practice.

This step ensured that the resulting competence framework is both evidence-based and implementation-ready: grounded in proven European educational materials while directly responding to the specific professional development needs of Ukrainian teachers. The intersection analysis served as the conceptual link between course availability and real classroom requirements, forming the basis for the competence matrix developed in this deliverable.

The dual-source validation approach ensured that competence identification was grounded in both proven European educational practices and the real-world needs of Ukrainian vocational teachers. On one side, European Educational Practice was represented through MENDELU’s tested BIM and Lean course modules, offering a structured foundation of technical content. In parallel, insights from Ukrainian Teacher Needs provided direct feedback from VET instructors, highlighting existing skill gaps, practical challenges, and training expectations. The convergence of these two data sources made it possible to define a Validated Competence Framework—a set of implementation-ready competences aligned with both available learning

resources and classroom realities. This dual validation process enhanced the reliability, contextual relevance, and transferability of the resulting competence model.

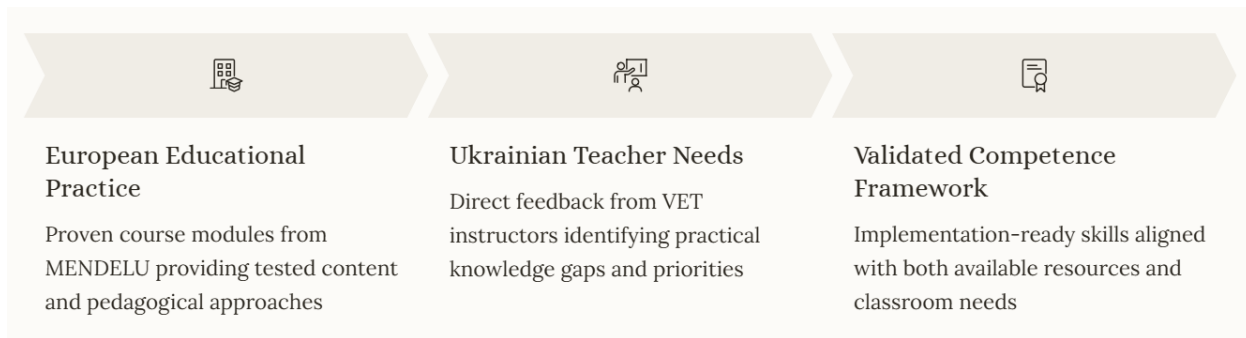


Fig.1 Dual-Source Validation

The applied methodology demonstrates strong contextual relevance by tailoring its design to the specific needs of EU-Ukraine VET collaboration. It combines an evidence-based approach, using both validated course materials and authentic teacher feedback, to ensure practical and data-driven outcomes. As a result, the methodology produces implementation-ready competences that effectively bridge European best practices with the realities of Ukrainian vocational education.



Fig. 2 Methodology Strengths

3 Implementation

In this chapter, we describe how we developed the basis for the teacher competency matrix. The next step explains how we identified the sectoral challenges in Ukraine and assessed the Ukrainian need for vocational teacher training.

3.1 Literature Review

Building Information Modelling (BIM) and Lean Construction have become foundational approaches for advancing productivity, collaboration, and sustainability in the construction industry. According to Eastman et al. (2018), BIM provides a digital representation of physical and functional characteristics of built assets, facilitating informed decision-making throughout the project lifecycle. Similarly, Lean Construction, introduced by Koskela (1992), applies manufacturing-based principles of waste minimization and continuous improvement to construction processes. Numerous studies have highlighted the complementary relationship between BIM and Lean, with both promoting efficiency, transparency, and collaboration (Sacks, Koskela, Dave, & Owen, 2010).

Recent literature emphasizes the importance of integrating BIM and Lean principles into vocational and higher education to address industry skills gaps (Succar & Sher, 2014). The European Construction Sector Observatory (2022) reports that digital transformation and sustainability targets are reshaping professional competence requirements, particularly within the EU's Green Deal framework. In this context, vocational education and training (VET) plays a critical role in preparing teachers and students for new digital workflows (European Commission, 2020).

