Education for zero energy Buildings using Building Information Modelling

Grant Agreement: 600946-EPP-1-2018-1-IE-EPPKA2-KA

O5.2 Revised learning units, training material and methodologies

Co-funded by the Erasmus+ Programme of the European Union

Issued by	ÉMI Nonprofit Llc.
Date:	2022.04.30
Version:	Final
Report number	O5.2
Task number:	Task 5.4
Status: :	Final
Dissemination level:	Public

Document history				
V	**Date**	**Organisation**	**Author**	**Description**
1.0	2022.03.01	ÉMI	Viola Kelemen	Initial version
1.1	2022.03.30.	ÉMI	Viola Kelemen	Draft version
2.o	2022.04.30.	ÉMI	Viola Kelemen	Final version

Approved on behalf of ÉMI as BIMzeED Lead WP5

Name: Viola Kelemen,	Dr. Károly Matolcsy
Organisation:	ÉMI Nonprofit Llc.
Date:	2022.04.30.
Signature:	

Approved on behalf of TUS as BIMzeED Project Coordinator

Name:	Gloria Callinan
Organisation:	Technological University of the Shannon
Date:	2022.04.30.
Signature:	

Authors:
Viola Kelemen (ÉMI Nonprofit Llc.)
Dr. Károly Matolcsy (ÉMI Nonprofit Llc.)

Bojan Milovanovic (University of Zagreb)
Jose Lucas (ITEC)
Marcos Herrera (CIM UPC)
Gloria Callinan (Technological University of the Shannon)

English proofread:
Gloria Callinan (Technological University of the Shannon)

Translations:
Not applicable.

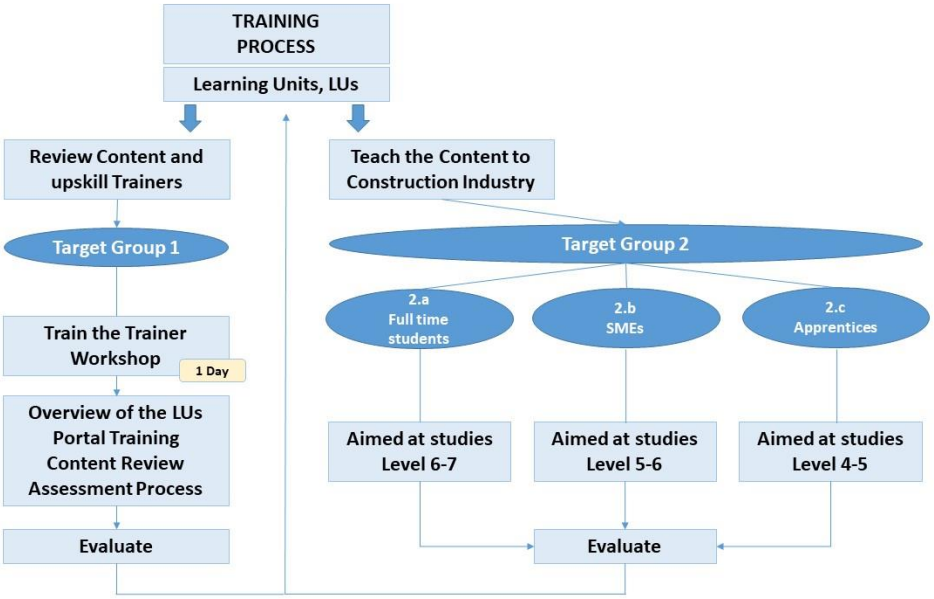
Contents

1. Executive Summary

The following O5.2 report is based on the data from the evaluation of the feedback of students, SME workers and trainers participated in the piloting activities. The report outlines all the necessary adjustments that are made in the learning units description, training material, training portal, training methodologies, new training techniques, assessment methodology.

2. Introduction

The BIMzeED innovative training approach is to develop 12 dedicated Learning Units (LUs) on relevant BIM and nZEB topics. The BIMzeED trainings will directly target **HEIs / VETs educators and private industry trainers (Target Group 1)** and, indirectly, the potential audience of these educators: **SMEs (site managers, craft workers, senior operatives), students and apprentices (Target Group 2)**. Pilots were carried out in two stages targeting the above-mentioned groups. This report determines the compatibility of the assessment process for all trainings in each country. The following methodology was used as the basis for the piloting and the evaluation process.



