



## **BIM-enabled Learning Environment (BLE) Platform – User Guidelines**

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# 1 Introduction

## 1.1 Background and purpose

Digitalization is transforming the real estate and construction (REC) sector and a key feature of this transformation is Building Information Modelling (BIM). BIM refers to the digital representation of buildings and construction operations and it offers opportunities for improving education and training through data rich virtual environments in which project-based learning experiences can be designed and delivered. This could fundamentally change the education and training of REC sector professionals from managers to site workers.

The BIM-enabled Learning Environment for Digital Construction (Benedict) project is an Erasmus+ Strategic Partnership between Tallinn University of Technology (TalTech), Tampere University (TAU) and the University of Bologna (UNIBO) aimed at leveraging the possibilities of BIM to enhance education and training by developing an innovative, BIM-enabled Learning Environment (BLE). The BLE platform is an integrated Moodle – DiStellar installation that is publicly available at [www.bim-enabled-learning.com](http://www.bim-enabled-learning.com).

The aim of these BLE platform user guidelines is to ensure that all key users of the BLE platform (system administrators, teachers, learners) as well as any other interested stakeholders can use the BLE platform. In addition, full technical details are shared so that others can replicate this BLE platform and/or further develop similar BLE platforms that make use of some or all the features developed as part of the Benedict project.

## 1.2 Objectives and scope of the BLE platform

The aim is to provide a prototype working BLE platform with the objectives:

- to demonstrate BIM-enabled learning
- to host pilot modules of BIM-enabled learning experiences
- to provide a fully documented and open-source platform that can be replicated and further developed by anyone interested in doing so.

The BLE platform comprises:

- an integrated Moodle – DiStellar installation as its core
- a repository of Open Learning Resources
- mixed reality (XR) materials generated for BIM-enabled learning experiences

## 1.3 Structure of the BLE platform user guidelines

These guidelines include Guidelines for System Administrators (section 2), for Teachers (section 3) and for Learners (section 4). Guidelines for the Open Learning Resources Repository appear in Appendix A, detailed guidance on the installation and use of the Distellar plugin for Moodle is provided in Appendix B and guidance on high fidelity architectural visualization for virtual reality in Unity is presented in Appendix C.



## 2 BLE Platform - Guidelines for System Administrators

### 2.1 Installation and Setup

#### 2.1.1 Moodle download and installation requirements

Moodle can be downloaded from <https://download.moodle.org/>. Before the installation, system requirements (web server) should be checked. Those requirements do depend on Moodle version and version specific requirements can be found from <https://docs.moodle.org/>. Depending on the location into where Moodle will be installed, some web-server hosting platforms do offer automatic Moodle installation.

#### 2.1.2 General setup

Moodle installation steps are given at Moodle Documentation/Installation quick guide. During the installation administration account will be created which will be used to configure all subsequent steps.

#### 2.1.3 Platform appearance and customization

Moodle “look and feel” can be configured through additional plugins. Visual appearance is mainly defined through the Moodle plugins (<https://moodle.org/plugins/>), especially by a Theme plugin.

#### 2.1.4 Configuring the Moodle Installation for integrated BIM-enabled functions

##### 2.1.4.1 *Recommended plugins*

Moodle 4.x versions come with many collaborative tools already included as default plugins. Therefore, in this subsection we focus onto BIM-enabled functions.

##### 2.1.4.2 *DiStellar plugin setup*

DiStellar plugin is a core plugin in BLE Platform. It should be installed separately by the administrator. Thereafter there are some additional settings that can be altered by the administrator.

Please refer to [Appendix A – User Guide DiStellar Moodle Plugin](#) for more detailed information.

### 2.2 Managing Courses

### 2.3 Managing User Accounts

#### 2.3.1 Authentication

Moodle can be configured in various ways to accept new visitors/learners etc. Most common way is to used the email-based self-registration plugin which is available in the default installation but it should be activated by the administrator (Moodle/Managing a Moodle site/Authentication).

#### 2.3.2 Authentication plugins

There could be cases when special/additional plugins are needed which enable corporate level authentication and/or country-specific authentication. Those cases are out of the scope of the current report.

#### 2.3.3 Enrolment

Enrolment to the course is possible once there is a user account created/activated. In some cases, courses can be offered through a guest-access method, but those are so-called ready-only and do not enable any engagement of the learner (through activities like quizzes, forum posts etc.). Enrolment to the Moodle course can be configured through a enrolment key but there could be some other, automatic or semi-automatic enrolment methods available depending on where the Moodle site has been installed and how it is connected to the user-management systems (like educational institutions registers etc.).



## 3 BLE Platform - Guidelines for Teachers

Please note that the guidelines given here do depend on Moodle Theme as well as the selected language interface.

### 3.1 How to create an account

- Please visit <https://www.bim-enabled-learning.com/ble/>
- Click “Log in” and pick ‘Create new account’ button

Is this your first time here?

For full access to this site, you first need to create an account.

Create new account

- Type-in your account username, password and other details you wish to use for your account. Input with \* marks are mandatory
- Click ‘create my new account’ button in the bottom part of the form.

Create my new account

- Your account registration depend on how the Moodle has been set up by the administrator. If self-registration is enabled, you get an email and you should confirm your registration and make a log in to the system for the first time. If self-registration is not enabled, you need to wait the approval from the administrator. You will be notified once the account is approved.
- Having an Moodle account, you need to be assigned to the course (or have privileges to create a course from scratch). Usually, this is done by the administrator or by another teacher, if she/he is already assigned to the course.

### 3.2 How to create a course

Once you can access to the course, you can start to build it up (by adding study materials but also enabling enrolment methods).

### 3.3 Setting participant enrolment mode

Participant enrolment mode determined how participant can see and join the course/module you have created. If disabled, participants will not be able to enrol in the course and can only be added manually by course creator/facilitator.

To set the enrolment method setting, please go to

**Course administration > Users > Enrolment methods > Self enrolment (Student)**






 Administration 

▼ Course administration

 Settings

 Turn editing on

 Course completion

▼ Users

 Enrolled users

▼ **Enrolment methods**

Manual enrolments

Guest access

Self enrolment (Student)

In the self enrolment page, you will see the following options

**3.3.1 Custom instance name**

You may leave this blank

**3.3.2 Allow existing enrolments**

Select 'yes' to allow participants already enrolled in other module to join this module

**3.3.3 Allow new enrolments**

Select 'yes' to allow new participants to enrol in this module

**3.3.4 Enrolment key**

You may leave this blank. Otherwise, participants will need the key provided here to enrol

**3.3.5 Use group enrolment keys**

Select 'No'.

**3.3.6 Default assigned role**

Please select 'participants'.



# Self enrolment

## Self enrolment

Custom instance name		<input type="text"/>
Allow existing enrolments		<input type="button" value="Yes"/>
Allow new enrolments		<input type="button" value="Yes"/>
Enrolment key		<input type="text" value="Click to enter text"/>
Use group enrolment keys		<input type="button" value="No"/>
Default assigned role		<input type="button" value="Student"/>

### 3.3.7 All other options

Please leave blank/ as it is.

Enrolment duration		<input type="text" value="0"/>	<input type="button" value="days"/>	<input type="checkbox"/>	Enable				
Notify before enrolment expires		<input type="button" value="No"/>							
Notification threshold		<input type="text" value="1"/>	<input type="button" value="days"/>						
Start date		<input type="button" value="29"/>	<input type="button" value="June"/>	<input type="button" value="2023"/>	<input type="button" value="11"/>	<input type="button" value="08"/>		<input type="checkbox"/>	Enable
End date		<input type="button" value="29"/>	<input type="button" value="June"/>	<input type="button" value="2023"/>	<input type="button" value="11"/>	<input type="button" value="08"/>		<input type="checkbox"/>	Enable
Unenrol inactive after		<input type="button" value="Never"/>							
Max enrolled users		<input type="text" value="0"/>							
Send course welcome message		<input type="button" value="No"/>							



### 3.3.8 Send course welcome message

Please tick if you want to send welcoming message to newly enrolled participant

### 3.3.9 Custom welcome message

If you tick the 'send course welcome message' above, please write your message in this box.

Click 'save changes' when you are done.

## 3.4 Activity types























The following are list of most common activities you may want to create for your course. Each activity will have different options and use. Knowing the differences between these activity types will help you in creating suitable activities.

Add an activity or resource ⊕

All

Activities

Resources

 Assignment ☆ ⓘ	 Book ☆ ⓘ	 Chat ☆ ⓘ	 Choice ☆ ⓘ	 Database ☆ ⓘ	 External tool ☆ ⓘ
 Feedback ☆ ⓘ	 File ☆ ⓘ	 Folder ☆ ⓘ	 Forum ☆ ⓘ	 Glossary ☆ ⓘ	 H5P ☆ ⓘ
 IMS content package ☆ ⓘ	 Lesson ☆ ⓘ	 Page ☆ ⓘ	 Quiz ☆ ⓘ	 SCORM package ☆ ⓘ	 Survey ☆ ⓘ
 Text and media area ☆ ⓘ	 URL ☆ ⓘ	 Wiki ☆ ⓘ	 Workshop ☆ ⓘ		

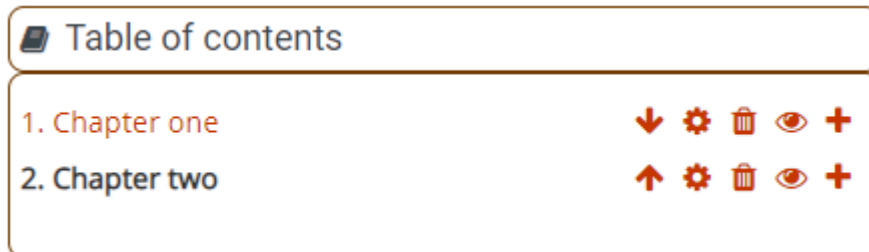




- Please click 'save changes' button when you are finished.

#### 3.4.1.6 Adding the next chapter

- To add the next chapter to your book, please click the '+' sign on the 'Table of Content' block. This will take you the same steps as described in section 3.4.1.5 above.



- Other commands:
- → to reorganise chapter order
- → to edit the chapter
- → to delete the chapter
- → to set chapter visibility; if disabled, the chapter will not be visible.

#### 3.4.2 Chat

Chat sessions will provide a chat room for your course. This can be used as communication tools between facilitators and participants.

