

Craft your Future - Learning Construction in Minecraft



Craft your Future is a lesson plan based on the computer game, Minecraft. In this custom built Minecraft world, students encounter a variety of problems that reflect construction challenges in cities today.

Practical information	
Subjects covered	Art and design, Design and technology, Geography
Year	5.-7. UK- Year's 7-9
Duration	4 chapters, 3 - 6 hrs each

Aims

- To spark interest and curiosity in a career in construction and building .
- To make students aware of how global challenges are countered in the local environment.
- To give students tools to take part in iterative work routines.
- To strengthen the students ability to work and think in a group.

Background

Across the world there is a surge in urban populations - the phenomena of urbanization. This creates a number of challenges for urban communities, and these are the problems that students will attempt to solve through their constructions.



The backdrop to this scenario is the city of Newtown, a fictitious urban environment undergoing redevelopment. In this setting, students enter as constructors, and must plan and create new urban landscapes to meet the needs of the growing population.

To set the scene, students explore the concepts of urbanization, communities and sustainability, to gain an understanding of the world they are building in. They must not only build to meet their own needs and interests, but create urban structures and spaces, that benefit many different groups of people.

Having gained an understanding of the issues they face as constructors, students enter a planning phase. Here they plan their builds using analog materials and tools, letting their ideas take form in an off game setting. After developing a common idea of what they will build, students present it to the class, who provide feedback and ideas for improvement.

Once the students have presented and implemented the groups suggestions, they bring it into Minecraft to develop it further. Here the plans are brought to life and students are encouraged to come up with more creative ideas and express them through the game.

21st Century Skills and Game Based Learning

Students work together in groups around planning and creating solutions in game. This is a skill that games in particular support well, since the culture around gaming is characterized by sharing information, collaboration and creativity. Studies show that digital games nurture the development of self confidence- and self esteem, because they are designed to constantly challenge gamers at the edge of their ability.

In this Minecraft scenario, students face construction challenges of increasing complexity, whilst letting them iterate on their plans, as they bring them to life in the game. This progress is only possible through a continuous cycle of trial and error. In return, the students will often experience the satisfaction of succeeding at a challenge, and this builds their self confidence.

The underlying mechanic of this game is the simple joy of seeing an idea come to life, which is one of the driving dynamics when players enter Minecraft in creative mode. The motivating factor behind the game is the game itself, and not the prospect of advancing in a reward system. This however, does not eliminate a teachers' role of motivating with other means, such as organizing each build as a competition.

Backstory

Newtown is a city that has emerged around its colossal coal driven power plant, which now has been closed down and is in a state of stagnation. The city has found new ways to



sustain itself after the powerplant has been dismantled and is now undergoing rapid expansion with the construction of new residential and commercial areas.

At the same time the old city is undergoing the restoration both buildings and urban spaces. The city has become an attractive location for a diverse cross section of the population, both because of work-, cultural- and recreational opportunities. This means that the urban spaces being developed are required to meet many different interests.

The new district plan has the general goal that the city must be a living city - 24 hours a day. To achieve this, the plan has the following requirements of all new constructions:

- They must be multifunctional.
- They must utilize all space optimally.
- They must activate and engage their surroundings.

Chapter 1: Tutorial and Renovation

Before students enter the game, the teacher must divide students into groups, if possible with 3 in each group. Each group is assigned a number, which is to be used to navigate throughout the rest of the game. Upon entering the game, students enter a chamber where they get to choose between tutorial and spawn - here they must select "tutorial" to enter chapter one. From here they enter a lobby with 10 portals, where they proceed through the portal corresponding to their group number. (Also shown in the video introduction)

Aims

- To let beginners get accustomed to the Minecraft interface and control of the avatar.
- To introduce the concept of urbanization.
- To practice teamwork around a common production.

Lesson Overview

Chapter one takes its beginning in a familiar environment, the home, which surrounds the private sphere. In groups, students move through an apartment complex, which has been transformed into a Minecraft tutorial. This tutorial is designed to prepare students to move around in Minecraft, interact with the user interface, build with, and remove blocks.

In the final stage of the tutorial, each group must collaborate in designing and placing various small structures. This small assignment is a practice ground for the upcoming assignments, that become more complex as they progress.