1. Figure

Arising out of the Needs Analysis conducted within the project the consortium developed a Skills Gap Report which informed the creation of new Learning Units (LUs) which meet these Skills Gaps. These defined LUs are tested during the pilot courses.

The first step of piloting was the recruitment of trainers from HEI, VET and private industry, who registered to participate in the Train the Trainer course (TtT).

After completing the Train the Trainer course the trainers became BIMzeED trainers and are in a position to pilot the BIMzeED Learning Units alongside existing courses for their students and for SME workers. The second stage of the piloting involves the integration of the Learning Units into existing courses, grouping the LUs together and create a specific course or use the LUs are stand-alone trainings.

The results of the Train the Trainers courses can be found in O5.3 Trainers Evaluation Report. The results of the implemented pilot trainings can be found in O5.4 Student Evaluation Report.

3. Assessment and methodology

The results from the various evaluation tasks and impact analysis (detailed in O5.3 and O5.4 reports) feed back into the partners to allow them to perform appropriate adjustments, improvements and modifications to the training materials and resources.

The evaluation (through surveys) assessed the following:

- satisfaction of trainers and trainees (HEI, VET students, apprentices and SME workers);
- the improvement of knowledge; the response of the training to the needs of students;
- the quality of the training materials and the pilot courses;
- the coverage of diagnosed educational needs;
- the integration of BIM and nZEB learning units into construction studies among HEIs and VETs.

As a result of the evaluation and feedback of trainers, students, the National Steering Groups and the members of the External Advisory Board the finalization of the learning units can be done. According to the feedbacks and suggestions of participants all learning units are very high quality and complete, no major adjustments are required.

4. Adjustments of the learning units and training material

Learning units were tested through pilot courses among target group 1 (trainers/educators) and target group 2 (students, apprentices and SME workers). Their feedback provided guidleines to adjusting and finalizing the learning units. BIMzeED partners reviewed the feedback related to the learning unit developed by them and made the necessary adjustments. Below the summary of modifications are described for each learning unit.

4.1. LU1 – Collaborative BIM to achieve NZEB

In LU1 some of the issues arised from the duration of the training and the software disclaimer. UZ, the developer of LU1 made the necessary adjustments in all relevant documents.
Duration of training:

- Course duration extended.

The adjusted hours were modified in *LU1.2 nZEB Fundamentals and LU1.3 BIM Fundamentals (ppt/pdf presentation).*
Following the extensions of time:

Topic 1.2 – nZEB Fundamentals (210 min + 60 Homework)					
Learning Outcome	**Title of *Topic* being covered**	**Breakdown of activity**	**Breakdown of Timing**	**Resources/*hand-outs***	**%**
	Global Warming EU Policies & Legislation	Presentation 1.2 Discussions Watching Videos	105 minutes	• LU1.2 - NZEB Fundamentals - EN_FINAL.pptx	
	nZEB National Legislation Sustainability Principals	Presentation 1.2 Discussions Watching Videos	105 minutes	• LU1.2 - NZEB Fundamentals - EN_FINAL.pptx	
	QUIZ	HOMEWORK ASSESMENT 1 – Quiz 1.1 – nZEB Fundamentals	60 minutes	• Quiz on Moodle • Resolution: LU 1.2 - Quiz 1 - nZEB Fundamentals.docx	

Topic 1.3 – BIM Fundamentals (270min + 180 min homework)					
Learning Outcome	**Title of *Topic* being covered**	**Breakdown of activity**	**Breakdown of Timing**	**Resources/*hand-outs***	**%**
	BIM & Background BIM Approach BIM Uses BIM Software BIM Standards and Processes	Presentation 1.3. Watching videos Discussions	180 minutes	• LU1.3 - BIM Fundamentals - EN_FINAL.pptx	

