



Training course on digital
construction for vocational
school teachers and trainers



The learning units are the result of the FIT for BIM project within the framework of the Erasmus+ programme.

Projekt- Coordination

BGZ Berliner Gesellschaft
für internationale Zusammenarbeit mbH

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www.fit4bim.eu

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Attachment:

Presentation: Kubus project (German)

BIM Workshop Revit 2019. Projekt Kubus (German)

Training Course on Digital Construction for VET-Teachers:

Basic Course Modeling, Modeling with the Method BIM

This module deals with modeling with BIM. There is a script available.

Bullet point	Comments / Example
1. Title	Module 1: „Basic Course Modeling”
2. Short description	<p>The implementation of the BIM method requires skills, abilities and knowledge in dealing with BIM-capable programs such as Revit, Allplan or Tekla. In addition to the modeling of a building geometry (3D) with the help of component libraries, the focus is also on the targeted use of the component data generated during modeling (masses, areas, quantities).</p> <p>What is interesting and new about Building Information Modeling compared to conventional and traditional methods are the data (references/parameters) which do not have any geometry and therefore cannot be seen in the 3D view.</p> <p>The "Basic Modelling Course" module provides participants with basic knowledge of creating a data model using BIM-enabled software and enables teachers to develop the first simple BIM-enabled projects for training. Participants will also gain an insight into how BIM-enabled software can be methodically and didactically trained. In addition, the module concretizes the knowledge acquired in the "Introduction to the BIM Method" modules.</p>
3. Target group Requirements of the participants	<p>Target group: Teachers in a department of a vocational training centre, for example with a focus on construction engineering, wood technology, construction planning or system planning.</p> <p>Prerequisites: The teachers should already have experience and knowledge in dealing with CAD software and its implementation. Participation in the modules "Introduction to the BIM Method" and an extended module "In-depth BIM" would be recommended in advance, but not a mandatory prerequisite for the "Basic Modelling Course".</p>
4. Duration of the module	<p>Total 40 hours, 20 hours, 10 units</p> <p>90 minutes and 20 hours of individual exercises for the consolidation of acquired knowledge and skills.</p>
5. Assets to be acquired	The participants ...

	extension if necessary. → Development of own first project ideas for the training (different levels or focal points, e.g. calculation or civil engineering)
6. Content	<p>BIM in construction planning: Effect of the planning method on the planning software and its users.</p> <ul style="list-style-type: none"> • What is the difference between CAD and BIM programs? • Basic information for the creation of a BIM project with regard to the structure (levels, floors, ...) <ul style="list-style-type: none"> → Minimum requirements for the production of an IFC • Dealing with libraries and databases → Import of external components/families • What are intelligent components? • Use of intelligent components (database/libraries) in the context of modeling commands (wall, ceiling, window commands, etc.) • Modification of existing components/objects (adaptation of attributes and parameters) • Which data is generated and how can it be accessed? → Room, component and materials lists • Intelligent dimensioning and labeling of views and sections <ul style="list-style-type: none"> → Utilization of component information • Export of the entire data model via IFC interface • Compilation of plans • Export of plans via plot or PDF • How can a qualification or training of trainees and pupils take place? Learning script, work in small groups, digital communication via Moodle with the lecturers (review, collection of problem areas, ...), playful learning progress check (Quiz)
7. Certification, if foreseen	Not intended, certificate of participation is issued by the management of the educational center.

BIM FOR DRAFTSMEN AND TECHNICAL ASSISTANTS

Module for teacher qualification:

Introduction to the BIM method

This BIM module is also suitable for other occupational groups or training occupations. It provides an overview of the BIM method and its application for training courses qualifying for university studies.

Content	Remarks / Example
8. Titel	Introduction to the BIM method
9. Summary	<p>BIM is a method for planning, execution and accounting of construction projects. <i>It is a 5-D model.</i></p> <p>Further dimensions will be worked out in the further development.</p> <p>The first three dimensions deal with the design of a digital twin of the future building. The fourth and fifth dimensions are the costs and the time schedule.</p> <p>This module provides an overview of BIM and enables teachers to plan a learning unit for an introduction to BIM for a training group.</p>
10.Target group Conditions for participation	<p>Teachers of a department or an educational area, a department of an educational centre</p> <p>Requirements: Teachers should have basic knowledge about digitisation in education and in their area of professional specialisation.</p> <p>The topic should have been discussed at a departmental conference so that all participants know what it is about.</p>
11.Duration	A total of 60 hours , 40 hours, 20 units of 90 minutes each / Additional 20 hours of independent practice.
12.Competencies What are the learning objectives?	<p>The participants are familiar with the BIM method, know the main actors and their roles, and know the basic flow of a construction project planned with the BIM method.</p> <p>They are able to design and plan a learning unit for their target group of trainees to introduce the BIM method.</p> <p>Result of the module: At the end of the module, each participant (or team of teachers) presents a plan for their target group.</p>
13.Organisation and structure of the module 1/	<p>The module consists of two parts:</p> <ul style="list-style-type: none"> - an information part with a expert from the building practice or a university and