Research has shown that the successful adoption of BIM depends on not only technical skills but also organizational and pedagogical readiness (Barison & Santos, 2010). Effective BIM education must emphasize collaborative learning, cross-disciplinary communication, and process thinking (Davies et al., 2015). Similarly, Lean Construction pedagogy should foster a mindset of continuous improvement and system optimization rather than rote application of tools (Ballard & Howell, 2003). Integration of these approaches within educational settings helps learners understand the interplay between digital models and production efficiency.

The dual-source approach adopted in this methodology—drawing from European educational practice and Ukrainian teacher needs—aligns with literature advocating for context-sensitive competence frameworks (Liu et al., 2021). International case studies suggest that locally adapted, evidence-based curricula yield higher adoption and impact in VET contexts (Chalhoub & Ayer, 2018). Moreover, BIM–Lean integration is increasingly viewed as a strategic enabler for sustainable construction, improving both project and educational outcomes (Sacks et al., 2018).

By synthesizing insights from EU-level projects and VET modernization initiatives, the literature review underscores that competence development must link practical BIM–Lean applications with digital pedagogy (Kiviniemi et al., 2019). The review also reveals a growing trend toward using BIM-based simulation and collaborative learning platforms in teacher training (Piroozfar et al., 2019). This evidence base provides a strong foundation for assessing existing course modules and designing competence-based frameworks tailored to Ukrainian vocational education needs.

3.2 Overview of the available courses in BIM & LEAN

The MENDELU BIM & Lean course modules provide a structured and pedagogically rich foundation for competence development in construction digitalization and process management. The curriculum begins with an Overview of Industry Trends, situating BIM and Lean within broader transformations such as sustainability, automation, and digital collaboration. This introduction helps educators contextualize technological innovation in relation to evolving labour markets and policy priorities.

The Understanding BIM module builds fundamental knowledge of digital modelling, focusing on how BIM enhances accuracy, coordination, and lifecycle management. This is further expanded in BIM Implementation, where learners explore workflow integration, project planning, and case-based examples demonstrating improved efficiency and reduced rework. Such content reflects the principles outlined by Eastman et al. (2018) regarding BIM-enabled lifecycle collaboration.

Modules 4 and 5 shift focus to Lean Construction Fundamentals and Lean Tools & Methods, which introduce the Lean philosophy, value-stream mapping, and practical tools like the Last Planner System and Just-in-Time delivery. These align with Lean Construction Institute (2020) guidelines emphasizing waste reduction and continuous improvement. Classroom activities within these modules are designed to translate industrial principles into pedagogical exercises, encouraging applied learning.

The Synergies Between BIM & Lean module provides an integrative perspective, illustrating how BIM’s data-rich models support Lean workflows through visualization, sequencing, and progress tracking. This integration is consistent with findings by Sacks et al. (2010), who demonstrated that BIM–Lean synergy can significantly enhance project performance. Practical Applications & Case Studies reinforce these connections by presenting real-world examples from European construction projects, highlighting lessons applicable to Ukrainian VET contexts.

Finally, the Future of Construction Technology module expands the learner’s horizon toward digital twins, robotics, and AI-driven systems. It anticipates future competence needs and aligns with EU digitalization and green transition objectives (European Commission, 2023). Collectively, these modules exemplify a forward-looking, implementation-ready approach to teaching BIM and Lean, blending conceptual, practical, and strategic learning outcomes.

By combining theoretical grounding, real-world case studies, and classroom-ready activities, MENDELU’s BIM & Lean curriculum offers a model for integrating digital and process innovation into VET programs. This structured progression—from conceptual understanding to applied competence—ensures that educators are equipped to guide students toward modern construction practices while addressing both European standards and local needs in Ukraine.

3.3 Interview of Ukrainian VET teachers

The questionnaire aimed to identify the current level of awareness, use, and training needs related to Building Information Modelling (BIM) and Lean Construction among vocational education and training (VET) teachers. Responses were collected from teachers of construction-related subjects from multiple Ukrainian institutions, reflecting diverse regional and institutional perspectives (Appendix 2).

3.3.1. Teaching Experience and Digital Familiarity

Most respondents have over 10 years of teaching experience, with a smaller proportion representing early-career educators.

