Bird house

Summary

Age category
9 - 12 years
Topic
Geometry
Measurement
Total duration
480 minutes

The students need to find out about birds that live nearby and design a bird house for them using a 3D-design program Tinkercad.

Problems to be tackled:

- What kind of birds live near your school or your home?
- What kind of bird house do they need?
- What is 3D-designing and how can you use a 3D-design program?

Real context

Real world motivation

There are many birds that live near your school or your home. Nowadays, birds have a hard time finding natural places to nest. Fortunately, we can help them. Your task is to find out about birds that live near you and design and build a bird house for them. For the design work, you are going to use 3D design software.

Goals

Skills

Science:

- Observing and recognizing birds based on criteria.
- Searching information about birds in the neighbourhood. E.g. on the internet, in books

Mathematics:

- 3D-modelling. (using software tools such as Tinkercad)
- Measuring.
- Scaling.

Technology - Engineering:

- Designing (students need to plan and draw a sketch of their bird house).
- Building (students need to build a good bird house based upon criteria).
- Using different tools in order to build with wood

Knowledge

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Mathematics:

- Scaling.
- 3D-modelling.

Science:

- Life of birds in the own region.
- Finding out the criteria for birdhouses in order to be suitable for a certain kind of bird.

Technology - Engineering:

- New technology 3D-modelling and 3D-printing.

Methodology

Part	Description	Timing
1	**Introduction: Group work** • Students need to find information about birds that live near and the need of a bird house to nest • Students need to find information about the size and shape of bird houses • Students need to be aware that if you want to use the bird house many years, they have to make sure you can clean it (*see tips & tricks, task 4*) • Students draw a picture of their bird house mentioning the real size measurements (*see worksheet, p. 6*)	45'
2	**Designing the bird house using 3D-program: Group work** Teachers introduction to 3D-program Tinkercad. *(see tips & tricks)* Students will design their bird house in Tinkercad because this will give them the opportunity to think concrete of every part they need in order to build the birdhouse. It gives them also a clear view on how it will look like. In fact they will behave a bit like real architects. But before starting to work in Tinkercad some preparations need to be done: • Students need to scale every measurement in scale 1:5, because they will use this scale in Tinkercad (*see worksheet, p.7*) • Students need to change units to millimeters, because Tinkercad uses millimeters (*see worksheet, p. 7)* When students have done this, they can start to design their bird house in a scale 1:5.	90'
3	**Making a plan of the different parts of the bird house: Group work** When the designing is done, students draw pictures, with measurements, of the different parts they need in order to build a full-sized bird house. In this excercise, they will use real measurements again... So they will need to scale again from 1:5 to real measurements. *(see worksheet, p. 8)*	45'

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4	**plans for the bird houses: Teacher evaluation** The teacher approves the plans for the bird houses and students can start to build their bird houses from wood.	135'
5	**attach bird houses: Group work** When the bird houses are ready, the class can go out and mount a couple of these bird houses near the school or take the bird houses home and mount them there. A useful task for faster teams is to find information about how to mount your bird house to a tree and what kind of laws there are in this regard.	45'
6	**Decorating the bird house: Group work** For faster teams, there can be an extra task to design a bird for their bird house with Tinkercad. Students can also be asked to design their own room, dream house etc.	90'
7	**Final assessment: group discussion** Each team tells a little about their bird house and how they answered the questions in the assessment sheet.	30'

Organization

Materials

Per group:

- Computers, for 3D-modelling
- Mice
- Board 2 by 4
- Plywood can be used for the roof, make sure it can stand the moisture
- Screws
- Screw drivers (power drill)
- Rulers
- Saws
- Protractors

Grouping

Groups should be organized according to students' abilities, maths and manual skills. Good group size for this activity is 2-3 students per group.

Coaching

Useful questions

Concerning planning and building the bird house

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Make sure that kids can answer these questions:

- What shape is your bird house?
- What are the measurements?
- What are the measurements when you scale to 1:5?
- If you print your design, you can compare different scaling. Why is the area and volume not in scale 1:5?

Reflecting on the activity

- How did your group work together?
- How did you contribute to the group work?
- What were the biggest difficulties that your group faced?
- How did the group overcome those difficulties?

Adaptations

- At earlier ages and classes with greater difficulties, the teacher needs to help with scaling the part.
- It may be wise to demonstrate how to model a bird house or do an easier task with Tinkercad first.
- The teacher can add more mathematics and challenges into this activity by asking children to design the bird house roof at a certain angle. The angle makes building more difficult, but not impossible.
- If there is a need for a greater challenge, children can be asked to calculate the volume of their bird houses.
- It is a good idea to give different tasks to students at the building stage. It is a good idea to have a smaller group of builders at the same time.
- If each group has an extra task of making a report on the project, some students can work on their report while others are building.
- PowerPoint is a good solution for the report. Reports can be used for the assessment part later.

Assessment

Teacher's assessment:

- Schedule adequate
- Students' motivation and participation
- Group collaboration
- All the groups have presented a project
- Cooperation of the whole group on building a good bird house

Student's assessment:

The most important point about the assessment is that students need to know about it at the beginning of this activity. For this activity, the assessment can be carried out in many ways.

- If there are computers or iPads in your school, a report can be made that includes all steps in this project. It could include pictures, video, text and drawings. Worksheets can be part of this.
- The report can be made without computers, to include worksheets.
- Students can also answer questions after the activity. For example:
  - How did your group work together?
  - What did you do for your team to succeed?
  - What did others do for your team to succeed?
  - What were the greatest difficulties?
  - How did your team overcome those difficulties?

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Tips & tricks

Task no. 2

- What the teacher needs to know before starting with Tinkercad.
  - The teacher needs to create an account in Tinkercad. It is a good idea to make one account for your class so that it is easier to log in.
  - Before the design work can start, the teacher should demonstrate how Tinkercad works. There are great tutorials on youtube, for example https://www.youtube.com/watch?v=CSEvXe1qRBI
  - The most important features to start with are: moving an object (also moving it up or down), scaling an object, scaling an object's dimension to a certain size, changing an object's angle, making a hole, rotating the view, zooming in and out, grouping and ungrouping.
  - Tinkercad works in millimetres so make sure that children understand that they need to scale their bird house before they start to model (work sheet).
  - It is good idea to make one Tinkercad account for the whole class.

Task no. 3

- Make sure that children draw every part that they need and put the right measurements into their plan.

Task no. 4

- Building instructions and different kind of bird house models are easy to find on the internet. You can find an example here.
- It is best to start building at the same time. For faster teams, check the extra tasks in part 6.
- Safety is the number one priority. Make sure that children know what they are doing.
- Don't use anything that doesn't belong to nature.
- Make holes for the screws before you drill so that the boards don't split.
- Measure one or two extra millimetres because of the saw, it is easier to remove wood than to add it.
- Small holes can be drilled into the bottom of your bird house to let the moisture out.
- The bird house needs to be cleaned every year. There are lots of different ways to build it for cleaning. The easiest way is so that you can open the roof or the bottom. These pictures show one solution.

Task no. 5

- Mount the bird house so that tree can grow. The rope can point a little upwards around the tree.
- A good height is over two metres so it is harder for children to disturb the birds.
- It is a good idea to drill small holes in the bird house for the rope.