	BIM Roles				
	Design Authoring tools	Practical demonstration by the instructor of a BIM design authoring tool	45 minutes	• LU1.3 - BIM Fundamentals - EN_FINAL.pptx (slide 29) • LU 1.3 - Demo (Design Authoring Tool) - BIM Fundamentals Folder. Includes: • LU 1.3 - Demo (Design Authoring Tool) - BIM Fundamentals.docx • S319 BIMzeED_R20_Autodesk Revit - Sample Project.rvt • S319 BIMzeED_AC23_Graphisoft Archicad - Sample Project.pla	
	LOD LEVEL DISCUSSION	Discussion	45 minutes	• LU1.3 - BIM Fundamentals - EN_FINAL.pptx (slide 30) • Guidance: LU 1.3 - Discussion LOD Level - BIM Fundamentals.docx	
	QUIZ	HOMEWORK ASSESMENT 2 – Quiz 1.2 – BIM Fundamentals	60 minutes	• Quiz on moodle • Resolution: LU 1.3 - Quiz 2 - BIM Fundamentals.docx	
	ACTIVITY	HOMEWORK ASSESMENT 5 – Task 1.2 – Business Case	120 minutes	• LU1.3 - BIM Fundamentals - EN_FINAL.pptx (slide 44) • Resolution: LU 1.3 - Task (Business Case) - BIM Fundamentals.docx	

Topic 1.4 – nZEB & BIM (60min + 60 min Homework)

Learning Outcome	Title of *Topic* being covered	Breakdown of activity	Breakdown of Timing	Resources/*hand-outs*	%
	BEM and BIM Inputs Outputs Integration challenges	Presentation 1.4. Discussions	60 minutes	• LU1.4 - NZEB and BIM - EN_FINAL.pptx	
	QUIZ	HOMEWORK ASSESMENT 3 – Quiz 1.3 – nZEB & BIM	60 minutes	• Quiz on moodle • Resolution: LU 1.4 - Quiz 3 - nZEB _ BIM.docx	

Topic 1.5 – Collaboration (240min + 60 Homework)

Learning Outcome	Title of *Topic* being covered	Breakdown of activity	Breakdown of Timing	Resources/*hand-outs*	%
	Collaboration Fundamentals	Presentation 1.5 Discussions	210 minutes	• LU1.5 - Collaboration - EN_FINAL.pptx	

	Navisworks demonstration	ASSESMENT 6 – Task 1.4	30 minutes	• LU1.5 - Collaboration - EN_FINAL.pptx (Slide 45)	
	QUIZ	HOMEWORK ASSESMENT 4 – Quiz 1.4 – Collaborative BIM	60 minutes	• Quiz on Moodle	

Software disclaimer:

- Response to review: Disclaimers exist in the .ppt presentation titled "Topic 3.1.2 - Required Software" in slide 4. Disclaimer added to documents: "LU3 Information for Trainers" and "LU3 Storeyboard EN-v0.5"

- *Amended document:*
  - *LU1 Information for Trainers*
  - *LU1.1.2 REQUIRED SOFTWARE - EN_FINAL.pptx*

Video translation:

Response to review: The unique videos used in this learning unit are from youtube and those that have been selected for the Learning Unit are able to be translated too several languages from youtube interface. A note explaining this is added to the LU1 trainer guide.

4.2. LU2 – BIM and NZEB for Workers

Duration of training:

Some issues arose from the duration of the training in other LUs. This LU was reviewed and the proposed 8 hours of structured learning and 24 hours of self-directed learning was found to be accurate and remain as outlined in PPT LU2.1.1

Software Disclaimer

Although there was no reference to software disclaimers in the survey responses, the PPTs were reviewed and declaimers were present. It was also communicated to learners that other software packages in addition to the ones used for the tasks in the LU's could be used. For the BIM related exercises and tasks, any of the BIM Modelling tools (Archicad, Allplan, Revit) can be used.

Some of the quizzes were reported or be repetitive and changed

4.3. LU3 – NZEB Realization and commissioning: Building Envelope and Air Tightness

In LU3 some of the issues arised from the duration of the training and the excersizes and the software disclaimer. UZ, the developer of LU3 made the necessary adjustments in all relevant documents.

Duration of training:

- Course duration extended from **32 hours to 40 hours.**
- The LU3 has **8 hours of structured learning** and **12 hours of self-directed learning** (much of which can draw from case studies and tasks foreseen). Revised version: The LU3 has **11 hours of structured learning and 29 hours of self-directed learning**.

The adjusted hours were modified in *LU3.1.1 Introductions LU3 (ppt/pdf presentation)* and also *in LU3 Information for Trainers.*

Software disclaimer:

- Response to review: Disclaimers exist in the .ppt presentation titled “Topic 3.1.2 - Required Software” in slide 4. Disclaimer added to documents: “LU3 Information for Trainers” and “LU3 Storeyboard EN-v0.5”
- *Amended document: LU3 Information for Trainers*

1) Original (page 6): BIM Modelling tools (Archicad, Allplan, Revit)
Revised version: For the BIM related exercises and tasks in LU3, any of the BIM Modelling tools (Archicad, Allplan, Revit) can be used.