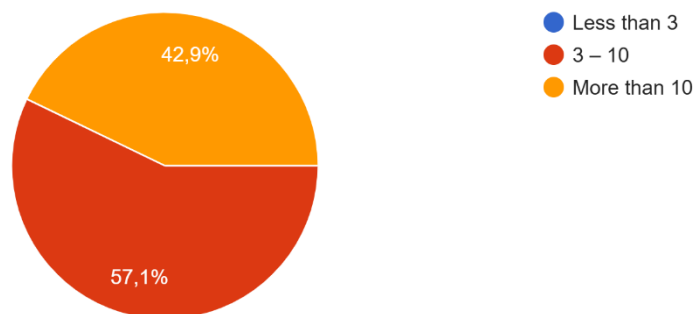


Fig. 3 Teaching experience

The majority indicated some degree of familiarity with digital tools such as AutoCAD, Revit, and ArchiCAD, while a few reported experiences with collaborative platforms and emerging technologies like 3D printing and virtual reality. This demonstrates a foundational digital

literacy but highlights the need for further specialization in BIM workflows and integration into pedagogy.

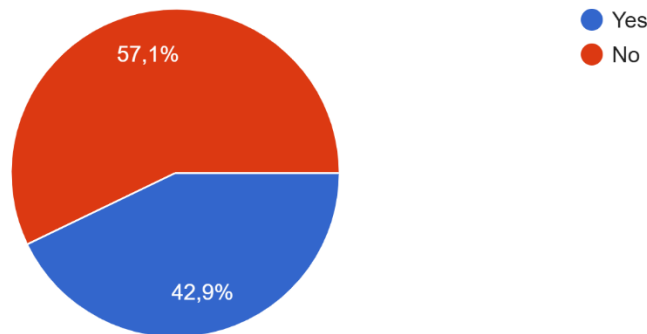


Fig.4 Familiarity with digital tools

3.3.2. Perceived Challenges and Priorities in Construction Education

Teachers consistently identified the modernization of curricula, digitalization of training processes, and harmonization with EU standards as urgent priorities. Specific challenges include the lack of licensed software, insufficient hardware, and limited institutional resources. Several noted the importance of dual education and collaboration with businesses to ensure training aligns with market demands and supports post-war reconstruction.

3.3.3. Familiarity with BIM and Lean Principles

A majority of teachers described themselves as “somewhat familiar” or “very familiar” with BIM, recognizing its relevance to labour market needs and energy-efficient construction.

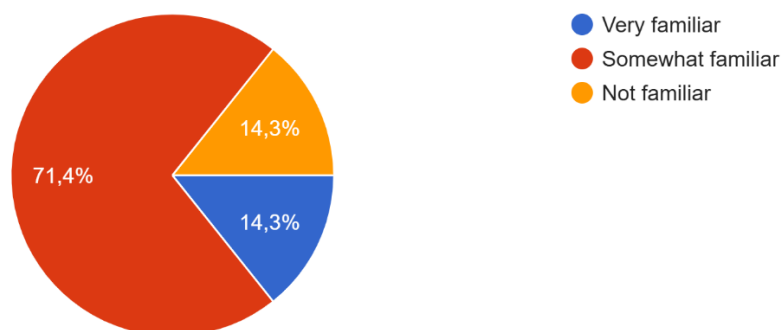


Fig.5. Familiarity with BIM technologies

Lean principles, including 5S, Value Stream Mapping (VSM), and Kaizen, were understood primarily as tools to improve efficiency and safety. However, many respondents indicated that

structured training and practical examples are necessary to effectively teach these methods within vocational programs.