The chat activity module enables participants to have text-based, real-time synchronous discussions.

The chat may be a one-time activity or it may be repeated at the same time each day or each week. Chat sessions are saved and can be made available for everyone to view or restricted to users with the capability to view chat session logs.

Chats are especially useful when the group chatting is not able to meet face-to-face, such as

- Regular meetings of students participating in online courses to enable them to share experiences with others in the same course but in a different location
- A student temporarily unable to attend in person chatting with their teacher to catch up with work
- Students out on work experience getting together to discuss their experiences with each other and their teacher
- Younger children using chat at home in the evenings as a controlled (monitored) introduction to the world of social networking
- A question and answer session with an invited speaker in a different location
- Sessions to help students prepare for tests where the teacher, or other students, would pose sample questions



### 3.4.2.1 General

- Name of this chat room: please give a name for the chat room.
- Description: provide a brief description about the book.

#### Adding a new Chat

##### General

Expand all

Name of this chat room

Description

### 3.4.2.2 Chat sessions

- Next chat time: Please set next chat session date and time
- Repeat/ publish session times: Select options whether chat session will be repeated
- Save past sessions: Choose duration before chat sessions are automatically deleted.
- Everyone can view past sessions: select yes to allow participants to read previous chat discussions.

### 3.4.2.3 Remaining options

For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

### 3.4.2.4 Click save and display to finish

Save and display

Cancel

### 3.4.2.5 To start a chat

- To start chatting, please click 'click here to enter the chat now'. The chat will be opened in a new window
- The 'use more accessible interface' option will take you to the chat room with alternative interface.
- To view past chat sessions, when applicable, please click 'view past chat sessions'.

### 3.4.2.6 To end a chat

- To end a chat, please close the chat window.

### 3.4.3 Choice

'Choice' activity will provide a single question with several possible responses. Choice results may be published after students have answered, after a certain date, or not at all. Results may be published with student names or anonymously.

A choice activity may be used:

- As a quick poll to stimulate thinking about a topic



- To quickly test students' understanding
- To facilitate student decision-making, for example allowing students to vote on a direction for the course

### 3.4.3.1 General

- Choice name: give a name to your 'choice' activity.
- Description: provide a brief description to your activity.
- Display mode: please choose how the options will be displayed

#### Adding a new Choice

##### General

Expand all

Choice name

Description 

A B I

Display description on course page

Display mode for the options

### 3.4.3.2 Options

Please set the options for the response.

- Allow choice to be updated: whether or not participant can change their answer
- Allow more than one choice to be selected: whether participant can select more than one choices
- Limit the number of responses allowed: whether or not each choice has limited number of responses allowed. This can be useful, for instance, in allocating groups, etc.

### 3.4.3.3 Availability

Please set whether the 'choice' activity is made available for a certain period only.

### 3.4.3.4 Results

Please set how the results will be published.

#### Results

Publish results

Show column for unanswered

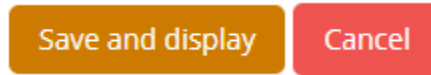
Include responses from inactive/suspended users



#### 3.4.3.5 Remaining options

For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

#### 3.4.3.6 Click save and display to finish



### 3.4.4 Feedback

The feedback activity module enables a teacher to create a custom survey for collecting feedback from participants using a variety of question types including multiple choice, yes/no or text input.

Feedback responses may be anonymous if desired, and results may be shown to all participants or restricted to teachers only. Any feedback activities on the site front page may also be completed by non-logged-in users.

Feedback activities may be used:

- For course evaluations, helping improve the content for later participants
- To enable participants to sign up for course modules, events etc.
- For guest surveys of course choices, school policies etc.
- For anti-bullying surveys in which students can report incidents anonymously

#### 3.4.4.1 General

- Name: give a name to your feedback activity.
- Description: provide a brief description to your activity.

##### ▼ General

Name

Description

#### 3.4.4.2 Availability

Please set whether the activity is made available for a certain period only.

#### 3.4.4.3 Question and submission settings

Please select the required options





## ▼ Question and submission settings

Record user names	<input type="text" value="Anonymous"/>
Allow multiple submissions	<input type="text" value="No"/>
Enable notification of submissions	<input type="text" value="No"/>
Auto number questions	<input type="text" value="No"/>

### 3.4.4.4 After submission

Please set what action will be taken after a feedback is received.

- Show analysis page: Yes/ No
- Completion message: please type a completion message to participants after they have submitted a feedback
- Link to next activity: After submitting the feedback, a continue button is displayed, which links to the course page. Alternatively, it may link to the next activity if the URL of the activity is entered here.

#### ▼ After submission

Show analysis page	<input type="text" value="No"/>
Completion message	<div style="border: 1px solid #ccc; padding: 5px;"><p>Rich text editor toolbar: Undo, Bold, Italic, Bulleted list, Numbered list, Indent, Outdent, Link, Unlink, Text color, Background color, Image, Video, Audio, Table, Help.</p><div style="height: 100px;"></div></div>
Link to next activity	<input type="text"/>

3.4.4.5 For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

3.4.4.6 Click save and display to finish



### 3.4.5 File

The file module enables a teacher to provide a file as a course resource. Where possible, the file will be displayed within the course interface; otherwise students will be prompted to download it. The file may include supporting files, for example an HTML page may have embedded images or Flash objects.

Note that students need to have the appropriate software on their computers in order to open the file.

A file may be used:

- To share presentations given in class
- To include a mini website as a course resource
- To provide draft files of certain software programs (eg Photoshop .psd) so students can edit and submit them for assessment

#### 3.4.5.1 General

- Name: give a name to your feedback activity.
- Description: provide a brief description to your activity.
- Select files: add files to share with participants in the box.

#### Adding a new File to Introduction

##### General

Name

Description

Rich text editor toolbar: Undo, Bold, Italic, Bulleted list, Numbered list, Link, Unlink, Image, Video, Audio, Embed, Help.


Display description on course page

Select files

Maximum size for new files: Unlimited

File manager icons: New file, Folder, Grid, List, Share.

Files



You can drag and drop files here to add them.

#### 3.4.5.2 Appearance

Please set how the activity will be displayed



## ▼ Appearance

Display



In pop-up



Show size



Show type



Show upload/modified date



Show less...

Pop-up width (in pixels)

1000

Pop-up height (in pixels)

600

Use filters on file content

None



### 3.4.5.3 Remaining options

For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

### 3.4.5.4 Click save and display to finish

Save and display

Cancel

## 3.4.6 Folder

Similar to file, a folder is used to share documents with the participants. The folder module enables a teacher to display a number of related files inside a single folder, reducing scrolling on the course page. A zipped folder may be uploaded and unzipped for display, or an empty folder created and files uploaded into it.

A folder may be used:

- For a series of files on one topic, for example a set of past examination papers in pdf format or a collection of image files for use in student projects
- To provide a shared uploading space for teachers on the course page (keeping the folder hidden so that only teachers can see it)

### 3.4.6.1 General

- Name: give a name to your feedback activity.
- Description: provide a brief description to your activity.



Adding a new Folder to Introduction

Expand all

General

Name

Description

1 A B I ☰ ☰ ☰ ☰ 🔗 🔄 😊 🖼️ 📄 🎤 🎥 📁 H-P

### 3.4.6.2 Content

Please select how the folder content will be displayed

Content

Files

Files
Maximum size for new files: Unlimited

You can drag and drop files here to add them.

Display folder contents

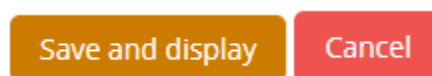
On a separate page

- Show subfolders expanded
- Show download folder button
- Force download of files

### 3.4.6.3 Remaining options

For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

### 3.4.6.4 Click save and display to finish



### 3.4.7 Forum

The forum activity module enables participants to have asynchronous discussions i.e. discussions that take place over an extended period of time.

There are several forum types to choose from, such as a standard forum where anyone can start a new discussion at any time; a forum where each student can post exactly one discussion; or a question and answer forum where students must first post before being able to view other students' posts. A teacher can allow files to be attached to forum posts. Attached images are displayed in the forum post.

Participants can subscribe to a forum to receive notifications of new forum posts. A teacher can set the subscription mode to optional, forced or auto, or prevent subscription completely. If required, students can be



blocked from posting more than a given number of posts in a given time period; this can prevent individuals from dominating discussions.

Forum posts can be rated by teachers or students (peer evaluation). Ratings can be aggregated to form a final grade which is recorded in the gradebook.

Forums have many uses, such as:

- A social space for students to get to know each other
- For course announcements (using a news forum with forced subscription)
- For discussing course content or reading materials
- For continuing online an issue raised previously in a face-to-face session
- For teacher-only discussions (using a hidden forum)
- A help centre where tutors and students can give advice
- A one-on-one support area for private student-teacher communications (using a forum with separate groups and with one student per group)
- For extension activities, for example 'brain teasers' for students to ponder and suggest solutions to

### 3.4.7.1 General

- Name: give a name to your feedback activity.
- Description: provide a brief description to your activity.
- Forum type: Choose one of the following forum types:
  - A single simple discussion - A single discussion topic which everyone can reply to (cannot be used with separate groups)
  - Each person posts one discussion - Each student can post exactly one new discussion topic, which everyone can then reply to
  - Q and A forum - Students must first post their perspectives before viewing other students' posts
  - Standard forum displayed in a blog-like format - An open forum where anyone can start a new discussion at any time, and in which discussion topics are displayed on one page with "Discuss this topic" links
  - Standard forum for general use - An open forum where anyone can start a new discussion at any time

#### Adding a new Forum to Introduction

[Expand all](#)

▼ **General**

Forum name

Description 

**A** **B** *I* **U** **L** **R** **S** **Y** **Q** **W** **E** **R** **T** **A** **S** **E** **H** **P**

Display description on course page

Forum type



### 3.4.7.2 *Attachments and word count*

Please set the following feature as required

- Maximum attachment size
- Maximum number of attachments
- Display word count

### 3.4.7.3 *Subscription and tracking*

#### **Subscription**

When a participant is subscribed to a forum it means they will receive forum post notifications. There are 4 subscription mode options:

- Optional subscription - Participants can choose whether to be subscribed
- Forced subscription - Everyone is subscribed and cannot unsubscribe
- Auto subscription - Everyone is subscribed initially but can choose to unsubscribe at any time
- Subscription disabled - Subscriptions are not allowed

Note: Any subscription mode changes will only affect users who enrol in the course in the future, and not existing users.