In their planning, students must show that they can utilize a new area - the roof, to create a common space for the residents. The roof is to be made multifunctional and serve a variety of interests. Students must come up with ideas that demonstrate an optimal use of the space. Their small constructions must show that they have an eye for the interests of the community before those of individual groups.



Before going in game, students must be equipped with a background knowledge and understanding of the context they are building in, and why. In preparation, students investigate the concept of **urbanization**, to gain insight into the necessity of building multifunctional facilities on a roof.

Before (2-3 hours)

1. The teacher divides the class into groups, preferably with 3 in each group. In preparation for the tutorial, each group member selects a colour, either blue, yellow, orange or pink - to be used when moving through the tutorial.
2. Getting into character: The groups agree on a name for their construction company and make a logo.
3. Investigating urbanization. Opening questions:
 - Why are urban populations growing? [See teacher / student resources](#)
 - What is a private, a common, and a public space?
 - Which purposes can a roof be used for in a residential building?
4. The teacher shows intro video to the chapter and the groups preview the roof they will be building on. Their constructions must include:
 - An outdoor kitchen facility.
 - A table and bench area
 - Three trees
 - A greenhouse
 - A secure perimeter
5. Groups discuss how they wish to make a common space on the roof and sketch their idea on the template available in the student menu.
6. Groups present their ideas to another group or the whole class, who provide feedback and suggestions for the build. If time permits, this phase can be framed as a public hearing, where different groups are assigned the role of a group of residents. This can be children, teenagers, families, and elderly residents.
7. If necessary, the teacher runs through the names and placement of specific keys (such as [Shift] and [Escape]) on the keyboard, as these will be needed when playing the tutorial.
8. The teacher establishes a codex for good in game behaviour together with the class. These can be:
 - Keep a respectful tone in the chat. This means that you do not write ugly messages to or about others or use swearwords.
 - Do not break or interfere with other player's constructions.
 - Follow the teacher's in game and off game instructions.

In Game (1½-2 hours)

1. Students enter the spawn area and find their way to their tutorial building using the number assigned to their group.



2. Students play through the first stages of the tutorial together. This will take approximately 20 minutes.
3. When students have completed this, the teacher can activate the “Students can build” function. This will allow students to complete the final stage of the tutorial, which takes place on the roof. Here they build their ideas on to the rooftop.
4. The teacher pauses the game and lets students show their builds to each other. This can be organized as a group to group activity (1 and 2, 3 and 4 etc), or a class activity. The groups provide each other with feedback.
5. The groups go back to their build to make a second and final iteration.
6. The groups document their work using screenshots or video recordings.

After (2 - 2½ hours)

1. Using their documentation material, the groups prepare their presentations. Here they must answer the following questions:
 - What have we built?
 - Why did we build it like this?
 - How do your constructions benefit the interests of the residents?
 - Did you follow your plan? Why? / Why not?
 - How did you perform together as a team?
2. The teacher summarizes the main points from the presentations and recaps the questions from the **Before** phase.
3. The groups are asked to reflect on the quality of their teamwork and suggest ways to optimize or improve this.

Evidence of learning

- Students can demonstrate a basic understanding of urbanization through designing and building basic structures.
- Students can develop and improve a design through a cycle of iteration, feedback and reiteration.
- Students can reflect on their own ability to participate in a team.

Chapter 2: Restoration

Aims

- To give an understanding of how different groups of people interact with buildings in a public space.
- To give students experience with administrating / running a design - and production process.
- That students have focus on architecture worthy of preservation and are able to see the qualities in a building.

Lesson Overview

The starting point of this chapter is an existing building from the old part of Newtown.



The assignment is to restore the building, so that the outer walls are kept intact, but the building is outfitted with new facilities, such as shops, offices or other functions. The main criteria is that the new building is to create a living urban space in all 24 hours of the day.

When designing their house, students must take the following into consideration:

- It must be multifunctional, i.e. it must cater to the needs of different groups of people, both the interior and the exterior.
- The exterior of the building must include public amenities such as playgrounds, benches or restrooms.
- The exterior must activate its surroundings; it should be interesting to be around the building.