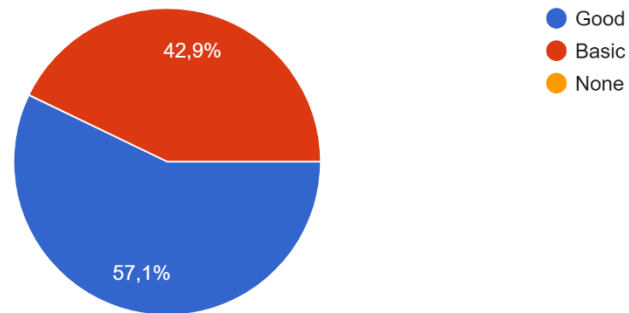


Fig.6. Familiarity with Lean Principles

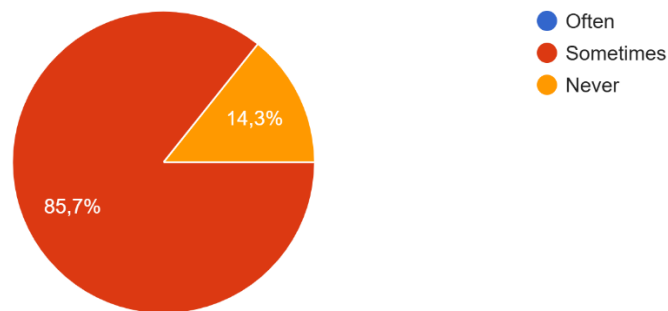


Fig.7. Level of real-life experience of respondents with BIM or Lean case studies

3.3.4. Competence Gaps and Training Needs

Respondents highlighted gaps in digital, technical, and pedagogical competences related to BIM and Lean integration. The most requested support includes:

- Access to licensed BIM software and updated equipment.
- Practical, example-based workshops
- Blended and peer-learning formats combining online and in-person sessions.
- Mentorship or exchange programs with EU institutions.

This aligns with the Erasmus+ objective of fostering European cooperation and knowledge transfer in vocational education.

3.3.5. Integration of BIM and Lean in Teaching

Participants emphasized the synergetic potential of BIM and Lean approaches: using BIM for project visualization and lean for process optimization can greatly enhance construction

education. Teachers proposed practical lessons such as simulating worksite logistics using Revit and applying Lean tools to identify waste in virtual models—helping students connect theory with real-world applications.

3.3.6. Emerging Technologies and Future Trends

Respondents cited AI, digital twins, robotics, and 3D printing as the most relevant technologies for future integration. These technologies are seen as key to preparing students for Industry 4.0 construction environments and promoting sustainability and efficiency in the built environment.

3.3.7. Implications for Mendel University and Erasmus+ Training

Findings reveal a clear demand for a structured, practice-oriented training framework that merges BIM, Lean, and sustainability competencies. Mendel University’s future training modules could thus emphasize:

- Applied BIM modeling and collaborative project simulations.
- Lean process optimization in digital construction.
- Integration of sustainability and circular economy principles.
- Scalable training tools adaptable to various VET contexts.

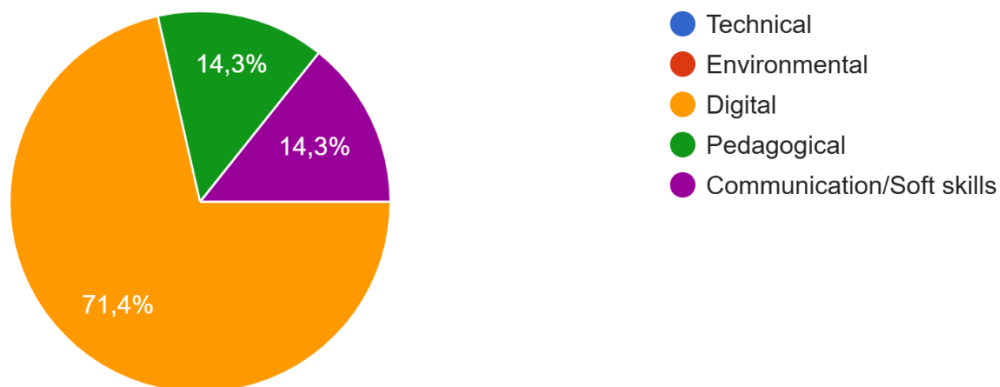


Fig.8. Competence areas needs to strengthen

These results underline the importance of capacity building for VET teachers, positioning BIM and Lean not merely as technical tools but as frameworks for innovation and sustainable growth in vocational education.