2) Original (page 6): Use of specialised tools for hygrothermal simulation in building envelope Revised version: For the exercises and tasks related to hygrothermal simulation, any of the available specialised tools can be used

- *Amended document: LU3 Storeyboard EN-v0.5*

1) Original (page 5): BIM Modelling tools (Archicad, Allplan, Revit)
Revised version: For the BIM related exercises and tasks in LU3, any of the BIM Modelling tools (Archicad, Allplan, Revit) can be used.

2) Original (page 5): Use of specialised tools for hygrothermal simulation in building envelope Revised version: For the exercises and tasks related to hygrothermal simulation, any of the available specialised tools can be used

Revised documents are the following:

- LU3 Information for Trainers_amended.pdf
- LU3 Information for Trainers_amended.docx
- LU3 Storyboard EN-v0.5.docx
- LU3.1.1 Introductions LU3 (ppt/pdf presentation)

All amended documents are accessible in Moodle platform.

4.4. LU4 - NZEB Realization and commissioning: Building Services and Smart Technologies

Regarding LU4 all students and all evaluators had good opinion about LU4 content, which is a rich content.

Comment:
Introduction is too succinct. In Descriptor presented recommended methodology, however, students may ask about details. Provide more explanation on learning methodology that will be applied (e.g. how many situations/projects they need to analyze; will they work on situations/projects individually or in groups; how many exercises they need to perform; how many questions will be given in exam test; if the exam test will be provided in Moodle or elsewhere, etc.). The separate list of exercises could be provided. The content of theoretical material of Topic 4.3 – Cooling & Ventilation Systems does not meet the declared objective to present the tools required for design of ventilation system. Change the wording of the objective or add the content to the slides. Post-Module Survey (Students and Workers) and Post-Module Survey (Educators/Trainers) not available. Why assessment quizzed provided only for Topics 4.4.1 - 4.4.2, 4.5, 4.6?

Answer: More explanation will be provided during the class.

Q6: Does the learning content meet your expectations?

Most of the content is dedicated to lighting systems, but it was expected that the content would be evenly distributed across all topics.

Answer: Other questions were also handled in the other modules.

Q8: Is there enough information on how to use digital tools in the LU?
Self learning will stimulate the trainees to gain more experience on learning-by-doing basis.

Answer: Agree, in the next version, self-learning materials will be explained.

Q10: Is the training content relevant to the objectives?

The content of theoretical material of Topic 4.3 – Cooling & Ventilation Systems does not meet the declared objective to present the tools required for design of ventilation system. Change the wording of the objective or add the content to the slides.

Answer: The wording was revised, it will be addressed during the course.

4.5. LU5 – NZEB Realization and commissioning: Quality Assurance

In LU5 the issues highlighted were: access to Moodle and the translations of videos into other languages. The Moodle issue has been dealt with and Moodle is now automatically accessible after registration. Currently LU1 is initially accessible but we plan to give access to all LUs to all learners/trainers who access the platform for the next two years. The platform is running and available. This requires changes in coding and algorithms which were implemented.
Translating of videos into other languages can be edited and a transcription added for the language required. All the Dialux videos are youtube clips therefore this was feasible.
Transcripts have been added to the Videos.
Comments on the complexity of Dialux were highlighted. The platform was tested by TUS and the assignments can be completed through the use of the tutorials, despite never having used the software before.

There was also a comment that there was too much information from other countries, and Spain should be focused on, but this can be edited out by anyone that doesn't wish to download all the content and it should be pointed out all countries PowerPoints and trainings are required to be available as part of the project deliverables.

4.6. LU6 - BIM Model Uses during construction

In LU6 the only issue was related to images with Low quality. LU6 have a lot of image and video resources that contribute to a bigger file sizes. In order to mitigate moodle storage capacity problems all the presentations have been printed in optimum quality option. Anyway, the trainer has acces to ppt editable files so she or he will be able to download it and print it in a major quality if required.

EAB Member 1

Q14 Do we need to amend anything in the content?

No, only review the images with low quality.