A point to be made before entering this building assignment is how construction takes place in real life and how the students workflow differs from real world construction. Even though building in Minecraft can represent a real world construction project well, the main difference is that Minecraft lets the player reiterate on what has been built. A real world construction does not allow this - but when working in Minecraft, we are given a tool for "spatial sketching".

Before (3-4 hours)

1. Introduction to restoration: Use a case as an example. [See teacher / student resources](#)
2. To get students reflecting on life in urban environments, the teacher can open a discussion based on these questions:
 - Which groups of people occupy different areas of a city - and when?
 - What are the dangers of urban areas that only consist of office buildings?
 - How can the exterior of a building be designed, so it becomes connected to its surroundings? - Especially outside office hours.
3. Students can retrieve a template from the site ciobmc.org, where they also can inspect an image of the building they will be working on.
4. Students plan the restoration in groups and sketch out their plan on the templates. In planning students must prepare to create a presentation of what they intend to do with the building. Here using different means of expression such as blocks or manifold paper will become useful in order to visually express their plan.
5. In the next phase the groups must present their plans to each other. This exercise is to mimic the democratic process that takes place, before a building is restored - the local development plan is taken to a public consultation, where residents are given the opportunity to give critique and feedback on the plan. This can be organized as a presentation for the whole class or a group to group exercise.
6. The groups take note of the different responses and revise their plan.
7. Before entering the game students are presented to the build tool (video), which will allow them to perform demolition more swiftly.



8. The teacher establishes an understanding of good in game behaviour together with the class. (see chapter 1)

In Game (3-4 hours)

1. The groups enter the spawn area and find their designated building via the number assigned to their group.
2. The teacher gives the groups an hour to produce a first iteration.
3. The game is paused and groups are allowed to inspect the response groups build. The groups provide each other with feedback. The game can be paused by using the "Freeze" button or deactivating the "Students can build" button. This allows students to either view each others builds off game or in game, depending on how the teacher wishes to organize the lesson.
4. The groups evaluate the feedback and create a second iteration. This process may be repeated 2-3 times, before the final build is completed.
5. At the end of the in game session, the groups document their constructions using screenshots or screen recordings.

After (1-2 hours)

1. The groups prepare a presentation where they answer the questions:
 - What have you built?
 - Why did you build it like that?
 - How does your building engage its users?
 - How is the building connected to the public space around it?
 - Did you follow your plan? Why? / Why not?
 - How did you perform as a team?
2. After the presentations the teacher should summarize, creating a connection between the aims of the lesson and the constructions that the students have developed.

Evidence of learning

- The students demonstrate an understanding of how buildings are connected to their surroundings.
- The students demonstrate an understanding of the need to create multifunctional buildings.

Chapter 3: Construction

Aims

- To use Minecraft to show innovative solutions to a multifunctional urban structure.



- To develop skills in collaboration.
- To gain an understanding of the professions that work together to create a complete construction.
- To give an understanding of the factors taken into account, and the criteria that must be met, when creating a new urban space

Lesson Overview

In this chapter, the groups visit a construction site where they will produce a building from scratch. The work in Minecraft is meant to reflect, as far as possible, the processes that a real construction project would undergo. In order to illustrate this working procedure, the students can find inspiration at the site goconstruct.org, where they can see the various roles and phases that are involved in the creation of a building.

The teacher simplifies these phases to match a Minecraft context, and introduces the five stages that the group must use as the framework for their production. These are:

- Design and planning (off game)
- Foundation
- Basic structure
- Facades
- Detailing

When these have been described, the class is introduced to three constraints that they must take account of when they begin:

- The building must take into account people on street level and provide attractive facilities such as shops, entertainment facilities and play areas.
- The building must provide the framework for an attractive working environment which allows for a flexible workspace.
- The building must make use of its height, and must have at least five storeys.

Before (2 - 3 hours)

1. Introduction to construction: The students gain a deeper insight into the complexity of a construction project through the site goconstruct.org.
2. On this basis, the students in the group discuss where they see themselves in a construction project, and then try to translate this into the work with Minecraft.
3. The teacher provides a basis for the construction challenge the groups must solve. The students are given three constraints that must serve as a common thread in their solution:
 - The building must take into account people on street level and provide attractive facilities such as shops, entertainment facilities and play areas.
 - The building must provide the framework for an attractive working environment which allows for a flexible workspace.
 - The building must make use of its height, and must have at least five storeys.