4 Results

4.1 Overview of Outcomes

The results of the analysis demonstrate that the development of the Teacher Competence Framework for BIM & Lean is grounded in two complementary sources: (1) validated European educational practice represented by the MENDELU BIM & Lean modules, and (2) a comprehensive needs assessment of Ukrainian VET teachers. This dual foundation ensures that the final competence model is theoretically robust, practically applicable, and contextually relevant for vocational training institutions in Ukraine.

4.2 Key Findings from the Course Review (MENDELU)

The review of eight BIM & Lean modules offered at MENDELU confirmed that the curriculum provides:

- a strong technical foundation (BIM modelling, Lean tools, digital workflows).
- alignment with EU policy priorities, including sustainability, digital transformation, and construction process optimisation.
- future-oriented topics, such as digital twins, robotics, and AI-enabled construction technologies.

These findings established the conceptual and methodological basis for constructing a competence set transferable to VET teacher training in Ukraine.

4.3 Key Findings from the Ukrainian Teacher Questionnaire

Across all institutions, teachers expressed strong motivation for adopting BIM, Lean, and modern digital practices, while simultaneously noting barriers such as:

- lack of licensed software and insufficient computing capacity, outdated equipment,
- insufficient practical teaching materials,
- need for real project examples demonstrating BIM–Lean integration.

Most respondents reported basic to intermediate proficiency in digital tools (AutoCAD, Revit, ArchiCAD), but only limited experience with structured BIM workflows or advanced collaboration environments.

Teachers associate Lean with 5S, Value Stream Mapping, Kaizen, visual management, and Just-in-Time, yet request clear guidance on how to adapt these tools for vocational teaching environments. Respondents consistently expressed interest in:

- short, in-person workshops,
- blended or hybrid formats,
- peer exchange with EU teachers,
- case studies demonstrating modern digitalised construction workflows.

Teachers identified the following technologies as most relevant for the future of VET construction training: 3D printing, robotics, digital twins integrated with BIM, AI for process optimisation.

The comparison of MENDELU's BIM & Lean course content with the needs identified in the Ukrainian teacher survey revealed substantial alignment across the following themes:

- Digital modelling and CAD/BIM fundamentals.
- Lean Construction principles and process optimisation.
- Integration of BIM and Lean for workflow planning and efficiency.
- Sustainable construction and energy-efficient building design.

At the same time, several gaps were identified that need to be addressed during capacity building:

- Expansion of open-source and low-cost BIM tools suitable for VET institutions.
- Development of hands-on exercises and teacher-ready materials.
- Inclusion of regional case studies relevant to post-war reconstruction in Ukraine.
- Reinforcement of pedagogical competences needed for teaching digital methods effectively.

This synthesis formed the foundation for the final competence matrix. (Appendix 3)

4.4 Resulting Competence Structure

The final competence framework developed in this deliverable consists of three interconnected competence domains:

- a) BIM Competences – including modelling, digital collaboration, data management, and applied BIM workflows.
- b) Lean Construction Competences – including process optimisation, waste reduction, continuous improvement, and workflow planning.

- c) Sustainability & EU Standards Competences – covering environmental performance, EU regulatory frameworks, standardisation, and safety.

Each unit includes: Competence statement, Knowledge learning outcomes, Skills learning outcomes, Relevance for VET teaching, Link to EU standards, when applicable. This structure ensures that the outputs are implementable within curriculum design (WP3) and reflect both European best practices and the practical needs of Ukrainian VET teachers.

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Appendixes

Appendix 1: List of BIM LEAN tools

A.1 Building Information Modelling (BIM) Tools

1. Authoring and Modelling Tools

Autodesk Revit – Widely used for architectural, structural, and MEP modeling; supports parametric design and information-rich models.

Graphisoft ArchiCAD – BIM authoring tool emphasizing design flexibility and collaboration.

Bentley AECOsim / OpenBuildings Designer – Used for complex infrastructure and large-scale building projects.

Trimble SketchUp + V-Ray – Simplified 3D modeling for concept visualization and early design stages.

Autodesk Civil 3D – Specialized for civil engineering and infrastructure design.

Tekla Structures (Trimble) – Advanced structural modeling and detailing for steel and concrete projects.