#### **Read tracking**

Read tracking enables participants to easily check which posts they have not yet seen by highlighting any new posts.

If set to optional, participants can choose whether to turn tracking on or off via a link in the administration block. (Users must also enable forum tracking in their forum preferences.)

If 'Allow forced read tracking' is enabled in the site administration, then a further option is available - forced. This means that tracking is always on, regardless of users' forum preferences.



### ▼ Attachments and word count

Maximum attachment size



500KB



Maximum number of attachments



9



Display word count



No



### ▼ Subscription and tracking

Subscription mode



Optional subscription



Read tracking



Optional



#### 3.4.7.4 *Post threshold for blocking*

Participants can be blocked from posting more than a given number of posts in a given time period. Some participants can be exempted from post limits.

### ▼ Post threshold for blocking

Time period for blocking



Don't block



#### 3.4.7.5 *Whole forum grading*

Please ignore this option.

#### 3.4.7.6 *Ratings*

Please ignore this option.

#### 3.4.7.7 *Remaining options*

For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

#### 3.4.7.8 *Click save and display to finish*

Save and display

Cancel

### 3.4.8 Lesson

The lesson activity module enables a teacher to deliver content and/or practice activities in interesting and flexible ways. A teacher can use the lesson to create a linear set of content pages or instructional activities that



offer a variety of paths or options for the learner. In either case, teachers can choose to increase engagement and ensure understanding by including a variety of questions, such as multiple choice, matching and short answer. Depending on the student's choice of answer and how the teacher develops the lesson, students may progress to the next page, be taken back to a previous page or redirected down a different path entirely.

A lesson may be graded, with the grade recorded in the gradebook.

Lessons may be used:

- For self-directed learning of a new topic
- For scenarios or simulations/decision-making exercises
- For differentiated revision, with different sets of revision questions depending upon answers given to initial questions

#### 3.4.8.1 *General*

- Name: give a name to your feedback activity.
- Description: provide a brief description to your activity.

#### ● Adding a new Lesson to Introduction [e](#)

▶ Expand all

##### ▼ General

Name

Description

Rich text editor toolbar: **Undo**, **Text color**, **Bold**, **Italic**, **Bulleted list**, **Numbered list**, **Link**, **Unlink**, **Smiley**, **Image**, **Table**, **Video**, **Fullscreen**.

Large empty text area for description.

#### 3.4.8.2 *Appearance*

Select options how the lesson will be displayed





▼ Appearance

Show less...

Linked media

Maximum file size: Unlimited, maximum number of files: 1

Files

You can drag and drop files here to add them.

- Display ongoing score
- Minimum grade to display menu
- Slideshow
- Maximum number of answers
- Use default feedback
- Link to next activity
- Progress bar
- Display menu

### 3.4.8.3 Availability

Please set whether the activity is made available for a certain period only.

### 3.4.8.4 Flow control

The flow control determine how student navigate and access the lesson. The available settings are:

- Allow student review: If enabled, students can navigate through the lesson again from the start.
- Provide option to try a question again: If enabled, when a question is answered incorrectly, the student is given the option to try it again for no point credit, or continue with the lesson.
- Maximum number of attempts: This setting specifies the maximum number of attempts allowed for each question. If answered incorrectly repeatedly, when the maximum is reached, the next page of the lesson is displayed.
- Action after correct answer: After answering a question correctly, there are 3 options for the following page:
  - Normal - Follow lesson path
  - Show an unseen page - Pages are shown in a random order with no page shown twice
  - Show an unanswered page - Pages are shown in a random order, with pages containing unanswered questions shown again
- Number of pages to show: This setting specifies the number of pages shown in a lesson. It is only applicable for lessons with pages shown in a random order (when "Action after correct answer" is set to "Show an unseen page" or "Show an unanswered page"). If set to zero, then all pages are shown.



## ▼ Flow control

Allow student review



No

Provide option to try a question again



No

Maximum number of attempts



1

Show less...

Action after correct answer



Normal - follow lesson path

Number of pages to show



1

### 3.4.8.5 Grade

Select the type of grading used for this activity. If "scale" is chosen, you can then choose the scale from the "scale" dropdown. If using "point" grading, you can then enter the maximum grade available for this activity.

## ▼ Grade

Grade



Type Point

Maximum grade

100

Grade category



Uncategorised

Grade to pass



Practice lesson



No

Show less...

Custom scoring



Yes

Minimum number of questions



0

Re-takes allowed



No



### 3.4.8.6 Remaining options

For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

### 3.4.8.7 Click save and display to finish

Save and display

Cancel

### 3.4.8.8 Importing questions

Import questions: you can import questions already prepared externally in the following format:

- GIFT format
- Aiken format
- Blackboard
- Embedded answer (cloze)
- Examview
- Missing word format
- Moodle XML format
- WebCT format



If you don't have pre-set questions in the above formats, you will need to create your questions using the 'add a question page' tool.

### 3.4.8.9 Add a content page

Please click the 'add a content page' button to create a content page. In the following page, you will have the options as the following:

Page title: give a title to your content page

Page contents: This is where you put your chapter content. You can format your content using the formatting

tools . You can also put a link to a URL, images, videos, or attach files by clicking the appropriate button .

#### ▼ Add a content page

Page title

Page contents

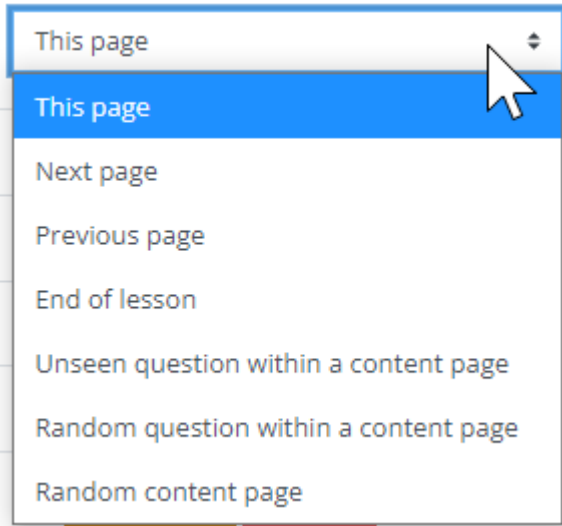
Arrange content buttons horizontally?

Display in menu?



**Content 1, 2, 3, ... etc.**

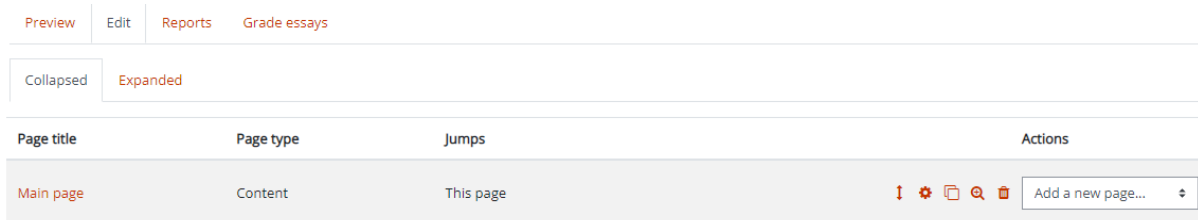
These contents 1, 2, 3 ... etc. options are used to create navigation button underneath your content page. In the 'description' box, give a name to the navigation button you need, followed by the action for the button as described in the 'jump' box.



Click 'save page' button to save the content page created and go to the main lesson page

**3.4.8.10 Adding additional content page**

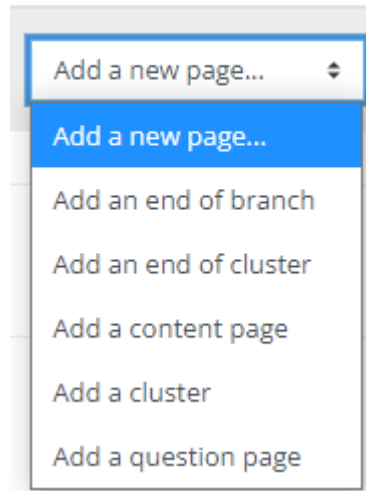
Once the content page is saved, you will see list of content pages which have been created.



For further actions, please select from the dropdown list in the 'add a new page' box. There are several actions available, as shown in the following figure:



#### Actions



Cluster and branches are used to identify different sections within a lesson. For more details about cluster please go the following link <https://goo.gl/LrJkMQ> and for branches please go to <https://goo.gl/dCsQ0v>

#### 3.4.9 Page

The page module enables a teacher to create a web page resource using the text editor. A page can display text, images, sound, video, web links and embedded code, such as Google maps.

Advantages of using the page module rather than the file module include the resource being more accessible (for example to users of mobile devices) and easier to update.

For large amounts of content, it's recommended that a book is used rather than a page.

A page may be used:

- To present the terms and conditions of a course or a summary of the course syllabus
- To embed several videos or sound files together with some explanatory text

##### 3.4.9.1 General

- Name: give a name to your activity.
- Description: provide a brief description to your activity.

##### 3.4.9.2 Appearance

Please select the settings you require for the page appearance

#### ▼ Appearance

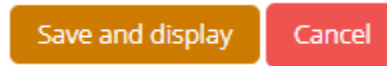
- Display page name
- Display page description
- Display last modified date



### 3.4.9.3 Remaining options

For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

### 3.4.9.4 Click save and display to finish



### 3.4.10 Quiz

The quiz activity enables a teacher to create quizzes comprising questions of various types, including multiple choice, matching, short-answer and numerical.

The teacher can allow the quiz to be attempted multiple times, with the questions shuffled or randomly selected from the question bank. A time limit may be set.

Each attempt is marked automatically, with the exception of essay questions, and the grade is recorded in the gradebook.

The teacher can choose when and if hints, feedback and correct answers are shown to students.

Quizzes may be used:

- As course exams
- As mini tests for reading assignments or at the end of a topic
- As exam practice using questions from past exams
- To deliver immediate feedback about performance
- For self-assessment

#### 3.4.10.1 General

Describe the name and provide brief description of the quiz

#### 3.4.10.2 Timing

Set the period of time that the quiz is available

##### ▼ Timing

Open the quiz       Enable

Close the quiz       Enable

Time limit    Enable

When time expires

#### 3.4.10.3 Grade

Set the grade category



### ▼ Grade

Grade category

?