4. As inspiration, the groups can study these cases: 8house, Bjerget, Superkilen. [See student / teacher resources](#)
5. The groups are given the specifications for their building site via ciobmc.org, and print out templates as necessary.
6. The groups begin to design their building with pencil and paper, and possibly various materials such as lego blocks, centicubes and manifold paper.
7. The groups must present their plans to each other. Here residents are given the opportunity to give critique and feedback on the plan. This can be organized as a presentation for the whole class or a group to group exercise.
8. The groups take note of the different inputs and revise their plan.
9. The teacher makes it clear to all which stages must be followed during construction:
 - Phase 1: Preparation of the site, establishment of a foundation/basement level.
 - Phase 2: Basic structure, establishment of the outline and edges of the building.
 - Phase 3: Facades: The basic structure is filled out with horizontal and vertical surfaces.
 - Phase 4: Detailing: The fixtures, vegetation and urban space around the building are worked on.

In game (3 - 4 hours)

1. The groups log in to Minecraft and find their way to their construction site.
2. Phase 1 (45 min): The groups prepare their sites for construction and possibly establish a basement storey. The teacher pauses the game and asks the students to document this phase.
3. Phase 2 (60 min): The teacher outlines the goal for the next phase, and allows the groups to begin work again. It is important that the students understand the importance of not producing surfaces, but only working on the outline. The teacher pauses the game and asks the students to document the finished outline.
4. Phase 3 (60 min): The teacher outlines the goal for the next phase, in which the students must choose the materials and fill out all the surfaces. The teacher pauses the game and asks the students to document their work.
5. Phase 4: (60 min): The teacher outlines the goal for this stage and emphasises that the building's link to the public space is the primary task to be solved. The challenge for the groups here will be to prioritise between the necessary and the cosmetic details. When the time is up, the teacher pauses the game and asks the students to document their work.

After (1 - 2 hours)

1. The groups prepare their presentations, in which they reply to the following questions:
 - What have you built?



- How have you built it? (Show pictures from the documentation of the progression.)
- Why did you build it like this?
- How does your building interact with the urban space?
- How does your building create quality for all citizens of the city?
- Did you adhere to your plan? Why / Why not?
- What went well/badly in your teamwork? How could this be improved next time?

2. The teacher summarises the students' work and links it to the constraints under which the students have been working.

Evidence of Learning

- The pupil shows an understanding of multifunctional construction in a virtual model.
- The student can demonstrate knowledge of the phases of a construction process.
- The student can reflect on and assess the quality of teamwork in a joint project.

Chapter 4: Refurbishment

Aims

- To allow students to appreciate the remarkable characteristics of a historic building.
- To allow students to gain experience with an authentic, large-scale construction project.
- To challenge students to work in larger teams.

Lesson Overview

Battersea Power Station is a gigantic monument, and represents a piece of history that is worthy of preservation. The building is iconic and serves as a landmark for the city, for which reason it is a listed building. The preservation order applies specifically to the four distinctive chimneys at each corner of the building, which may not be demolished. Apart from these, the groups may freely decide which new features they will give the building.

As input for this challenge, it can be an advantage to break the task down into several possible tracks. This may be structured by considering the basis of the following functions:

- *Live*: Install residences.
- *Work*: Give companies office facilities.
- *Play*: Transform into an interactive, entertaining and playful environment.



- *Shop*: Equip with shops and shopping facilities.
- *Eat*: Equip with restaurants and cafes.
- *Stay*: Create accommodation possibilities.

This division is taken from the current [redevelopment project](#), which creates a mixture of all six possibilities. The groups can draw inspiration from this and plan their project with emphasis on specific functions.

The construction planning may be based on the following questions:

- What functions does our group wish to emphasise when we redevelop the building?
- Which parts of the existing structure are suitable for the various tracks?
- Which parts of the structure should be demolished / preserved?
- Which group members will take responsibility for the various phases?

The project undergoes five different phases:

- Design and planning (off game)
- Demolition
- Basic structure
- Facades / exterior
- Detailing / interior

These phases include elements of the working procedures the groups have already experienced in Chapters 2 and 3. The challenge in this project is that the size of the building makes demands on the group's ability to see overall solutions while at the same time dividing the whole building into smaller tasks that can be delegated within the group.