2. Coordination, Clash Detection & Collaboration

Autodesk Navisworks Manage – Used for model coordination, clash detection, and 4D simulation.

Solibri Model Checker – Quality assurance and model validation tool for IFC-based workflows.

BIMcollab / BIM Track – Cloud-based issue management platforms for interdisciplinary collaboration.

Trimble Connect – Project collaboration and model-sharing environment supporting IFC integration.

3. BIM Data Management and Integration

Autodesk BIM 360 / Autodesk Construction Cloud – Cloud-based environment for model sharing, document management, and workflow tracking.

Bentley ProjectWise – Common data environment (CDE) for managing large-scale project information.

NavVis / Matterport – Reality capture and digital twin creation tools using 3D scanning and photogrammetry.

Speckle / IFC.js – Open-source BIM data exchange and integration platforms supporting digital interoperability.

4. 4D/5D BIM and Project Simulation

Synchro 4D (Bentley) – Integrates 3D models with scheduling for 4D construction sequencing.

CostOS / Vico Office – Enables 5D estimation, cost management, and project visualization.

Fuzor / Twinmotion – Used for real-time simulation and immersive visualization of BIM environments.

A.2 Lean Construction Tools

1. Planning and Workflow Control

Last Planner System (LPS) – A collaborative planning framework improving task reliability and short-term planning.

Lookahead Planning / Pull Planning – Visual scheduling methods used to align workflows with project constraints.

Takt Planning & Control (TPC) – Flow-based scheduling aligning tasks with project rhythm to reduce waste.

2. Value Stream and Process Optimization

Value Stream Mapping (VSM) – Visualization of material and information flow to identify non-value-adding activities.

A3 Thinking – Structured problem-solving and continuous improvement documentation tool.

Kanban Boards (Digital or Physical) – Visual management tool for workflow transparency and task tracking.

1. Continuous Improvement Tools

5S (Sort, Set in order, Shine, Standardize, Sustain) – Workplace organization method for efficiency.

Root Cause Analysis (5 Whys, Fishbone Diagram) – Systematic approach to identifying and solving process issues.

PDCA (Plan–Do–Check–Act) – Cyclical framework for continuous improvement and performance monitoring.

2. Integrated BIM–Lean Synergy Tools

4D BIM for Lean Scheduling – Using BIM-based simulation to improve flow and reduce waiting time.

Digital Kanban Systems (e.g., Trello, Asana, or BIM 360 Plan) – Combining Lean task management with BIM coordination.

Visual Management Dashboards – Integrating real-time project data for team coordination (e.g., Power BI + BIM).

BIM-based Value Stream Analysis – Linking process metrics and model data to optimize design and construction performance.

A.4 Recommended Open Educational or Demonstration Tools

BIM Vision – Free IFC model viewer suitable for training purposes.

OpenBIM tools (IFC, BCF, IDS) – Promote interoperability and open standards in education.

Lean Simulation Games (e.g., LEGO® Serious Play) – Used in classrooms to demonstrate flow and waste concepts.



nPlan / Alice Technologies – AI-based construction optimization platforms demonstrating emerging Lean digitalization.

Appendix 2: Teacher Topic List

Module	Title	Content Description
1	Overview of Industry Trends	This module introduces current global and regional trends shaping the construction industry, including digitalization, sustainability, and resource efficiency. Teachers will learn about challenges such as labor shortages, rising costs, and climate goals. Emphasis will be placed on how innovation is reshaping the sector and influencing vocational education.
2	Understanding BIM	Focuses on the principles of Building Information Modeling (BIM), explaining its role in creating digital representations of physical and functional characteristics of buildings. Teachers will gain insights into how BIM improves design accuracy, collaboration, and lifecycle management. Demonstrations of common BIM tools and interfaces will be included.
3	BIM Implementation	Explores practical aspects of implementing BIM in construction projects, from planning to operation. Teachers will examine workflows, required skills, and organizational changes needed for successful BIM adoption. Case examples will highlight benefits such as reduced errors, cost savings, and better coordination.
4	Lean Construction Fundamentals	Provides an introduction to Lean Construction philosophy, which aims to reduce waste and maximize value in construction processes. Teachers will learn about Lean principles, terminology, and the cultural shift needed for adoption. The module includes simple classroom activities to demonstrate value-stream thinking.
5	Lean Tools & Methods	Covers practical Lean tools such as the Last Planner System, Just-in-Time delivery, Value Stream Mapping, and continuous improvement methods. Teachers will explore how these tools can be adapted