Grade to pass

?

Attempts allowed

Grading method

?

#### 3.4.10.4 *Layout*

Set how questions will be displayed

### ▼ Layout

New page

?

Show less...

Navigation method

?

#### 3.4.10.5 *Question behaviour*

Set how questions are presented to participants

### ▼ Question behaviour

Shuffle within questions

?

How questions behave

?

Show less...

Each attempt builds on the last

?

#### 3.4.10.6 *Review options*

These options control what information students can see when they review a quiz attempt or look at the quiz reports.

**During the attempt** settings are only relevant for some behaviours, like 'interactive with multiple tries', which may display feedback during the attempt.

**Immediately after the attempt** settings apply for the first two minutes after 'Submit all and finish' is clicked.

**Later, while the quiz is still open** settings apply after this, and before the quiz close date.



**After the quiz is closed** settings apply after the quiz close date has passed. If the quiz does not have a close date, this state is never reached.

▼ **Review options**

During the attempt

- The attempt
- Whether correct
- Marks
- Specific feedback
- General feedback
- Right answer
- Overall feedback

Immediately after the attempt

- The attempt
- Whether correct
- Marks
- Specific feedback
- General feedback
- Right answer
- Overall feedback

Later, while the quiz is still open

- The attempt
- Whether correct
- Marks
- Specific feedback
- General feedback
- Right answer
- Overall feedback

After the quiz is closed

- The attempt
- Whether correct
- Marks
- Specific feedback
- General feedback
- Right answer
- Overall feedback

**3.4.10.7 Appearance**

Set the appearance of the quiz page

▼ **Appearance**

Show the user's picture

?

Decimal places in grades

?

Show less...

Decimal places in question grades

?

Show blocks during quiz attempts

?

**3.4.10.8 Extra restrictions on attempts**

Please set extra restriction as the following options, only if required

▼ **Extra restrictions on attempts**

Require password

?

Show less...

Require network address

?

Enforced delay between 1st and 2nd attempts

?    Enable

Enforced delay between later attempts

?    Enable

Browser security

?

Allow quiz to be attempted offline using the mobile app

?





### 3.4.10.9 Overall feedback

Give general feedback to participants, based on the grade result boundary.

#### ▼ Overall feedback

Grade boundary 100%

Feedback

Grade boundary

Feedback

Grade boundary 0%

Add 3 more feedback fields

### 3.4.10.10 Remaining options

For the remaining options (common module settings, restrict access, activity completion, tags, and competencies), please refer to section 3.4.11

### 3.4.10.11 Click save and display to finish

Save and display Cancel



### 3.4.11 Options available in most activity types

#### 3.4.11.1 *Common module settings*

You may ignore this option.

#### 3.4.11.2 *Restrict access*

You can add access restriction to your book by clicking the 'add restriction' button. You can set the restriction based on

- Dates; restricted for certain dates or period,
- Grades; restricted for participants with certain grade,
- User profile; restricted for participants with specified profile features (institution, country, etc.)
- Restriction set; a combination of the above options.

#### 3.4.11.3 *Activity completion*

This option will allow you to choose various course completion notifications. The options are:

- Completion tracking: whether you want to track participants' completion for this activity
- Require view: whether you require participants to view the book before they completion can be marked.
- Expect completed on: This setting specifies the date when the activity is expected to be completed. The date is not shown to students and is only displayed in the activity completion report.

#### 3.4.11.4 *Tags*

You may ignore this tab

#### 3.4.11.5 *Competencies*

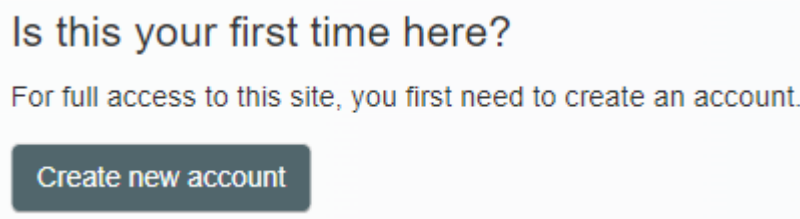
You may ignore this tab



## 4 BLE Platform – Guidelines for Learners

### 4.1 How to create an account

- Please visit <https://www.bim-enabled-learning.com/ble/>
- Click 'Log in' and pick 'Create new account' button



- Type-in your account username, password and other details you wish to use for your account. Input with \* marks are mandatory
- Click 'create my new account' button in the bottom part of the form.
- You will receive a notification email shortly. Please click the link the email or cut and paste the link to your browser to confirm your email address and finalise your registration.

### 4.2 How to enrol in a course

To enrol in a course, click the 'Courses' option under "Navigation" block. It will take you to course group which will show the available courses and module you can enrol.

Select the course you want to enrol, and click 'enrol me' button in the bottom of the page.

### 4.3 Questions and feedback

If you have any questions or wish to give feedback on the BIM-enabled Learning Platform, please contact your course instructor.



## **Appendix A – Open Learning Resources Repository Guidelines**

Guidelines begin on next page.



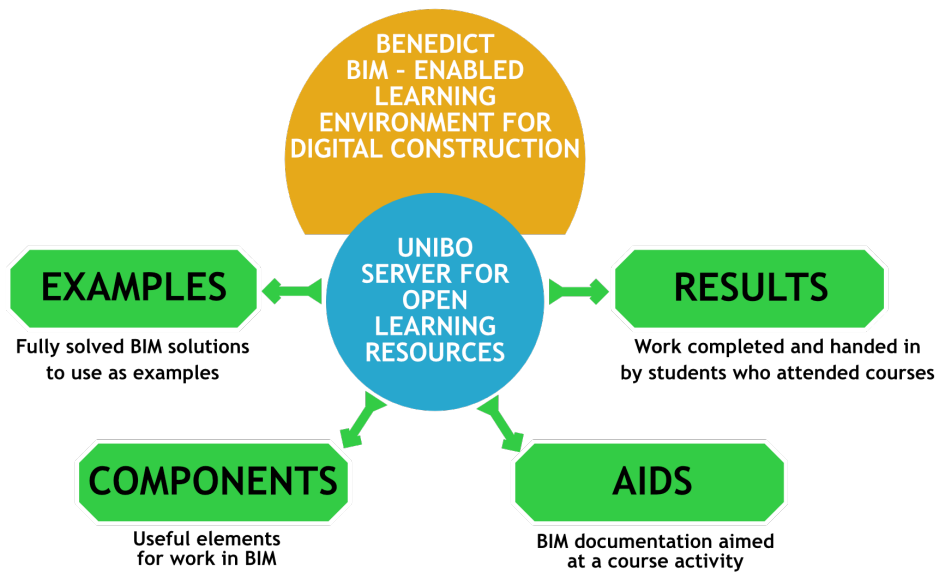
# OPEN LEARNING RESOURCES REPOSITORY

## User Guidelines v1

Prepared by:

ARTIFICIODIGITALE

[www.artificiodigitale.com](http://www.artificiodigitale.com)



Schema of information in DB

## UNIBO Database (DB) Record Types

There are 4 records types

Every record type has its own fields

EXAMPLE Record Fields

field	required	type	file format	options
title	<input checked="" type="checkbox"/>	text		few words
type	<input checked="" type="checkbox"/>	locked list		architecture   building site   engineering   MEP   regulation   object
preview	<input checked="" type="checkbox"/>	image	jpg   png	
note	<input checked="" type="checkbox"/>	long text		free description
file	<input checked="" type="checkbox"/>	archive	.zip   .7z	
IFC	<input type="checkbox"/>	file	.ifc   .IFCzip	

COMPONENT Record Fields

field	required	type	file format	options
title	<input checked="" type="checkbox"/>	text		few words
type	<input checked="" type="checkbox"/>	locked list		template   object   document   layout   assistant   schema   algorithm
preview	<input checked="" type="checkbox"/>	image	jpg   png	
note	<input checked="" type="checkbox"/>	long text		free description
file	<input checked="" type="checkbox"/>	archive	.zip   .7z	

AID Record Fields

field	required	type	file format	options
title	<input checked="" type="checkbox"/>	text		few words
type	<input checked="" type="checkbox"/>	locked list		layout   data
preview	<input checked="" type="checkbox"/>	image	jpg   png	
note	<input checked="" type="checkbox"/>	long text		free description
file	<input checked="" type="checkbox"/>	archive	.zip   .7z	



RESULT Record Fields

field	required	type	file format	options
title	<input checked="" type="checkbox"/>	text		few words
type	<input checked="" type="checkbox"/>	locked list		architecture   building site   engineering   MEP   regulation   object
course	<input checked="" type="checkbox"/>	locked list		ABS   CPE   ODC
preview	<input checked="" type="checkbox"/>	image	jpg   png	
note	<input type="checkbox"/>	long text		free description
doc	<input checked="" type="checkbox"/>	archive	.zip   .7z	
BIM	<input type="checkbox"/>	archive	.zip   .7z	
3D	<input type="checkbox"/>	archive	.zip   .7z	
IFC	<input checked="" type="checkbox"/>	file	.IFCzip	
video	<input type="checkbox"/>	file	.mp4	max h720 25fps 200kbps
student	<input checked="" type="checkbox"/>	text		name surname (several name?)
contact	<input type="checkbox"/>	email		email address
year	<input checked="" type="checkbox"/>	number		exam passed year

## Login and roles

To use the DB server there are some rules to follow:



guest account

anonymous accounts have some restrictions



[All Contents](#) [Examples](#) [Components](#) [Aids](#) [Results](#) [Home](#)

[Home](#)

**Access denied**

You are not authorized to access this page.

Powered by [Drupal](#)







for full access to data you need to activate a personal user account.

