



FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

BIM for Higher Education – Intermediate Report from the ERASMUS+ BIM4HEI Project

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Wirtschaft Dresden
University of Applied Sciences



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Results

R1: Lecturing Reference Guide (BIM Teaching Approach)

→ 50p PDF for Lectures + 50p PDF Method Reader

R2: Short Training Activities for Students

→ 3 Pan-European BIM Summer Schools (2024)

R3: BIM Practical Tool for teaching

→ 10 Exercise Sheets + sample Data + teaching instructions

R4: MOOC Massive Open On-line Courses

→ Videos and Learning-Hub (t.b.d)



11/2021 to 10/2024



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Motivation

1. Many educators at the university level have identified **significant deficiencies** in the content and methods of **engineering education** related to the digitization of the construction industry.
2. This concerns both the challenges posed by **emerging technologies** and the **internationalization** inherent in the management of construction projects.
3. The **BIM methodology**, centered around the "digital building environment" model or the "digital twins" of design, construction and operation, serves as an ideal core for **interdisciplinary** and **internationalized education**.
4. Need for (vendor neutral) **open-access learning resources** in multiple languages for undergraduate and graduate students in higher education

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GEOSA
General Authority for Survey
and Geospatial Information





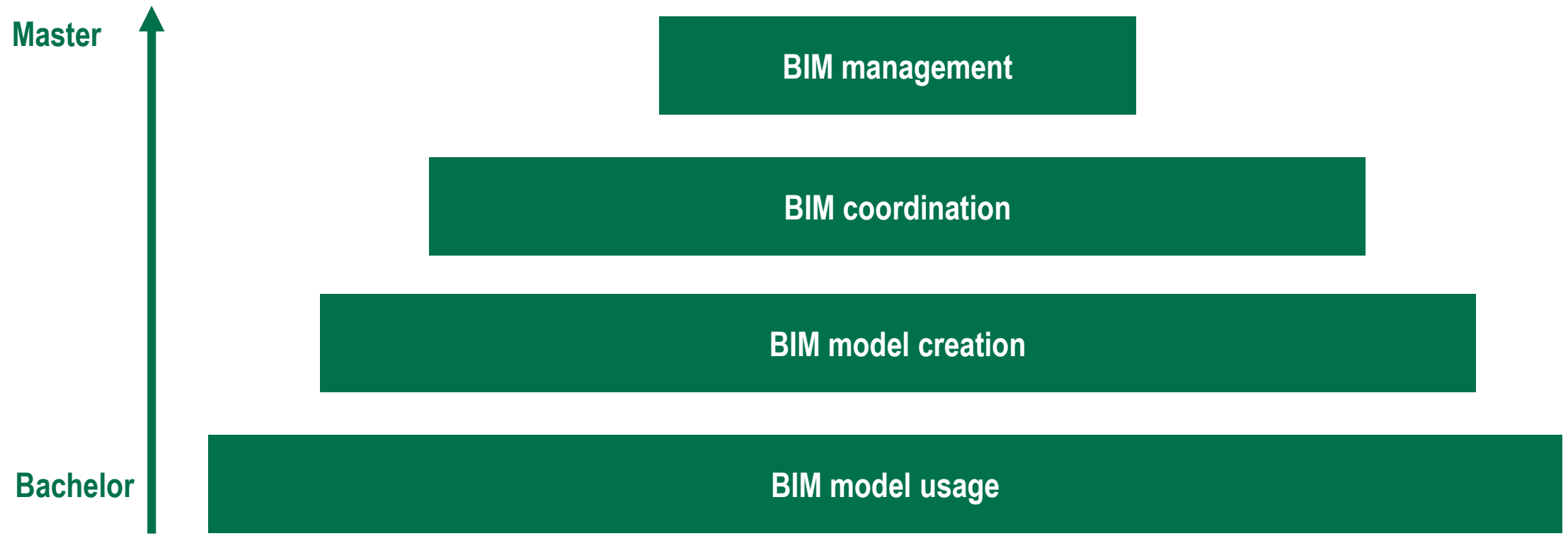
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Competency levels



*VDI/bs (2019) Richtlinie 2552 Blatt 8.1: Building information modeling - Qualifications - Fundamental knowledge., Germany: VDI & buildingSMART Richtlinie.