		for classroom training and project simulations. Emphasis is placed on improving productivity, safety, and quality.
6	Synergies Between BIM & Lean	Examines how BIM and Lean approaches complement each other in improving project outcomes. Teachers will understand how digital models support Lean workflows through visualization, planning, and real-time monitoring. Real-world examples will be used to show integrated application in modern projects.
7	Practical Applications & Case Studies	Focuses on real-world applications of BIM and Lean in construction projects across Europe and the Visegrad region. Teachers will analyze case studies showing successful implementation and challenges faced. The module will encourage critical thinking on how to adapt these practices for vocational training.
8	Future of Construction Technology	Explores emerging technologies such as digital twins, artificial intelligence, robotics, and 3D printing in construction. Teachers will learn how these innovations may transform the industry over the next decade. The module also discusses the implications for skills development, labor markets, and VET education.

Appendix 3: Teacher Competence Matrix – BIM & LEAN

 Co-funded by the European Union	EU project				
	ECVET Points: ECTS Credits:				
EQF Level: 6	UA	CZ	DE	NO	SK
NQF Level:			6		
Units of Learning Outcomes	U1	Understanding BIM			
	U2	BIM Implementation			
	U3	Lean Construction Fundamentals			
	U4	Lean Tools & Methods			
	U5	Synergies Between BIM & Lean			
	U6	Future of Construction Technology			
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Understanding BIM	Unit	Competence	
		Knowledge	Skills
<p>This unit provides teachers with a foundational understanding of Building Information Modelling as a modern digital approach to construction planning and communication. It introduces the structure of BIM models, the concept of data-rich building components, and the purpose of a shared digital environment. Teachers gain insights into how BIM supports construction accuracy, reduces errors, and enables smoother collaboration. The unit also emphasises the importance of adopting digital workflows at VET level to reflect European construction practices. By understanding BIM fundamentals, teachers will be able to guide students towards digital literacy and industry-ready competencies.</p>	U1	Teacher will know how to explain BIM principles and demonstrate the basic functions of BIM software in classroom settings.	
		<ul style="list-style-type: none"> principles and terminology of BIM structure and purpose of 3D digital models BIM levels of development and information exchange standards (e.g., IFC) role of BIM in improving coordination and reducing errors 	<ul style="list-style-type: none"> navigating BIM user interfaces demonstrating basic modelling tasks explaining digital workflows to students integrating BIM into introductory construction lessons

BIM Implementation	Unit	Competence	
		Knowledge	Skills
<p>This unit deepens teachers' abilities to apply BIM as an operational tool in planning, sequencing, documentation, and communication. It introduces practical BIM workflows used in the construction industry, including model coordination, clash detection, and version management. Teachers learn how BIM supports project scheduling (4D) and cost</p>	U2	Teacher will know how to apply BIM workflows in teaching and guide students through simple coordination and planning tasks.	
		<ul style="list-style-type: none"> BIM execution processes and workflow stages principles of clash detection and model coordination 	<ul style="list-style-type: none"> preparing classroom exercises based on BIM workflows demonstrating BIM-based planning and sequencing