To activate a **user account**:

select log in

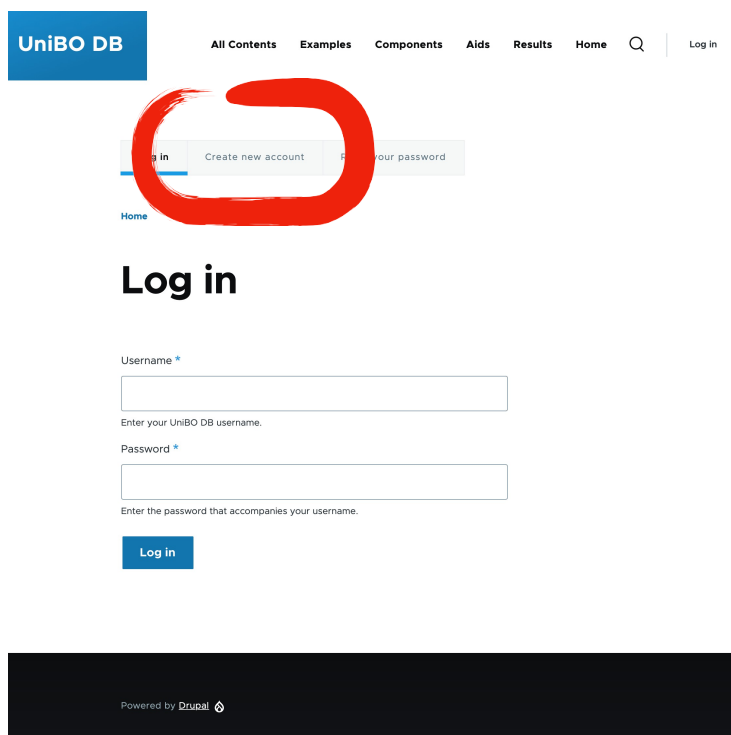


# welcome

Welcome to the UniBO server for Open Learning Resources



if you have not yet a user select “create new account”





[Log in](#)

[Create new account](#)

[Reset your password](#)

[Home](#)

## Create new account

Email address \*

The email address is not made public. It will only be used if you need to be contacted about your account or for opted-in notifications.

Username \*

Several special characters are allowed, including space, period (.), hyphen (-), apostrophe ('), underscore (\_), and the @ sign.

### ▼ Contact settings

Personal contact form

Allow other users to contact you via a personal contact form which keeps your email address hidden. Note that some privileged users such as site administrators are still able to contact you even if you choose to disable this feature.

[Create new account](#)

follow the instructions in the emails sent to you.



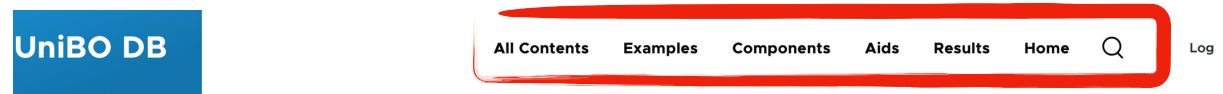
#### account request restrictions:

- only email with domain @unibo.it can request to create new account
- every new accounts requested must be activated by an administrator

every account is set to a specific role and every role has different restrictions:

- guest / anonymous: most limited accounts
- activated user / students: can navigate and download data
- content creator / teachers: can create and upload data
- administrator: can do everything

## Browsing contents - searching and finding data using the main menus



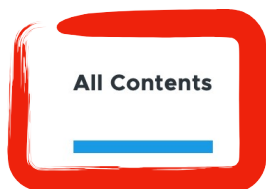
## welcome

Welcome to the UniBO server for Open Learning Resources



## All contents

this page lists all records of every type



Examples

Components

Aids

Results

Home



Home

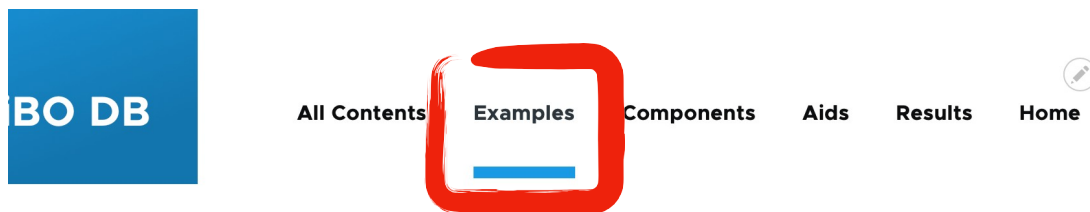
# all

Title	Content type
<a href="#">2022-g13-Gustiuc</a>	<a href="#">result</a>
<a href="#">2022-g11-Negrini-Bevilacqua-Visconti-Bonanni</a>	<a href="#">result</a>
<a href="#">2022-g10-Bartolucci-Sala-Ferri-Useri</a>	<a href="#">result</a>
<a href="#">2022-g4-Zucchini-Murelli-Maccaferrri-Fava</a>	<a href="#">result</a>
<a href="#">2022-g2-Bortolani-Gibertini-Barbolini-Neri-Salas</a>	<a href="#">result</a>
<a href="#">2022-g1-Valente-Fregni-Nora</a>	<a href="#">result</a>
<a href="#">2023-g6-Bertani-D'Alio-Peri-Rossi</a>	<a href="#">result</a>
<a href="#">2023-g5-Siciliani-Ronconi-Tanzarella</a>	<a href="#">result</a>



**Examples**

lists all examples records - you can perform a search query of words in titles



Home

# examples ☆

Title

Apply

Title	ExamplePreview	ExampleType
<a href="#">progetto di abitazione bifamigliare</a>		<a href="#">architecture</a>
<a href="#">Residenza bifamiliare nZEB</a>		<a href="#">architecture</a>
<a href="#">Simple Living unit project in Revit</a>		<a href="#">architecture</a>



## Components

lists all components records - you can perform a query of words in titles



All Contents

Examples

Components

Aids

Results

Home



Home

# components

Title

Apply

Title                      component\_preview      component\_type

[Simple Revit template](#)



[template](#)

[door and windows](#)



[object](#)



## Aids

lists all aids records - you can perform a query of words in titles



All Contents

Examples

Components



Aids

results

Home



Home

# aids

Title

Apply

Title	aid_preview	aid_type
-------	-------------	----------

<a href="#">Simple 2D CAD plan</a>		<a href="#">layout</a>
------------------------------------	---	------------------------



<a href="#">Starting LOD B</a>		<a href="#">data</a>
--------------------------------	---	----------------------





**Results**

lists all results records - you can perform queries on words in students' names, sort by name, year or course

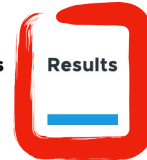


All Contents

Examples

Components

Aids



Home

Home

# result ☆

result\_student (field\_result\_student)

Sort by

result\_student (field\_result\_student) ▾

Order

As

Apply

Title	result_preview	result_student	result_type	result_y
<a href="#">2022-g1-Chendi-Andreotti</a>		Chendi Andreotti	<a href="#">building site</a>	2022
<a href="#">2022-g1-Valente-Fregni-Nora</a>		Valente - Fregni - Nora	<a href="#">building site</a>	2022
<a href="#">2022-g10-Bartolucci-Sala-Ferri-Useri</a>		Bartolucci - Sala - Ferri - Useri	<a href="#">building site</a>	2022





## Adding content

to create new content you need an activated user with right role

### Choose a record type

show sub-menu if it's hide clicking on "Manage"



By bragadin, 31 May, 2023

## tower crane

This a tower crane

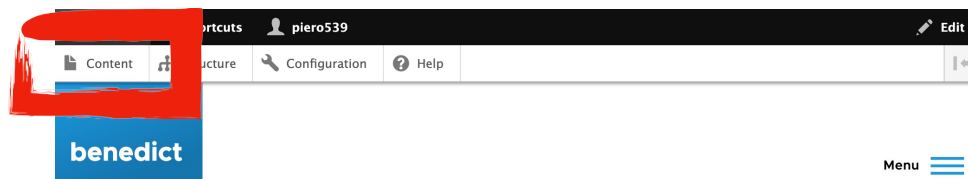
By super, 23 May, 2023

## campo multiplo

By super, 15 May, 2023



click on "content"



By bragadin, 31 May, 2023

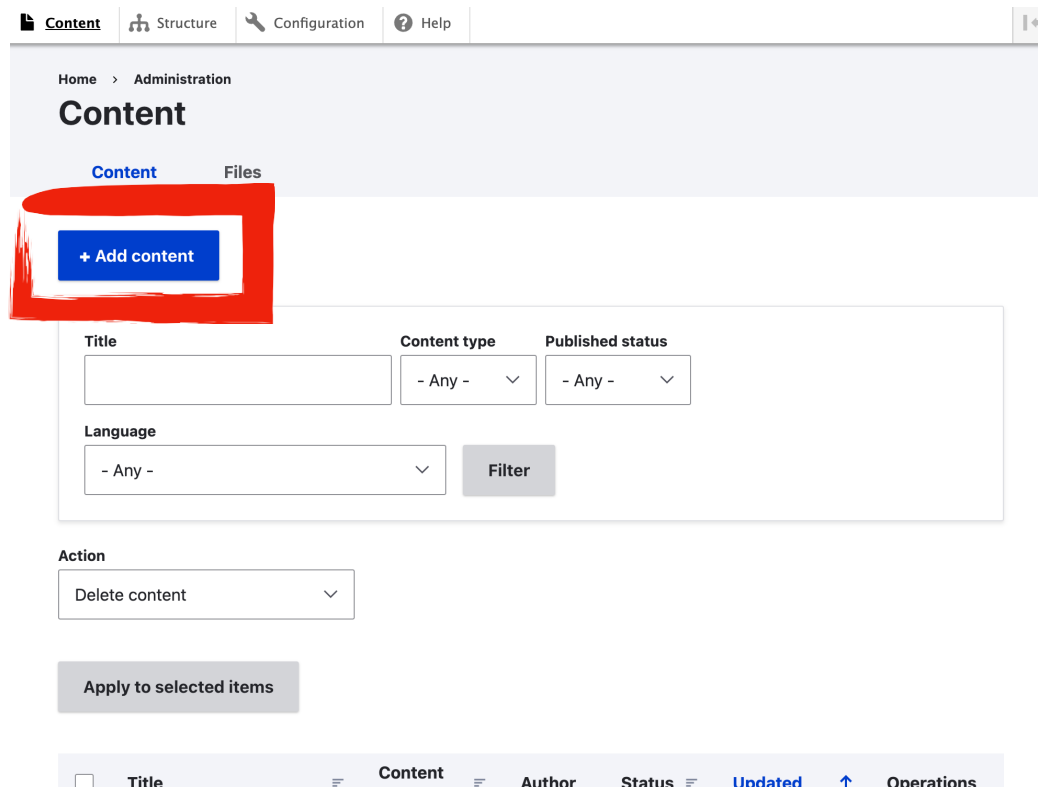
## tower crane

This a tower crane

By super, 23 May, 2023

## campo multiplo

click on "+ Add content"





choose the type you want to create

Content | Structure | Configuration | Help

---

Home

## Add content

- > **aid**  
Documentazione BIM finalizzata ad una attività di corso

---

- > **Basic page**  
Use *basic pages* for your static content, such as an 'About us' page.