4.7. LU7 – BIM Model Uses for specification and quantification

Software disclaimer

- Response to review: Disclaimer added to documents: "*LU7 Information for Trainers*" and "*LU7 Storeyboard EN-v0.4*" and presentation "LU7-0 Introduction"
- Amended document: **LU7-0 Introduction**
    1. **Original (slide 10):** *no disclaimer*
       Revised version (disclaimer added):
       ** For the BIM related exercises and tasks in LU7, any of the BIM Modelling tools (Archicad, Allplan, Revit) can be used*
       *** For project management exercises and tasks in LU7, any appropriate project management software can be used*

- Amended document: **LU7 Storeyboard EN-v0.4**
    1. **Original (page 5):** *BIM Modelling tools (Archicad, Allplan, Revit)*
       Revised version: *For the BIM related exercises and tasks in LU7, any of the BIM Modelling tools (Archicad, Allplan, Revit) can be used.*

    2. **Original (page 5):** addition of a sentence
       Revised version: *For project management exercises and tasks in LU7, any appropriate project management software (Vico office, Bexel Manager) can be used*

- Amended document: **LU7 Information for Trainers**
    1. **Original (page 6):** *BIM Modelling tools (Archicad, Allplan, Revit)*
       Revised version: *For the BIM related exercises and tasks in LU7, any of the BIM Modelling tools (Archicad, Allplan, Revit) can be used.*

    2. **Original (page 6):** addition of a sentence
       Revised version: *For project management exercises and tasks in LU7, any appropriate project management software (Vico office, Bexel Manager) can be used*

Revised documents are the following:

- LU7-0 Introduction (ppt/pdf presentation)
- LU7 Storeyboard EN-v0.4.docx
- LU7 Information for Trainers

All amended documents are accessible in Moodle platform

Comments of the External Advisory Board

EAB Member 1

Q6: Does the learning content meet your expectations?
There is a lot of theoretical and specific content on the subject, but I missed more information such as what to consider when preparing a BIM model, strategies, examples, etc

Answer: There are several examples incorporated to lectures. BEP (Building information modelling execution plan) including strategies how to produce suitable BIM model was considered in other LU's.

Q7: Is the Learning Unit content suitable for the target group?

Yes, but I am not sure about class 7.2, it already has a lot of planning and cost management theory. It is necessary to know it for the following classes, but it could be made more dynamic.

Answer: Thank You for Your comment. Topic 7.2 is theoretical with many graphics and the teacher is encouraged to engage the students to discussions, and to use created assessment to discuss the assessment results and potential issues.

Q9: Is there a good mix of theory and practice?
In my opinion, concentrating all the practice at the end of the module can be a bit heavy. For each lesson, there is an individual test, but there could be

Answer: The course is planned as a sequence of short theoretical explanations of concepts followed by a set of practical activities for hands on application of theoretical knowledge in order to acquire practical skills. This will enhance the fast application of theoretical into practical and to consolidate the knowledge. Trainers can integrate exercises earlier if they feel its appropriate.

Q17: Do you have any suggestions for improvement?
In my opinion, the practical part could be rethought so that the students participate more and more doubts could arise during the unit. We should also review the video link and the quality of some of the images in the presentations.

Answer: The course is planned as a sequence of short theoretical explanations of concepts followed by a set of practical activities for hands on application of theoretical knowledge in order to acquire practical skills. We reviewed the link and improved the quality of images.

4.8. LU8 - BIM Model Standardization for NZEB Design

No amendments were done because trainees and trainers gave no feedback related to this LU.

Comments of the External Advisory Board

Q4: Regarding the Learning Unit Content, please provide your opinion on it.

Since I am only able to see some of the LUs, it is difficult to verify whether there is missing content or anything needing amendment. While LUs need to be stand-alone, it would also be useful for students within each LU to see where the connections are to other LUs, particularly if they might need to recap on particular knowledge, definitions, etc.

Answer: More details are needed to detect the issue of only part of the learning unit visible. The connection to other LUs can be done using LU descriptors.

Q9: Is there a good mix of theory and practice?
However, there is a lot of text on many of the slides which makes them heavy going.

Answer: Thank you for your feedback. We minimized the number of such slides and/or create figures/graphs following such slides. These figures and graphs can be used to lecture about a specific topic, while the slides containing text are foreseen to be used by students if needed for learning.

