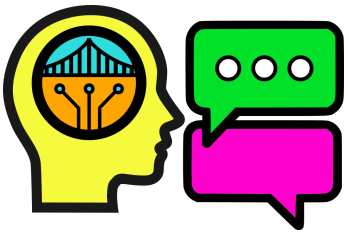


Solve a problem with LEGO Spike

Lesson summary

Based on a story, the students build and program elements that can help the story's main characters in different ways. By emphasizing, analyzing and problem solving the students come up with ideas, build prototypes and test and qualify them. LEGO Spike Prime is used.

Target Audience: *12-14 years old students with little prior knowledge about the subject*
Duration: *3 lessons of 45 minutes + optional lunch break*
Learning goals: General skills: teamwork, logical thinking, problem solving, and decision making. CT foundations: Decomposition
Online or offline: Offline
Computational Thinking:

- **CT-concepts**:
    - Decomposition➔ dividing a problem into small pieces
    - Pattern recognition ➔ looking for similarities or patterns within those small pieces that can help you solve the problem.
    - Abstraction ➔ distinguishing

Particulars: Use og LEGO Spike Prime.

Materials

per group of 2-3 students

- A set of LEGO Spike Prime (with a selection of different LEGO bricks)
- Ipad, laptop or computer with internet access (to use LEGO Spike website)
- Tape in different colours (red, blue, yellow etc.)
- Scissors, pen etc.
- Evt. cardboard and other materials to build the universe from the story

Preparation

1. Find a relevant local story - see Appendix 1 for inspiration
2. Create a design challenge – what is most important? To get the creation to drive, stop, or...?
3. Set-up the location:

a. Space where the students can stand up in a circle for Shared Memory (see appendix 2)
b. Tables for each group– with LEGO Spike Prime, ipad, tape and other materials
c. Create a test lane – a table that illustrate the universe of the story

4. Print hand-outs with the most used codes

Evaluation

Before every lesson the teacher decides what is the most important evaluation criteria based on the learning dimensions - see Appendix 4.

Lesson Description – **Solve a problem with LEGO Spike**

The workshop is divided into 3 lessons. They can be taken consecutively in one day or spread out over more days.

Lesson 1 – About Computational Thinking and Inspiration

Introduction to Computational Thinking (10 minutes)

Ask the students:
- What do you know about how computers and telephones work?
- Can they think for themselves? (Why or why not?)
- Who controls what a computer does?
- Are computers creative?
- Can computers solve problems?

Explain to the students that they are going to work on Computational Thinking. Simply put, this involves learning how to get a computer to solve a problem for you. It is not merely programming, but also, for example, learning how to break down a problem into pieces, or recognizing patterns so you can better solve a problem.

There are four main foundations of CT:

- Decomposition➜ dividing a problem into small pieces
- Pattern recognition ➜ looking for similarities or patterns within those small pieces that can help you solve the problem.
- Abstraction ➜ distinguishing between the main and secondary issues. What is really important to solve the problem?
- Algorithms ➜ coming up with step-by-step instructions to solve the problem. In this lesson you will be introduced to pattern recognition

xx - a small exercise (10 min) (SKAL HAVE FUNDET GOD ØVELSE)
Short exercise which illustration the concepts of computational thinking

Read the story loud (5 min)

The students sit in a circle – on the floor or at chairs (alternative at their tables as normal). Most important is that everyone sits comfortably and is able to hear the story.. The teacher read the story out loud.

Shared memory (15 min) (Barnbookbadet – see appendix 2)
The students stands in a circle and the teacher is the middle asking questions:

- What can you remember about the world in which the story takes place?
- Who do we meet in the story?
    - What do you remember about them? Their relationships etc.
- What has happened in the story so far?
- Which themes are there in the story?
- Etc.

Every student is allowed to give one answer, before the next student in the circle takes over etc. When no one has more to answer a question, the teacher asks the next question.

Sum up (5 min)

The teacher summarizes what the shared memory is and ensures it's written down/the students remember the main part and tells what to expect in the next lesson or immediately continue to the next step if the workshop is continuous. .

Lesson 2 – Inspiration and ideation

Our design challenge (10 min)

The students are divided into small groups (2-3 persons) and start to come up with ideas to help the people in the story. After 5 min. every groups tells the others about their ideas to inspire each other.

Every group writes down their design challenges - ex. "how do we build a creature, that can fly and catch the storch, so it will not damaging the cornfield".

Intro to LEGO Spike (5 min)

Short introduction to the most used functions in LEGO Spike (see Appendix 3)

Build your creation and test (30 min)

Every group builds and tests their creation.

Lesson 3 - Ideation and reflections

Test and iteration (30 min)

All the students meet at the testlane and every group presents their idea and solution. The different creations are tested and every group receives feedback from the other students.