<p>estimation (5D), enabling them to translate these processes into educational activities. The unit focuses on turning BIM concepts into classroom practice through exercises, simulations, and collaborative assignments. It also highlights the pedagogical role of hands-on modelling for strengthening problem-solving in students.</p>		<ul style="list-style-type: none"> relationship between BIM models and project timelines digital documentation and information exchange protocols 	<ul style="list-style-type: none"> coordinating student activities in a shared model environment interpreting BIM outputs for teaching purposes
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Lean Construction Fundamentals	Unit	Competence	
		Knowledge	Skills
<p>This unit introduces teachers to the essential concepts of Lean Construction and its application within construction processes. It explains the philosophy of value creation, continuous improvement, and identification of waste in workflows. Teachers learn to recognise inefficiencies typical of construction projects and to translate these insights into teaching methods. The unit supports the development of a Lean mindset that can be incorporated into workshop assignments and practical demonstrations. By mastering Lean fundamentals, teachers are better equipped to prepare students for modern, efficiency-oriented construction roles.</p>	U3	<p>Teacher will know how to explain Lean principles and demonstrate waste-identification exercises to students.</p>	
		<ul style="list-style-type: none"> undamentals of Lean philosophy and value creation the seven types of waste (Muda) in construction concepts of process flow and continuous improvement key Lean terminology and concepts 	<ul style="list-style-type: none"> designing simple Lean exercises for students identifying inefficiencies in construction workflows applying value-focused reasoning in teaching illustrating continuous improvement principles through examples.

Lean Tools & Methods	Unit	Competence	
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		Knowledge	Skills
<p>This unit equips teachers with practical knowledge of the most widely used Lean Construction tools and their classroom application. It covers structured tools such as 5S, Value Stream Mapping, Kaizen, Just-in-Time, and visual management. Teachers learn how to use these tools to analyse, optimise, and visually present construction workflows. The unit places emphasis on hands-on exercises that can be adapted to the VET learning environment, such as organising workshops with 5S or mapping simple student projects. The competence aims to empower teachers to lead structured problem-solving activities and cultivate process-focused thinking.</p>	U4	<p>Teacher will know how to implement core Lean tools in classroom activities and guide students through practical optimisation tasks.</p>	
		<ul style="list-style-type: none"> designing simple Lean exercises for students identifying inefficiencies in construction workflows applying value-focused reasoning in teaching illustrating continuous improvement principles through examples 	<ul style="list-style-type: none"> designing simple Lean exercises for students identifying inefficiencies in construction workflows applying value-focused reasoning in teaching illustrating continuous improvement principles through examples

Synergies Between BIM & Lean	Unit	Competence	
		Knowledge	Skills
<p>This unit focuses on the integration of BIM and Lean as complementary approaches to improving construction efficiency and decision-making. Teachers learn how digital models support Lean principles such as waste reduction, transparent planning, and improved communication. The unit covers the use of BIM for visual management, 4D scheduling, and workflow optimisation. It enables teachers to demonstrate how combining both</p>	U5	<p>Teacher will know how to demonstrate connections between BIM tools and Lean process optimisation during teaching activities.</p>	
		<ul style="list-style-type: none"> relationships between BIM visualisation and Lean principles use of BIM for 4D scheduling and digital workflow optimisation 	<ul style="list-style-type: none"> designing assignments linking BIM models to Lean concepts demonstrating BIM visualisation for problem-solving using BIM outputs to identify workflow inefficiencies

<p>approaches creates higher value and more predictable outcomes in construction. By understanding these synergies, teachers can create interdisciplinary lessons that reflect modern construction project management practices.</p>		<ul style="list-style-type: none"> • role of BIM in reducing waste and improving transparency • common integration practices used in modern construction 	<ul style="list-style-type: none"> • guiding student teams in combined BIM-Lean activities
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Future of Construction Technology	Unit	Competence	
		Knowledge	Skills
<p>This unit prepares teachers to introduce emerging construction technologies that will shape the future of the industry. It explores technologies such as digital twins, robotics, 3D printing, automation, and AI-driven optimisation. Teachers learn about technological trends, their relevance for both digital and physical construction processes, and how they integrate with BIM and Lean principles. The unit encourages educators to incorporate forward-looking content that builds students' awareness of modern tools used in innovative construction. By understanding future technologies, teachers can foster student interest and help them prepare for evolving labour-market expectations.</p>	<p>U6</p>	<p>Teacher will know how to explain emerging construction technologies and integrate them into VET teaching materials.</p>	<ul style="list-style-type: none"> • explaining emerging technologies in accessible ways • integrating future-oriented topics into lessons • demonstrating simple examples of innovative tools • linking innovations to BIM and Lean concepts in teaching