---

- > **component**  
Elementi utili al lavoro in BIM

---

- > **example**  
soluzioni BIM completamente risolte da usare come esempi

---

- > **result**  
Lavori completati e consegnati dagli studenti che hanno frequentato i corsi

### Fill in the fields

- fill in the empty fields following the instructions: those marked with a red asterisk (\*) are required (see screenshots below)
- when done click on “save”
- check your new content and note its own address (URL) for using it



Manage Shortcuts piero539

Content Structure Configuration Help

Home > Add content

## Create component

**Title \***

**Body (Edit summary)**

**component\_type \***

- Select a value - v

**component\_preview \***

Add a new file \*

Scegli file Nessun file selezionato

One file only.  
 256 MB limit.  
 Allowed types: png gif jpg jpeg.

**component\_file \***

Add a new file \*

Scegli file Nessun file selezionato

One file only.  
 256 MB limit.  
 Allowed types: zip 7z.

Save Preview

Manage Shortcuts piero539

Content Structure Configuration Help

Home > Add content

## Create component

**Title \***

ConcreteTruck

**Body (Edit summary)**


A simple Concrete Mixer Truck to check manouvering distances in your projects.  
 Revit Family version 2019 and dwg version 2007

**component\_type \***

object

**component\_preview \***

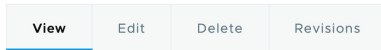
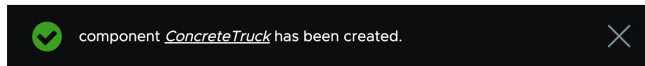
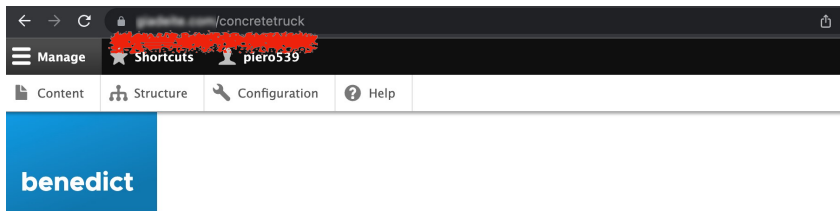
ConcreteTruckPreview.png (23.72 KB) Remove



**component\_file \***

ConcreteTruck.Z (4.17 MB) Remove

Save Preview



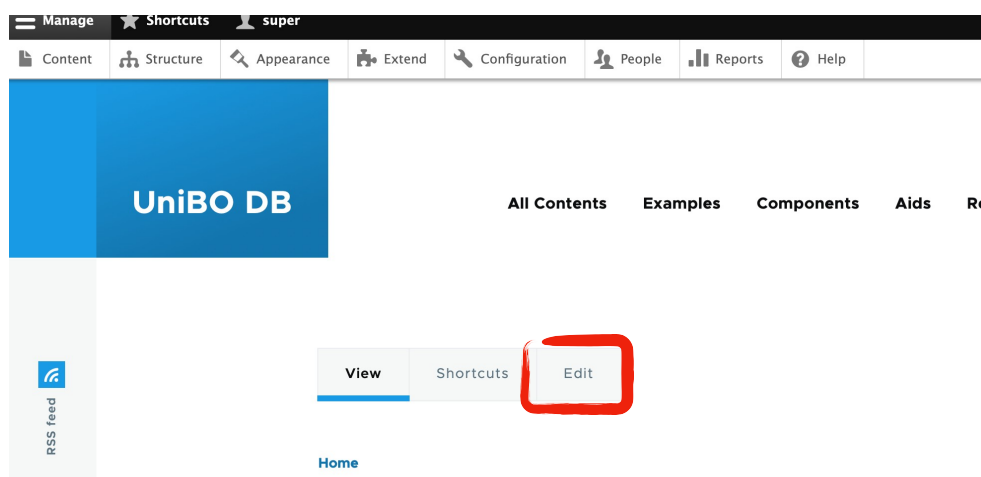
[Home](#)

# ConcreteTruck

## Special information

Pay attention to some special features:

- You can't delete records, only edit them (if you have the appropriate role) because others might be using the same contents in their learning activities. Only administrators can delete.
- There is a limit to the size of file that can be uploaded. This depends on technical limitations but it is also intended to force users to check the quality of data and manage file sizes before uploading content.
- There are some specific file formats that are allowed for uploading (image, IFC, etc...). For all other data, a simple compressed archive (zip or 7z) must be created in which any type of files can be included.





## Link to content by page URL

This is the simplest way to use contents in teaching activities

Every record has its own web address (URL) - simply copy and paste the entire address to use the content in your teaching activities on any platform and browser.

The screenshot shows a web browser window with the URL <https://www.uniroma2.it/uni-bo-db/content/simple-revit-template>. The browser's address bar shows "Non sicuro" (Not secure) and the UniBO DB logo is visible in the top left corner. The page title is "Simple Revit template" and it was created by user "super" on 5 April, 2023. The description states: "A very simple template to start to working in Revit (version 2023)". The page includes a "component\_type" field with the value "template" and a "component\_preview" field showing a screenshot of the Revit software interface. The "component\_file" field contains the link "Simple Revit template\_data.7z (4.71 MB)".



## **Appendix B – User Guide DiStellar Moodle Plugin**

Guidelines begin on next page.



# USER GUIDE

## DISTELLAR MOODLE PLUGIN

Prepared by :

DiRoots

[www.diroots.com](http://www.diroots.com)

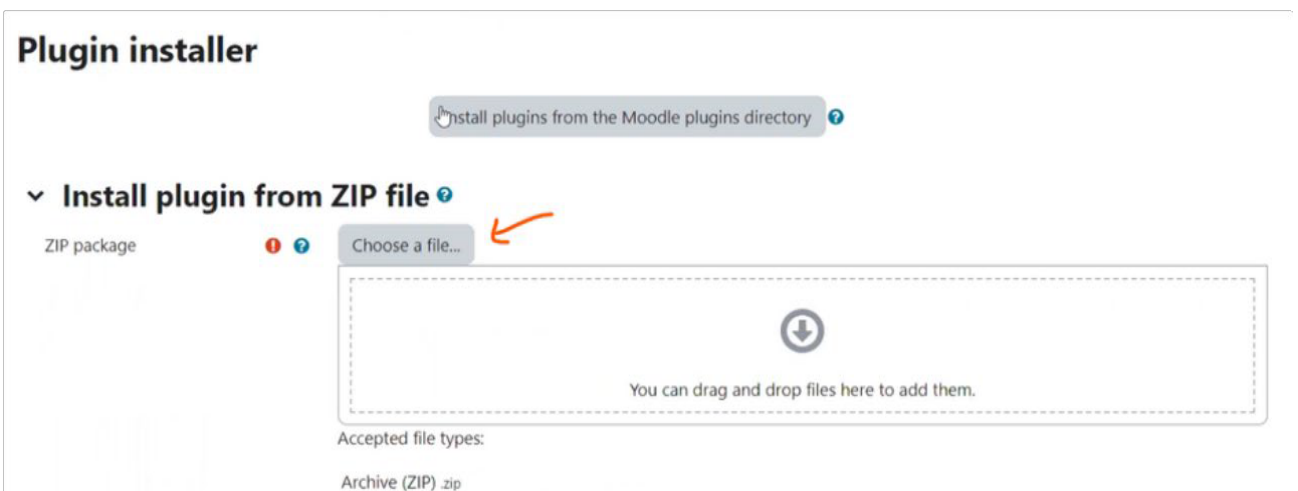




## Installation

To install the DiStellar Moodle plugin in your Moodle website please follow the following instructions that are compatible with Moodle 4.1:

1. We assume that you have access to your Moodle website file, in your Moodle installation folder, locate the file 'config.php' and add the following code at the end of the file.  
**ini\_set('memory\_limit', '5120M'); // Set memory limit to 5 GB**
2. Open your Moodle website and go to Site Administration → Plugins → Install plugins.
3. Under 'Install plugin from ZIP file' click on the 'Choose a file' button then a popup window should appear.
4. From the popup window click on the 'Upload a file' tab from the left pane then click on the 'Choose File' button, then another popup will appear where you can choose a file from your device, choose the 'distellar.zip' you obtained from step 1 and click on the 'Open' button then click the 'Upload this file' button.



5. Click the 'Install from the ZIP file' button.
6. Click the 'Continue' button.
7. Another page should appear where you can click again the 'Continue' button.
8. Another page should appear where you should click the 'Upgrade Moodle Database now' button.
9. Another page will appear where you can click on 'Save changes' button.
10. Now go to Site Administration → Plugins → Plugins overview → Additional plugins
11. Click the blue button after the 'Text filters' as shown in the following image



**Additional plugins**

11 plugins 438 Additional plugins 1

Plugin name	Version	Availability	Actions	Notes
<b>Text filters</b> ⚙️ ←				
DiStellar IFC Viewer filter_distellar	1.0.0 2022031500	Disabled	Settings	Uninstall <span>Additional</span>

12. Another page will appear, find in the list 'DiStellar IFC Viewer' and from the dropdown next to it choose 'On'.

## Usage

To open an IFC file in DiStellar Viewer please follow the following instructions:.

1. Go to your desired course on your Moodle website and create a new 'File' resource to upload your IFC file as described in the following [official Moodle video](#).
2. From the File resource you created in step 1, edit its settings and set Appearance → Display to 'In pop-up' for example like in the following image, knowing that the plugin supports all display options except for 'Force download'. Also based on the display option you choose the file will appear in your Moodle website in different ways.

Appearance

Display ?

Automatic

- Automatic
- Embed
- Force download
- Open
- In pop-up**

Show upload/modified date ?

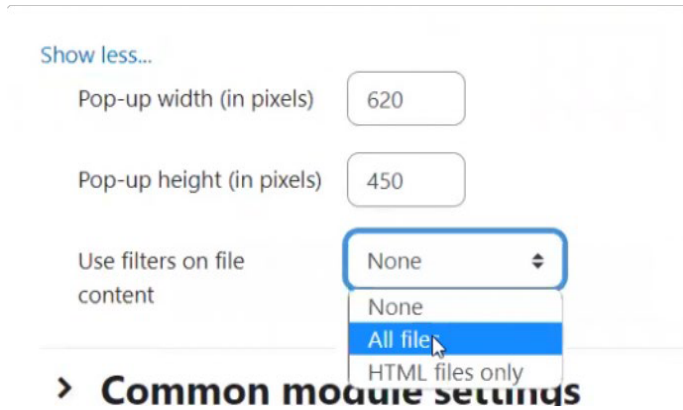
Display resource description

Show more...