<p>Module BIM, Expert/ Proposal for a time schedule</p>	<ul style="list-style-type: none"> - a practical part, in which the teachers practice and a teaching unit for trainees is developed. <p>The module is to be moderated by a competent person a specialist or department manager who has studied BIM in detail. An external expert well familiar with the construction practice should be consulted.</p> <p>Form of organisation:</p> <ul style="list-style-type: none"> - 20 appointments of 90 minutes each, - 10 appointments of 180 min. each - Alternatively: 5 days at 4 units 'a 90 min. <p>Structure: 10 appointments of 180 min each</p> <ul style="list-style-type: none"> - Introduction by the moderator, overview of BIM, seminar content, goals of the seminar, clarification of the assignment for the learning unit to be developed - 6 appointments with an external lecturer on the listed specialist content (see point 7) - Two dates: Exemplary, a process in BIM, e.g. conflict analysis (see technical contents, part 2) - 1 appointment: Elaboration of a course unit with advice from the instructor for a group of trainees - *Definition of competences and objectives for the respective group, - *Selection of subject content, selection of teaching material - *Planning the teaching unit / course unit - *Final date: presentation of the learning units, feedback, evaluation of the module <p>20 hours of individual work to deepen your knowledge.</p>
<p>14.Specialist contents</p>	<p>Digitisation in the building industry, effects on the work processes</p> <p>Resource: Research findings from BIBB (or others), occupational screening, which digital skills are to be integrated in the respective construction occupations</p>

	<p>Part 1: Basics - BIM, Building, Information, Modeling</p> <p><i>What does this mean?</i></p> <ul style="list-style-type: none"> - Communication in BIM, essential software elements like RE-VIT are presented - Goals of BIM, who defines what? The role of the future building owner, the role of the architect, legislative requirements (future planning of infrastructure projects with BIM methods) - Role of BIM - Fields of activity of BIM, comparison with the fee structure for architects and engineers (in Germany HOAI) <p><i>Methods: Lectures, followed by discussions ...</i></p> <p>Part 2:</p> <ul style="list-style-type: none"> - Standards, guidelines of BIM - Structure of standardization, What is standardized in BIM, what is not? - Ownership, of the data generated in and with BIM, who has which rights? Who owns the data? - Who can dispose of the data and in what way? - Internal company guidelines for working with BIM, internal company standardizations - Added value and challenges of/at BIM - Specific point: Conflict analysis – exemplary case study - Application forms of BIM - Object-oriented model structure versus traditional structure / differences in the process flow according to traditional structures and BIM respectively - Clarification: Level of detail in BIM - BIM implementation in the project, planning with the BIM method - BIM implementation in companies: structure and process, BIM execution plan - Exemplary Modeling Guidelines - Coordination in BIM, overall coordinator, BIM coordinator - Definition of roles, cooperation of professionals with the coordinators <p>Ressource: Journal BUILD-ING and VDI/BS-MT 2552, sheet 8.1.</p>
15.Certification provided	If not, Confirmation of participation by the management of the educational center

Training Course on Digital Construction for VET-Teachers

Strategy for teacher training

Survey for the BIM working groups

I. Formal learning, qualification measures

I.1. Courses; Which courses for the extension of the technical competence were offered at your institution and who participated?

I.2. In which conferences did colleagues participate?

I.3 Which courses for the learning of new programs (e.g. Revit) have been offered at your institution / have been organized by yourself?

I.4. Participation in courses of other providers – to which courses of advanced training of other providers, mostly the industry or large offices, did colleagues have been sent to?

I.5 What internships in innovative companies (Offices working with BIM, for example?) did your colleagues benefit from?