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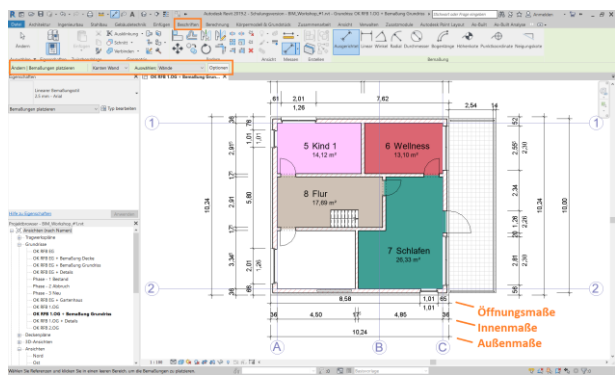
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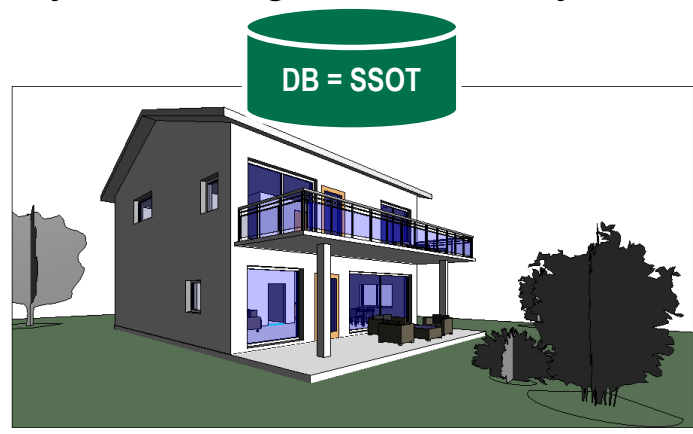
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BIM Competency levels – (1/4) Model User

Students engage with BIM through 3D visualization, understanding the spatial relationships of components, and recognizing multi-criteria ordering structures. The core message emphasizes that BIM is a database, not a drawing, and emphasizes the unified storage of data for design, construction, and operation, thereby reducing redundancy.



floor plans, dimensions, labels, colors,...



3D Model view



<Raumliste Workshop #1>				
A	B	C	D	E
Ebene	Fläche	Fußboden	Volumen	Wandoberfläche
OK RFB EG	8.41 m ²	Parkett	Nicht berechnet	Putz weiß
OK RFB EG	7.32 m ²	Fliesen	Nicht berechnet	Putz weiß
OK RFB EG	13.71 m ²	Parkett	Nicht berechnet	Putz weiß
OK RFB EG	58.11 m ²	Parkett	Nicht berechnet	Putz weiß
OK RFB EG: 4	87.54 m ²			
OK RFB 1.OG	14.12 m ²	Teppich	Nicht berechnet	
OK RFB 1.OG	13.10 m ²	Fliesen	Nicht berechnet	
OK RFB 1.OG	26.33 m ²	Teppich	Nicht berechnet	
OK RFB 1.OG	17.69 m ²	Teppich	Nicht berechnet	
OK RFB 1.OG	15.05 m ²		Nicht berechnet	
OK RFB 1.OG: 5	86.28 m ²			

Tables, Lists, Reports



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BIM Competency levels – (2/4) Model creation

Active creation of BIM models is essential for students to grasp BIM paradigms. Modeled components, uniquely addressable through an ID, have topological relationships and are instantiated using prototyping mechanisms. Spatial structuring, parameterization of 3D geometries, and use of component lists for quality assurance are key aspects.

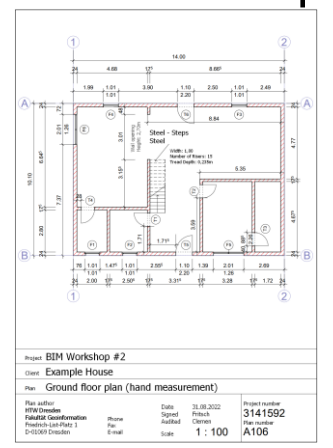




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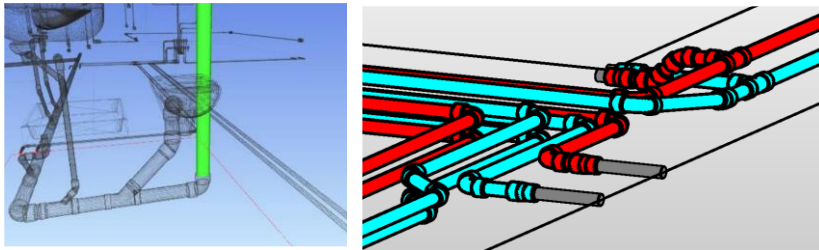
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BIM Competency levels – (3/4) Model coordination and verification:

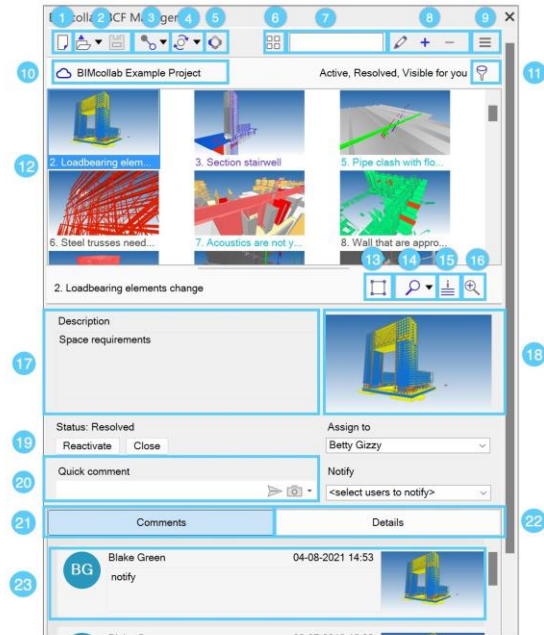
Model coordination, essential for higher-level quality assurance, involves spatially and semantically disjoint models. The goal is to detect clashes and gaps, emphasizing the importance of coordinated 3D models to avoid spatial conflicts. Automated model checking increases the efficiency of digital, model-based planning.



Clash detection



BCF



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Issue Management



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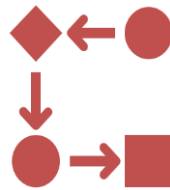
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BIM Competency levels – (4/4) Management and collaboration strategies

BIM management requires knowledge of model use, creation, and coordination. However, management includes understanding the purpose of BIM models, preparing people for BIM projects, designing information management contracts, defining levels of information needs, and addressing IT structures and data formats for model exchange.



Standards

Processes and Security

Commercial and legal aspects
(e.g. Ownership, Contracts)

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R1 – Lecture Reference Guide



LECTURING REFERENCE GUIDE
BIM Teaching Approach



Intellectual Output 1
Document funded by Erasmus + KA2 Programme
Grant Agreement 2021-1-CZ01 - KA220-HED-000032082

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- BIM COMPETENCE
- TEACHING BIM
- INCLUDE BIM IN THE CURRICULUM

→ Not published until now, but can be send on demand

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R1 – Lecture Reference Guide – Annex (teaching) Method Reader

Three functional categories:

- Introduction/Repetition
- Teaching Methods
- Feedback/Testing



Example: For active learning students of HTW Dresden, Master course "Surveying and BIM" are asked to structure unordered paper cards. The cards display names of concepts, IFC entities and small figures of different geometric representation types for solid modeling.





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R2 – Short Training Activities

Day 1 Model usage and creation

Day 2 GeoBIM and Information Management

Day 3 Collaboration and BIM Management

03/24 Prague, Czech

05/24 Aveiro, Portugal

06/24 Dresden, Germany



**Active Learning
methods
...less lectures!**





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R3 – Learning Material and R4 - MOOC (ongoing work)

Name	Level/Duration	Description
BIM Views and Queries	Bachelor /120 min	BIM is a database - not a drawing!
BIM-Construction with Components	Bachelor /180 min	The component makes the difference!
Coordinate systems in Revit	Bachelor & Master /180 min	BIM is coordination!
Collaboration with BCF	Bachelor & Master /120 min	BIM is collaboration!.
Visual Programming with Dynamo	Master /180 min	BIM is automation!
Information Modeling and IFC	Master /270 min	BIM is Information modeling!
...		More to be delivered in the final project phase



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Findings and Limitations

- It was not easy to find consensus, what is “absolutely necessary” to teach.
- Large diversity in pre-education level, involved engineering disciplines and national/regional
- The final success of the project can only be evaluated once the teaching materials have been fully practiced and tested with the students. After completion, the materials will need to be constantly adapted to new technological trends - the BIM/digital twinning is evolving rapidly.
- Students honor activating learning methods 😊, long lectures are boring 😞

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SUSTAINABLE DEVELOPMENT GOALS

International Federation of Surveyors supports the Sustainable Development Goals

Commission 10

Construction Economics and Management

Serving Society for the Benefit of People and Planet

<p>4 QUALITY EDUCATION</p>	<p>9 INDUSTRY, INNOVATION AND INFRASTRUCTURE</p>	<p>8 DECENT WORK AND ECONOMIC GROWTH</p>
<p>17 PARTNERSHIPS FOR THE GOALS</p>	<p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	