**Note:** If you want your Display option to be 'Force Download' then set the 'Use filters on file content' to 'None' in the next step.

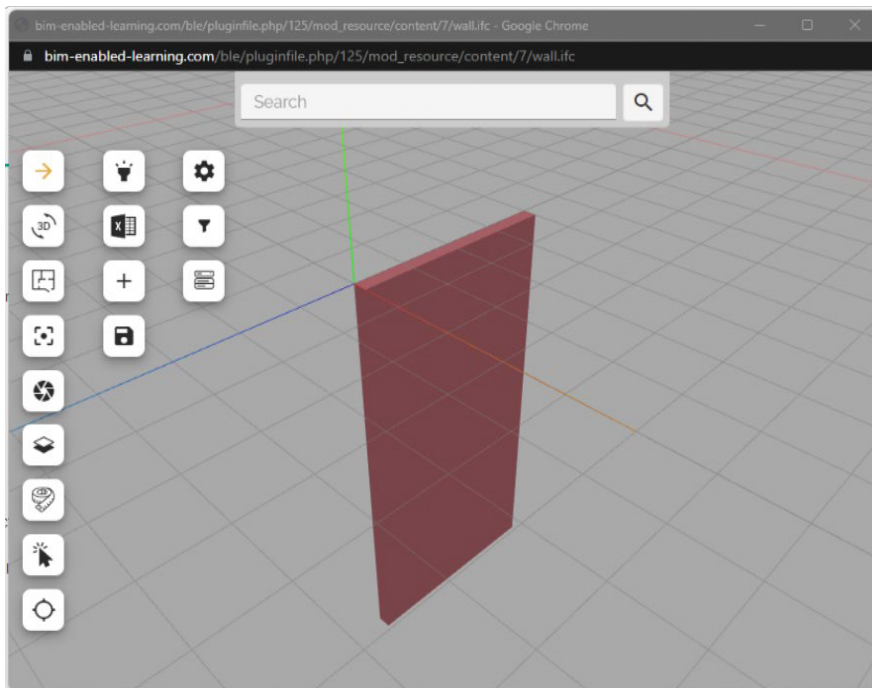
3. No matter which Display settings you choose, click on the 'Show more' link from the previous step, and from 'Use filters on file content' choose 'All files' as shown in the following image





4. Now you can save the current settings and click on the file, it should display it in DiStellar

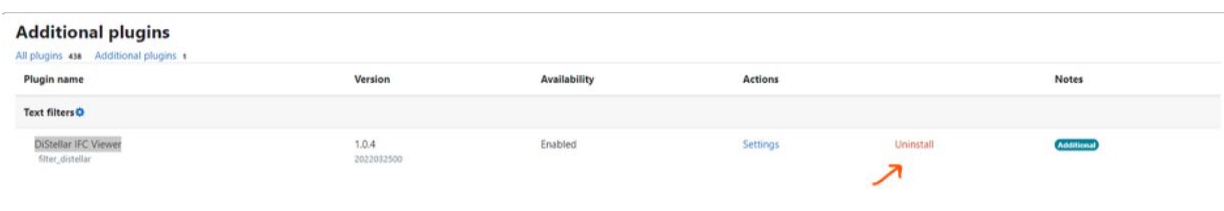
Viewer for example you should see something like the following image;



## Uninstallation

To uninstall the DiStellar Moodle plugin from your Moodle website, please follow the following instructions for Moodle 4.1:

1. In your Moodle website go to Site Administration → Plugins → Plugins overview → Additional plugins
2. find 'DiStellar IFC Viewer' under 'Text filters' and click on the 'Uninstall' link as in the following image;



3. A new page should appear, click on the 'Continue' Button.
4. Another new page will appear. Click again on the 'Continue' Button.
5. Repeat step 4 for the new page that should appear.
6. Another page should appear click on the 'Upgrade Moodle database now' button.
7. A final page should appear click on the 'Continue' Button.
8. That's it your Moodle site no longer have the plugin installed.

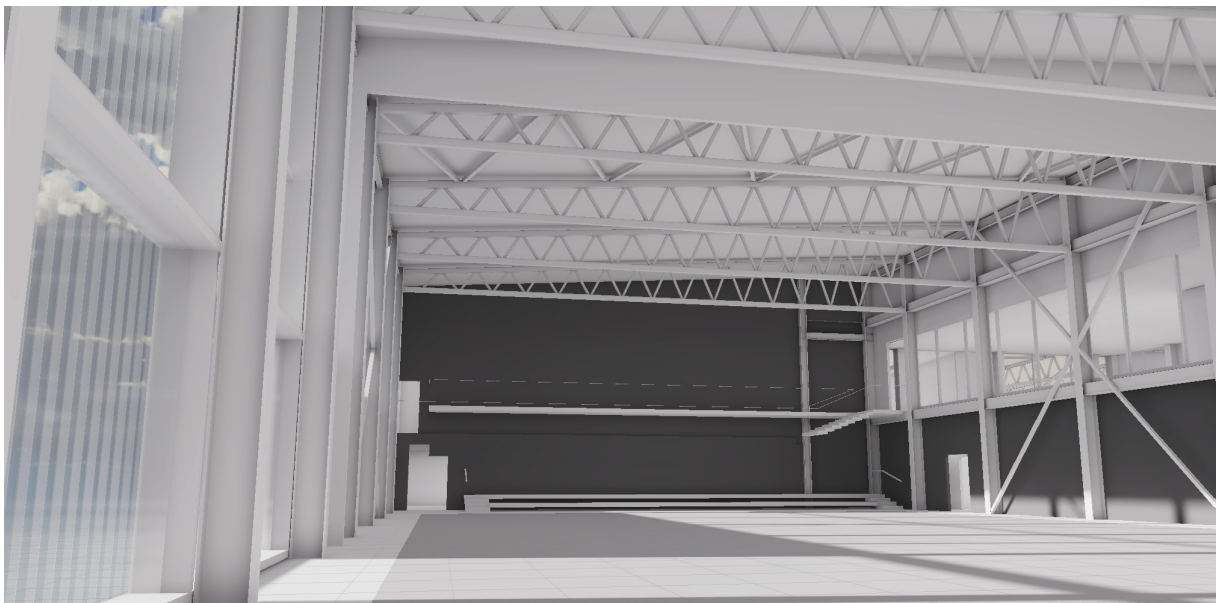


## **Appendix C - High Fidelity Architectural Visualization for Virtual Reality in Unity**

Guidelines begin on next page.



# High Fidelity Architectural Visualization for Virtual Reality in Unity



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## Introduction

This document will show the workflow, process, and tools used in creating a high fidelity VR visualization targeting [Varjo](#) headsets, although the majority of this process will apply to all tethered VR headsets. The BIM model is a sports hall provided by the Architecture and Civil Engineering Students of Tampere University. This is part of the [BENEDICT](#) project. Links are provided at the end of this document to the Github repository and application files, which have been made available for further exploration of the project or to experience it yourself. All of the software tools used in this process are open-source, or have free tiers available.

This is not intended as a tutorial, as each project will differ in its approach and goals, and detailing all steps would be outside of the scope of this document, but rather this should serve as a guideline or overview of the process as whole, with some best practices to keep in mind. It should serve as the starting point to help give initial direction, help to make the process a little more transparent and approachable.

While there are many ways to approach ArcVis (architectural visualization), this approach will focus on creating a high performance, high fidelity experience targeting ultra high resolution VR. This approach will allow for the best possible viewing experience for users, however comes with the tradeoff of longer processing times (typically days to weeks), and requiring specialized expertise that may not be as scalable or repeatable. This document will give an insight into what this process looks like with the goal of making it more approachable to architects / designers / developers.

There are black box solutions that exist that will allow for significantly reduced processing times and increased iteration speeds, allowing models to be prepared and viewed in VR with minutes, however come with the tradeoff of not being customisable, making significant sacrifices in visual fidelity, and often result in poor user experience such as confusing interactions and motion sickness/nausea.

There is also the possibility of using plugins or products such as [Unity Reflect](#), and other tools built for the purpose of ArcVis that provide a good balance of customisable and quality, and can be set up to allow for fast iterations times. It should be noted that these are paid products, and not within the scope of this project, but could be considered where the cost/reward favors a heavier investment in time, money, and expertise initially, but allows for a faster, scalable, and still high quality output over the long run.



## Overview



Workflow process:

1. IFC file is created / handed over
2. The IFC file is processed, prepared, and optimized in Blender
3. The blender file / FBX is imported into Unity and the scene is prepared in Unity - Lighting, materials, baking, settings, etc
4. Relevant VR plugins / packages are imported and setup
5. An application is built which can be shared / experienced in VR





## Process

### IFC handover

Due to all of the relatively time consuming process of optimizing and preparing the model for visualization, it is strongly recommended to do all preparation of the IFC before handover, as this workflow does not easily support updating the model, but rather much of the following process will need to be redone. Properly prepared IFC models will also dramatically speed up and simplify the following stages in the process.

Some of the main guidelines that should be followed in the BIM software where possible:

- Place all objects on their correct levels / floors
- Name objects correctly, allowing for string search later on (Eg: “pillar”, “window”)
- Group / label / remove extra object (be particularly wary of objects like toilets, sinks, nuts and bolts, etc, as these can be highly time consuming to remove later and significantly impact the performance)
- Apply correct materials. (The material properties will be set up separately in unity, but the same materials should be shared across all relevant objects, and named accordingly, eg: glass.)
- Resolve any Z-fighting / co-planar surfaces. These will be particularly distracting in VR.
- Where possible, split objects based on materials (eg, if you want floors in different rooms to have different finishes or colors)

In some cases it may also be beneficial to have a model purposefully prepared for visualization purposes.