Q17: Do you have any suggestions for improvement?

As gamification is suggested in the descriptor guidance for trainers, this could be brought to the fore a bit more in the materials, i.e. some level of competitive learning / research by students.

Answer: Thank you for your feedback. LU8 Information for trainers document guides trainers to use gamification, group work etc.

4.9. LU9 - Building Energy Modelling (BEM) Design and Export

In LU9 some of the issues arised from the duration of the training and some misunderstandings with other LUs.

Duration of training:

- Course duration extended.

The adjusted hours were modified in *LU9.2 Energy analysis workflow, LU 9.3 - Export to gbxml and LU9.4 - Export to IFC.*

Revised documents are the following:

- *LU9 Trainer guide*

Topic 9.2 – Energy Analysis Workflow (260 MIN)					
Learning Outcome	**Title of *Topic* being covered**	**Breakdown of activity**	**Breakdown of Timing**	**Resources/*hand-outs***	**%**
	Energy models and benefits	Presentation 9.2	20 minutes	1. LU9.2 Energy Analysis Workflow.pptx	
	Simulation workflow within a project	Presentation 9.2	10 minutes	2. LU9.2 Energy Analysis Workflow.pptx	
	Design performance modelling (dpm) tools	Presentation 9.2 Videos	20 minutes	3. LU9.2 Energy Analysis Workflow.pptx video links (slide 13)	
	Building energy modelling (bem) tools	Presentation 9.2 Videos	20 minutes	4. LU9.2 Energy Analysis Workflow.pptx video links (slide 13)	
	Agents responisbilities	Presentation 9.2	5 minutes	5. LU9.2 Energy Analysis Workflow.pptx 6.	
	Simulation Stages	Presentation 9.2	20 minutes	7. LU9.2 Energy Analysis Workflow.pptx 8.	
	Conceptual Masses	Presentation 9.2 Videos	5 minutes	9. LU9.2 Energy Analysis Workflow.pptx video links (slide 19)	
	Simulation tools and engines	Presentation 9.2	20 minutes	10. LU9.2 Energy Analysis Workflow.pptx 11.	
	Break		15 minutes		
	Information exchanges	Presentation 9.2	20 minutes	• LU9.2 Energy Analysis Workflow.pptx	
	Information exchanges	GBXML Demo	20 minutes	• LU9.2 Energy Analysis Workflow.pptx (Slide 29) • LU9 – Additional information for trainers (Demo Guidance) • LU9.2.a - gbXML Viewer Demo Files: • BMZD_LU9_R20_ResidentialSampleModel 17. BMZD_LU9_R20_ResidentialSampleModel	
	Information exchanges	GBXML VS IFC Discussion	30 minutes	18. LU9.2 Energy Analysis Workflow.pptx (Slide 30) 19. LU9 – Additional information for trainers (Discussion Guidance)	

				20.	
	BIM to BEM	Presentation 9.2	25 minutes	21. LU9.2 Energy Analysis Workflow.pptx 22.	
	Assesment 1 – Evaluable Questionnaire	Questionnaire on moodle	30 minutes	LU9.2 Energy Analysis Workflow.pptx (Slide 37) Questionnaire on moodle	30%

Topic 9.3 – EXPORT TO GBXML (225 MIN)

Learning Outcome	Title of *Topic* being covered	Breakdown of activity	Breakdown of Timing	Resources/*hand-outs*	%
	EXPORTING gbXML file from Revit	Procedure	10 minutes	• LU9.3- Export to GBXML	
	PREPARE ENERGY ANALYTICAL MODEL (EAM)	Export gbXML dialog ENERGY SETTINGS: Mode Ground Plane Project Phase Analytical space and surface resolution Perimeter Zone Depth Perimeter Zone Division	45 minutes	• LU9.3- Export to GBXML	
	PREPARE ANALYTICAL MODEL BY ADDING ROOMS (AM)	Room boundaries Zone volume computations Detect possible problems Good practices	45 minutes	• LU9.3- Export to GBXML	
	EXPORTING gbXML DIALOG	GENERAL TAB: Building Type Location Ground Plane Export Category Export Complexity Detailed Elements Project Phase Building Envelope DETAILS TAB	45 minutes	• LU9.3- Export to GBXML	
	PRACTICAL EXERCICE	Open Sample Unselect Room Bounding as explained	60 minutes	• LU9.3- Export to GBXML • LU9 - Additional information for trainers	