A second focus area that groups should be aware of is that they need to work from "the rough" towards "the detailed". It is a pitfall to begin detailing too early, and here it is important that the teacher, as facilitator, requires the groups to undergo all the phases of construction, which ensures that a virtual rough sketch is created before detailing takes place.

The groups plan their constructions using the templates that have been placed at their disposal. In these, you can see the building from five sides, plus an isometric view. It may be beneficial to discuss together how to exploit that fact that the group has many members, and ways to turn this into an advantage rather than a disadvantage. These might for example include:

- Appointing a group leader
- Delegating areas of the building to a team with a specific task
- Creating a team to come up with a separate proposal for how, for example, shops or offices should be implemented.
- The group can also choose to split into two sub-groups, each of which develops a draft plan, after which the group as a whole agrees on which ideas they wish to further develop.



When the groups have developed a plan for the redevelopment, they present it. Here they must argue for the choices they have made, and explain how their idea will benefit the citizens of Newtown.

Before (3 - 5 hours)

1. The groups investigate Battersea Power Station in order to obtain an understanding of the building's characteristics and architectural value. Here it is worth noting that:
 - The building is one of the largest brick buildings in the world.
 - It is one of London's most famous landmarks.
 - The fame of the building is partly due to its inclusion as a reference in several areas of popular culture.
2. [See teacher/ student resources](#)
3. The teacher introduces six different approaches to the redevelopment of the building: *Live, work, play, shop, eat, stay*. Here it may be remarked that there have been concrete plans to turn the plant into an amusement park or a football stadium.
4. The teacher composes new groups, in which the groups go together, 1 and 2, 3 and 4, etc. The teacher explains to the class that the challenge is to create both a good solution and good teamwork. This is more difficult with larger groups.
5. The teacher facilitates a joint discussion of how to structure the group work when there are more members. The teacher indicates various proposals – as described in the Lesson Overview.
6. The groups then begin developing ideas for the redevelopment and outline how it should look. The groups use the templates available through ciobmc.org.
7. When the groups have drawn up their initial proposals, the teacher outlines the phases of construction to all the groups, and stresses the importance of working with a "rough sketch" before going into details.
8. The groups then discuss how to approach the construction process, and prepare a presentation in which they show and explain what they want to build, and how they will delegate the work.
9. The groups receive feedback from each other at each presentation.

In game (4 - 6 hours)

1. The groups log in to Minecraft and make their way to their construction site. Those students who wish to do so can try out the "build tool" in a separate construction area. The teacher can assign selected students to this skill.
2. The groups begin the first phase, demolition. It can be convenient for a student with permission to use the "build tool" to do this work. While this is going on, the second phase, basic structures, may be initiated by students who are not involved in demolition.
3. After about 45 mins the teacher pauses the game and indicates that the groups now need to move on from demolition to establishing the final basic structure. Students must document the process with screenshots.



4. In the same way, the teacher initiates the next two phases by pausing the game and asking everyone to document the process with screenshots. It is important that the teacher sets time limits, so that students feel that they have a deadline by which they must reach a certain goal.
5. When the construction has reached the detailing phase, the teacher can assign extra time, during which the groups can go back and create new iterations. The challenge of this task is that it can take a very long time to be “finished”. Here, an important lesson of iterative workflows is that you are constantly in a process in which the product is being refined.
6. Finally, the groups document their work with screenshots, and possibly video recordings.

After (2 - 3 hours)

1. The groups prepare presentations of their constructions, in which they must answer the following questions:
 - What have you built?
 - Why did you build it like this?
 - What have you done to emphasise / preserve the building’s special characteristics?
 - How will the citizens of the city benefit from this building?
 - How do you assess your own ability to perform together as a team?
 - How do you think things might possibly be done better next time?
2. The groups present their constructions and answer the above questions.
3. The teacher sums up and highlights the challenges that the groups encountered, and uses these as the basis for a class discussion on the complexity of teamwork in joint productions.

Evidence of Learning

- The student shows awareness of preservation-worthy constructions in a building.
- The student can show a production that has been developed through several specific construction phases.
- The student can reflect on teamwork in a group, and on how this might be improved.