## Blender Processing and optimisation

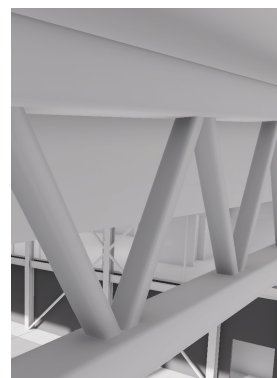
Unity does not natively support IFC or any of the other BIM formats, which means an appropriate file will need to be created. FBX is typically the recommended format as it preserves materials and hierarchies, although there are others which will also work such as OBJ.

Unity can also directly import blender files (.blend) directly, provided blender is installed on the machine.

In addition to file format conversion, blender should also be used to prepare the file for easy use in Unity. Steps include:

- All of the steps missed in the IFC file from the handover phase
- Setting a target budget for object count and vertice count, and either removing non visible objects, or reducing polygon count until your target budget has been made. This step will be more time consuming when given large IFC files, or if targeting less powerful platforms such as mobile devices.
- Move the entire model so that the main parts are close to the world origin and at floor level
- Group collection of objects that may need to be selected together frequently for editing/toggling. A good rule of thumb is to set it to *Floor > Static / NonStatic > Object type > object*
- Collections are not supported in unity, so group your objects / floors inside an empty transform rather.
- Unity can generate UV maps for light baking, however in certain cases, there can be benefit to creating these manually, for instance if there is light bleed, or material scale/orientation is incorrect.
- In some cases it may benefit to remodel / replace certain objects to remove visual artifacts or particularly heavy necessary objects.

In the diagram below, roof beams were remodeled to allow for proper light calculations on rounded corners and remove the black seams as these were important visually and clearly visible in the main hall





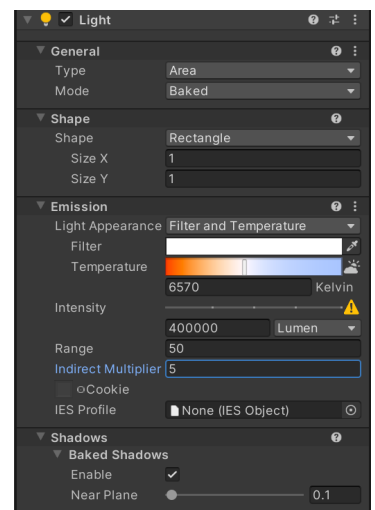
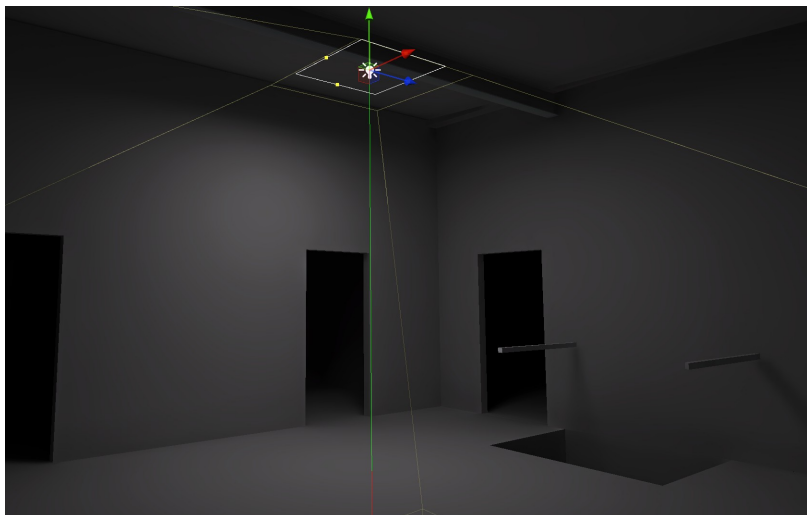
## Unity Scene

Setting up the scene in Unity is typically where the most time is taken, and will likely have the biggest impact on the final results, although the amount of time spent can vary significantly depending on the project goals, previous preparation stages, team size and skill level, and project deadlines.

Before starting this part of the process, you should ensure you have a clear idea of what platforms and quality you are aiming for, as this will dictate the whole process moving forward. For this project we are targeting high fidelity on high powered PCs, and therefore chose to work in HDRP, use high resolution assets and lightmaps, and push for high quality while maintaining appropriate performance (stable 90fps for VR)

A typical workflow in Unity to set up the scene would include the following steps:

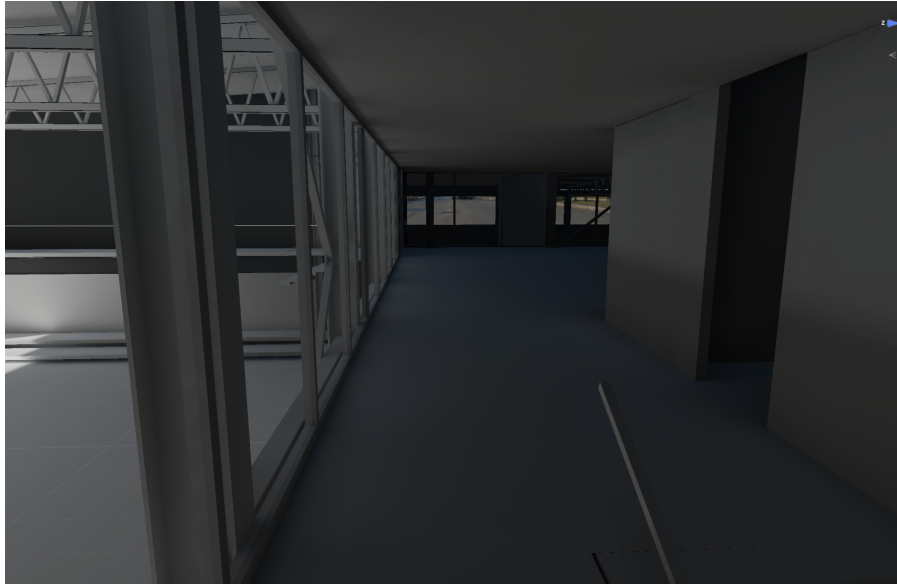
- Import the model and place it at the origin
  - On asset import properties, enable “generate lightmap UVs” if they have not already been created
  - Mark the model and its children as static in the hierarchy.
- Setup Lighting
  - Place lights to all rooms that should be illuminated. Area lights at ceiling level facing down work well in ArcVis as they feel more natural and reduce hotspots generated by others such as point lights.



- Place reflection probes in key areas, such as rooms with glass or other reflective surfaces.



- Lighting with only sun and HDRI (before adding area lights indoors) can feel lifeless and be too dark for practical use, particularly if you progress further into the rooms of the building.

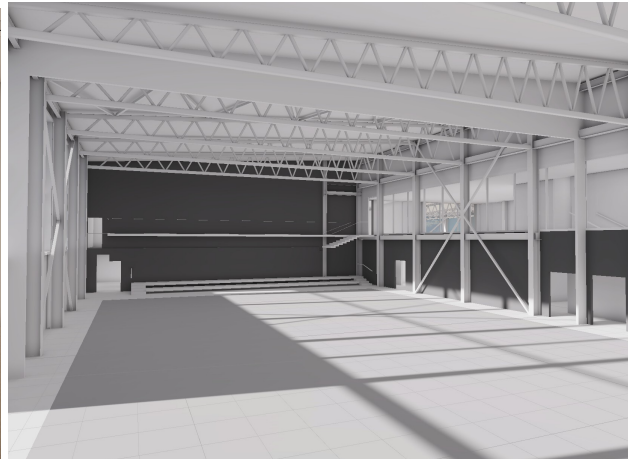
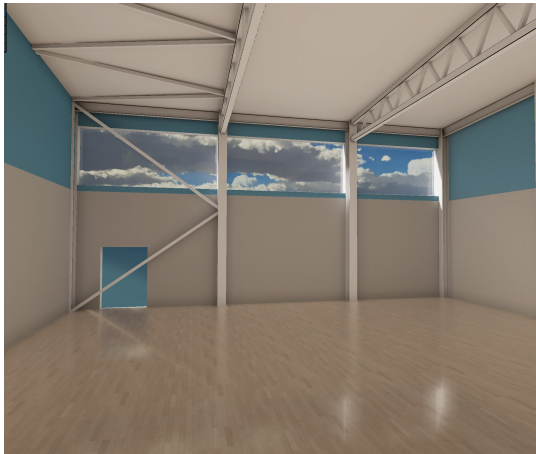


- Adjust the Sun / directional light
- Add an HDRI skybox to match your desired aesthetic
- Align the rotation of the scenes directional light with the HDRI sun to ensure visual consistency with shadows and lighting





- Setup materials
  - Using PBR materials can make a significant improvement when aiming for realism
  - In certain cases, using exclusively gray/white materials can encourage discussion around the space while minimizing distractions and still looking good.



- Bake lighting
  - Disable / tone down any post processing as this can give false impressions, and make it difficult to troubleshoot
  - Bake at medium / lower settings, as initial setup of lighting will need a LOT of iterating to get the correct light intensities
  - Bake, adjust , repeat. Until you get close to the desired atmosphere.
  - Increase lightmap resolution, samples, and light bounces for the final bake
- Reintroduce and adjust post processing (more tips on this details in the VR setup section)



## XR / VR

There are several SDKs that can be imported to enable VR, most of which use OpenXR as the backend, allowing for use across headsets and even platforms. Some of the common ones include Oculus Integration, MRTK, and Unity's Interaction toolkit. This project is targeting Varjo headsets, which also is built on OpenXR, but also allows several features specific to Varjo headsets, and therefore makes use of the [Varjo SDK](#).

Some extra considerations are necessary when using Varjo in particular, due to how the XR3 and VR3 utilize focus displays overlaid on top of wider peripheral displays. These particularly affect certain post processing effects. Primarily, screen space effects and bloom should be disabled, and dynamic exposure should be disabled / set to a fixed value.

Once the SDK is imported and configured, teleportation or other movement should also be set up. This will require colliders to be placed, primarily on floors and walls, where you want to either allow or prevent teleportation

As VR is still fairly new to many people, it can also be helpful to have additional tools to assist with accessibility. One possible solution to this is to have a set of key bindings on a keyboard (eg, numbers 1,2,3,4, or "N" for next) which then teleport users to key areas in the model. This allows for an assistance to show a user all the key areas without communication or technological barriers, and can also work as a reset if a user gets lost or disoriented.

## Links

360 Video flythrough: [Benedict 360 injected Youtube video](#)

[Varjo Demo](#)

[Free-movement demo](#) (no VR required)

[Github repository](#)