		Set Limit Offset and Bse Offset as explained Export gbXML Use gbXML Viewer to see the result			
	Break		20 minutes		

Topic 9.4 – EXPORT TO IFC (180 MIN)

Learning Outcome	Title of *Topic* being covered	Breakdown of activity	Breakdown of Timing	Resources/*hand-outs*	%
	gbXML vs IFC FORMAT	GbXML IFC	10 minutes	• LU9.4- Export to IFC	
	INFORMATION INCLUDED	Data from BIM Model that should be transferred Mapping Conclusions	45 minutes	• LU9.4- Export to IFC	
	EXPORTING IFC DIALOG	General Additional Content Property Sets Level of Detail Advanced IFC Classes IFC Resources Property Sets	45 minutes	• LU9.4- Export to IFC	
	PRACTICAL EXERCICE	Open Sample Configure txt for user defined property sets Export IFC with settings described	60 minutes	• LU9.4- Export to IFC • LU9 - Additional information for trainers	
	Break		20 minutes		

Comments of the External Advisory Board

EA MEMBER 1

Q7 Is the Learning Unit content suitable for the target group?

Building Physics knowledge needed (Only students and professionals with deeper level of competencies).

Answer: This is taught in other LUs and the learning unit is targeted to those people that have to prepare a bim model in order to export it to later on run energy simulations so they need Building Physics knowledge.

Q7 Is there a good mix of theory and practice?

Not enough basic knowledge on BP

Answer: This is taught in other LUs.

Q13 Do you believe a topic is missing from the content?

Open software approach, at least consideration of further BIM software

Answer: 2 out of 4 sections of this learning units are addressed to talk about exchange formats based on open schemas…. Gbxml and IFC. But you need a commercial modelling tool to then export and create an open format.

EA MEMBER 2

Q6: Does the learning content meet your expectations?

Although it has perhaps focused too much on explaining the use of specific software.

Q8: Is there enough information on how to use digital tools in the LU?

yes, as a technological basis, maybe I miss some real case study example

Answer: The aim of this LU is to explain the use of software to carry out exportation from BIM to BIM and then run energy simulations. Not to understand energy simulation outcomes or building thermal performance. Theory is in other learning units.

Q7: Is the Learning Unit content suitable for the target group?

Although it is focused on the modeler rather than on management for project manager role

Answer: It is focused also for the project manager. The PM needs to understand the implications of carrying out energy simulations from bim models and the amount of work needed. Understanding the workflow is the only way to understand the process.

Q9: Is there a good mix of theory and practice?

Apart from the above, I miss other data analysis software oriented to non modeler roles such as power BI.

Q13: Do you believe a topic is missing from the content?

I miss other data analysis programs oriented to non modeler roles such as power BI, and the explanation of some real case studies

Answer: Due to confidentiality clauses we can not introduce real case studies. Power BI is used for Business Analytics, not for energy simulations and less to export a BIM Model to a BEM model that is the objective of this learning unit. We believe that this proposal is completely out of place.

4.10. LU10 - Energy Simulation with BIM Tools

The overall evaluation of LU10 is positive, however the EAB members evaluating the LU pointed out the request of more info and small amendments.

Q8: Is there enough information on how to use digital tools in the LU?
A comprehensive high level presentation of energy simulation software should have been presented. Difference between BIM software and energy simulation software should have been highlighted as well.

Answer: More explanation will be provided during the introduction, difference between BIM software and simulation software will be highlighted during class.

Suggestion of improvement:

LU10.1.1 Introductions LU10_FINAL OK, however, it will be good to include some quants after slide 5 for justification of the need for use of BIM in energy simulation.

Answer: Justification of the need for use of BIM in energy simulation is included. Other software will be acknowledged during lessons.

LU10.1.2 Required system for LU10_FINAL Full functional ArchiCAD is available for 30 days for educators and students. Is the coursework submitted within 30 days? If not how is it possible for a student to do an assignment and submit long after exhausting the 30 days trial period? Really, there is less information on PowerPoint presentation LU10.1.2. Things like acknowledging other software, before justification of the chosen software could have been considered.

Answer: The first trial is for 30 day, but for students with a university e-mail address a free 1 year trial is available for their course.