I.6. Exchange – are you in communication/ dialogue with modern, innovative offices/ companies?
I.7. Independent study – How and where did you acquire knowledge about the BIM and skills within BIM by yourself; literature, internet research among others?
II. Informal and experience based learning
II.1 Experimental learning, where and how did individual colleagues familiarize themselves with the new programs, did acquire knowledge and skills due to learning by doing?
II.2. “Stealing with the eyes and ears”, where and how did you acquire knowledge and skills informally, did look over your colleagues’ shoulder, overheard something during the coffee break?
II.3. Cooperation, are there any colleagues that worked in an office or company, secondarily work and acquire knowledge due to learning at the workplace? Where and how do you learn from such colleagues?
II.4 Teamwork, if there are team structures, you are working in a team, how and what are you learning in the team, in team meetings or from the mutual elaboration of learning contents, of curricula etc.?
Comments

Glossary

BIM- The term Building Information Modeling (BIM) describes a method of networked planning, execution and management of buildings and other structures using software. All relevant building data are digitally modelled, combined and recorded. The building is also geometrically visualized as a virtual model (computer model). Building Information Modeling is used in the building industry for construction planning and execution (architecture, engineering, building services, civil engineering, urban development, railway construction, road construction, hydraulic engineering, geotechnics) as well as in facility management.

The method is mainly concerned with processes. The BIM applications are mainly related to communication, coordination and teamwork. Software, hardware and cloud solutions are required for BIM implementation.

Open-BIM

With Open-BIM, data is exchanged with open information models. An open information model is based on a disclosed schema. The most widely used schemas are those of buildingSMART (including IFC, BCF). With an Open-BIM approach, the software used should be able to import or export data according to the open information model agreed upon in the project. Software from different manufacturers can be used.

Closed-BIM

In Closed-BIM, data is exchanged and integrated according to a proprietary information model of a software manufacturer. A proprietary information model is based on a schema of the software vendor whose structure is not disclosed ("closed"). In a Closed-BIM approach, the software to be used should be tailored to several planning disciplines and the project team should be composed in such a way that as many planning disciplines as possible can work with this software.

BIM models: from 3D-4D to 5D-6D-7D

3D model - The term 3D is mainly used in the trigonometric calculation and production of spatial volume models (coordinates: length-width-height). In the following ones, additional dimensions are added (4D-hyperspace-hyperspace body simulation-rotation)

BuildingSMART International is an international non-governmental non-profit organization. It defines the Industry Foundation Classes (IFC) exchange format for BIM data exchange in the construction industry. <https://www.buildingsmart.org>

BIM software -

These include: Software for creating models, test programs, simulation programs and data exchange platforms for models

BIM guidelines and standards

In DE - VDI Guideline 2552 <https://www.vdi.de/richtlinien/unsere-richtlinien-highlights/vdi-2552>

Blended learning

Blended Learning is a combination of different methods and media, which integrates as a universal learning organisation all methodological, media-didactic and media-pedagogical as well as learning theoretical orientations.

CAD (computer-aided design)

Computer aided design refers to the support of design tasks by means of EDP for the manufacture of a product (e.g. buildings).

CAGD - Computer-Aided Geometric Design

refers to the computer-aided description of the shape of geometric objects. It deals with the description of two-dimensional curves as well as three-dimensional surfaces and bodies.

CAM= Computer-aided manufacturing

CIM- Computer Integrated Manufacturing/Building

The CIM method also deals with data use. In contrast to BIM, planning data is directly transferred digitally to production (e.g. in timber and precast concrete construction).

Digital construction document

An electronic construction file with which all internal and construction processes can be depicted and completely documented. For construction projects it is important to be able to query the current status at any time. Documents can be controlled and logged in an electronic archive and edited.

Digital twin

A digital twin is a digital representation of a tangible or intangible object or process from the real world in the digital world. It is irrelevant whether the counterpart already exists in the real world or will exist in the future.

EU BIMTG

EU-BIM Working Group

<http://www.eubim.eu/wp-content/uploads/2018/02/GROW-2017-01356-00-00-DE-TRA-00-1.pdf>

HOAI

Fee schedule for architects and engineers (Germany)

LMS - means Learning Management System MS, also used is the term Learning Management Software. It is a platform that combines various functions.

As a complex content management system (CMS), the system enables to support teaching and learning processes, to manage learning materials and user data as well as to control the execution of courses including test procedures. There is a need for schools to use a system to have an overview of their students' progress and grades.

LOD

Degree of finalization, defines the necessary information content and level of detail of the digital building models.

A large number of 400 terms (in German and English) are available at

<https://www.baunetzwissen.de/glossar/a?thema=bim>

<https://bimdictionary.com>

SOURCES /Other recommended links

<https://group.thinkproject.com/de/ressourcen/bim-glossar>

https://www.dbz.de/dbz-newsletter_3275088.html

<https://de.wikipedia.org>

https://www.computer-spezial.de/artikel/baustelle-4-0_3265917.html

<https://www.easy-lms.com/de/wissenscenter/wissenscenter-lms/was-ist-ein-lms/item10182>

<https://www.baunetzwissen.de/bim/fachwissen/grundlagen>

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