Based on the feedback the creations are improved - if time for it.

Reflections and sum-up (15 min)

- What did we learn?
- Was it difficult to come up with ideas?
- Was it difficult to realize your idea?
- Where can we use what we learned?
- Etc.

Appendix 1 - Choose a relevant story

“Fool stories” or joke tales exist in many cultures! It’s a global phenomenon to tell humorous stories about a “silly” neighboring town or a particular group. Here are some examples:

- **Molbohistorier** (Denmark) - Popular humorous tales, where the point is often to make fun of the particular group by portraying them as naïve, foolish, or clumsy.

- **Tyltyl and Jan** (The Netherlands) — Stories about naive villagers, often from Kampen or Urk.

- **Lepe jokes** — stories and jokes about people from **Lepe**, a town in Andalusia. In Spanish humor, **“chistes de Lepe”** are jokes that portray the people of Lepe as naive or not very clever.

- **Gotham stories** (England) — “The Wise Men of Gotham” are old tales about the people of Gotham acting foolishly to avoid having the king visit them.

- **The Citizens of Schilda** (Germany) — “Die Schildbürger” are stories of townspeople doing comically stupid things, like trying to carry sunlight into the town hall in sacks.

- **Nasreddin Hodja** (Turkey and the Middle East) — Slightly different, as although he acts foolishly, his tales usually have a deeper point or moral behind the joke.

These stories often serve as social satire and folk entertainment — and they reflect that humor about “foolishness” and human mistakes is universal.

The story should be easy to read and understand and shouldn’t take longer than 3-5 min. to read loud.

Appendix 2 - Shared Memory method

https://www.laesesporet.dk/sites/default/files/inline-files/Pixiudgave%20af%20det%20norske%20barnbokbad_tryk.pdf (in danish)

Introduction
The Norwegian *barnebokbad* (children's book bath) is quite a comprehensive method for delving deeper into the plot of a novel. The idea of using this method at the Book Camp is to give participating children tools to formulate questions for the author that go beyond the classic “How much do you earn?” and “How long did it take to write the book?”

For the Book Camp, we suggest using a less comprehensive version of the method. Here is a guide on how you can work with it.

If you would like to explore the *barnebokbad* method in more depth, you can read more on the website: https://barnebokbad.no/om-metoden/

Shared Memory
Shared memory is an exercise designed to reactivate the children’s knowledge about the story, setting, and characters of the book. The exercise takes place in a circle, where all the children sit on chairs.

The teacher or librarian asks the students a question, for example, “What can you remember about the main character?” Each student contributes one piece of information and then passes the turn on. If a student can’t think of anything new, they say “pass.” Afterwards, the facilitator asks if anyone has something to add.

When the main character has been thoroughly described, you move on with a question about another character, the plot, or the setting.

Examples of questions for the exercise:

- What can you remember about the world in which the story takes place?
- What can you remember about the relationships between the characters?
- What has happened in the story so far?

The task:

Make a vehicle, which can transport the peasant to the stork in the field without damaging the cornfield (too much)

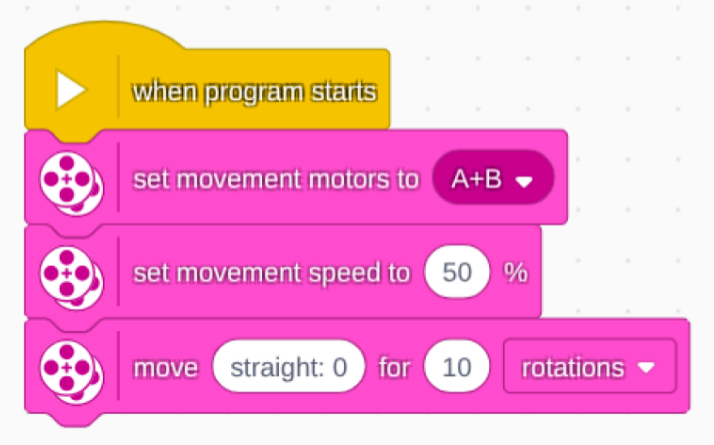
Materials:

- 1 set of Lego Spike Prime
- A peasant (Lego-figure)
- A stork (another Lego-figure)

App:

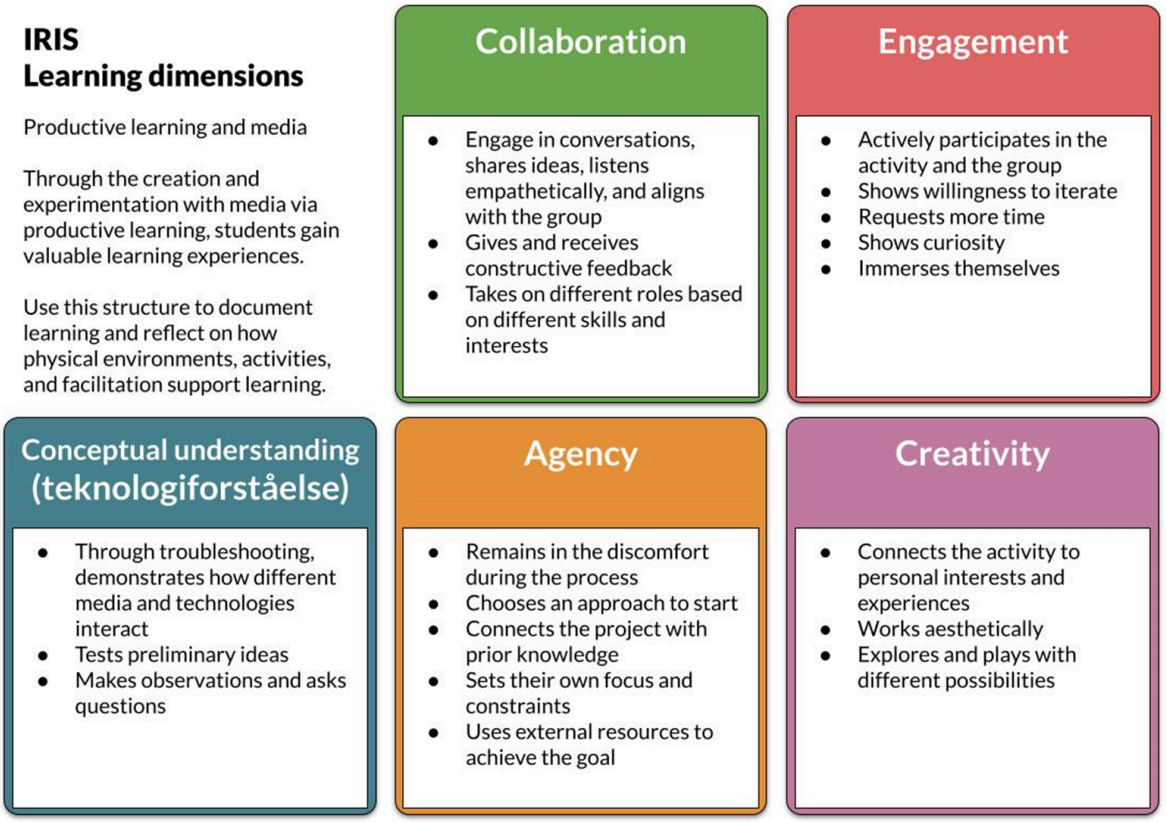
Kortlink.dk/2mqqr

Basic stack:



Appendix 4 - Learning Dimensions

Learning Dimensions are developed at The Thinkering Studio at Exploratorium in San Francisco, US and our work toward reflections are deeply inspired by their work.



What Do We Want Participants to Gain from Our Activities – and How Do We Ensure That It Happens?

Quality in teaching is both a complex and sometimes controversial topic. Therefore, we use the **Learning Dimensions** – a dynamic tool developed by the Exploratorium in San Francisco. We use the Learning Dimensions to document learning and to evaluate whether we succeed in providing participants with a valuable and meaningful experience through our activities.

Our Starting Point

When we develop and evaluate an activity, we always ask ourselves:
What do we want to learn or find out through this activity?

To ensure a thorough and nuanced process, we work in three phases:

- **Pre-Meeting**
  Before the activity, we hold a meeting to determine which learning dimensions and which (two) indicators we want to focus on.

- **Green, Yellow, and Red**
  During the activity, an observer is present to take notes based on the agreed dimensions and indicators.
  Immediately after the activity, we gather for a short reflection session, assessing the activity using a red, yellow, and green model.

What worked well, what worked less well, and what didn't work at all?

- **Post-Meeting**
  The week after, we meet with the person or people who observed the activity for a deeper analysis of how the learning dimensions were reflected in the activity.

A Flexible Assessment Framework

We assess our activities using a range of learning dimensions and associated indicators. The areas of focus depend on the individual activity and therefore vary from time to time. However, we also compare the learning dimensions across different activities to identify patterns—whether certain dimensions are being neglected, need updating, or could be improved.

The learning dimensions are crucial for assessing the participants' outcomes from the workshop, but also for gaining insights into the breadth, depth, and level of our activities in general.

A Tool for Continuous Improvement

The goal of working with the learning dimensions is not to reach a final answer, but to ensure ongoing development. Our approach is to **"be on the right path"**, rather than to meet a fixed, predefined goal. The tool is therefore **not** a measuring device, but should remain a dynamic aid that supports educators in creating inspiring and engaging learning experiences.