LU10.2 Basics of simulation features with CAD system_FINAL On slide 6 “Data transfer through IFC can be eliminated, which slowed down and made the design process inconvenient”. Why? IFC is the industry standard and in my opinion, IFC files are lighter and likely not going to slow software than the native files. Slide 45, The results of the simulation can be saved in different file formats and used in other programs and calculations. Which file formats? List them please. Where is the Energy plus? How does it fit here?

Answer: IFC is not mandatory to use. File formats can be excel and PDF, but PDF is a document type, while excel is easier to edit later. Energy plus is a new approach comparing nZEB and passive house principle, it is mentioned as an alternative and possible approach. Also Energy plus is in some cases included in the BIM module, it should be taken into consideration separately when it is not included.

LU10.5 Complex simulation and data-exchange between BIM-capable CAD systems_FINAL Life Cycle Cost on slide 17 is so sudden. However is relevant to BEM?

Answers: LCC and LCA will be mentioned underlying the importance of circular economy in the construction industry. Difference is explained in class. BEM is only used in special cases for unique materials, structures and is important to at least be mentioned in lectures.

4.11. LU11 - Nearly Zero Energy Building Facility Management

The feedback from the piloting surveys pointed out the LU was of acceptable quality but a bit straightforward and unchallenging. This review revealed that sections of the LU were introductions for the learners to LU12 and the FM (CMMS) software. Two of the LU11.1 introduction slides were rewritten to explain this and the descriptor also had a clarification that was introductory content which prepared the learners for more technically in depth LU12.

4.12. LU12 - BIM in Facility Management Software (CMMS)

In LU12 the only issue is related to balance between theory and practice. In this learning unit and in difference with other LUs we have bet to explain first theory and then practice and not to do theory+practice in small topics. The reason is that here we will have a very heterogenic background from students, it is a very new topic that is rarely to find it in actual courses related to BIM or nZEB so we have to ensure a common basis through the students before get into practice. We agree that the best way to teach is with small topics and combining theory and practice but we believe that with this learning unit we are in front of and exception due the lack of knowledge in the building sector related to BIM and FM.

Comments of the External Advisory Board

EAB MEMBER 2

Q9 – Is there a good mix of theory and practice?

“The LU is very front-loaded with theory. It would be useful to introduce even a small practical exercise earlier in the LU.”

Answer: Here we have a dilemma. We agree that it is very important to mix theory and practice as we have done in LU6 but the problem is that the people doesn’t have the same background on the matter that they have in other fields. Here the student comes with a very very basic knowledge and if we introduce earlier the practice we believe that would be counterproductive. Our practice says that introducing practical exercises way too early or with a very basic knowledge can confuse the student that will not understand what is really doing.

5. Modification of the E-learning platform

During the implementation of the pilot courses (both for trainers and students) the trainings were available on Moodle platform. The platform was used and the data was maintained differently in the case of trainers in the first phase and students for the second phase.

In order to keep the platform working the long-term maintenance and sustainability of Moodle needed to be solved.

During the project implementation trainers needed to apply through the BIMzeED website to participate in the Train the Trainer course. Their application were reviewed by the responsible project partner who gace access to the trainers. After a trainer completed a learning unit in the Train the Trainer course, the project partner gave access to the full training material of that learning unit. Students were automatically enrolled in LU1 after their registration on the BIMzeED website.

For assuring the long term accessibility and sustainability of the training materials the E-learning portal will be as automized as possible.

Slight modifications and adjustments are also made according to the feedback of the participants (see feedback analysis in O5.4 Students Evaluation Report).

6. Summary and conclusion

BIMzeED structured the training material and content using common LUs with flexible standardised delivery (in class, on-line and on-site) suitable for HEI and VET training. The training content includes nZEB related subjects with BIM maturity. The training content was developed and delivered in a Blended Learning format supported by a E-Learning portal, and the finalised LUs were made available as Toolkits to potential students, HEIs, VETs and SMEs.

After the pilot trainings surveys were completed by participants related to each LUs.

The results from the various evaluation tasks and impact analysis feed back into the partners to allow them to consider appropriate adjustments, improvements and modifications to the training materials and resources. All partners were responsible to do the necessary adjustments.

All Learning Units were finalized according to the feedback of trainers, students and EAB members. As a result a high quality, sustainable training material was created and is available for future use in 4 languages (English, Spanish, Croatian, Hungarian).