Lego* Algorithmics

Teachers' guide

An activity by Grok Academy

Teacher's notes

*LEGO is a trademark of the LEGO Group

Nuts and bolts

Suggested year groups: **Years 5 to 6**
(can be modified to suit Years 3 & 4, or Years 7 & 8, as outlined in the Appendix)

Subject areas: **Digital technologies**

Suggested timing: **30 minutes + (one lesson)**

What we'll be doing?

In this activity students will:

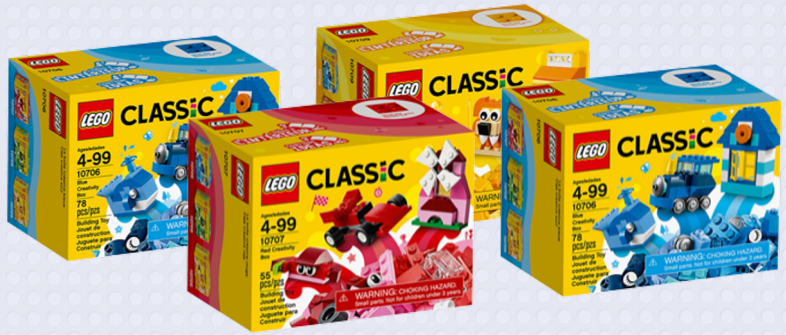
- Solve problems with collaboration
- Follow instructions / Give good, clear instructions
- Link following instructions with algorithms
- Learn about clear communication and specification
- Learn about transforming information from one form to another (visual to spoken text)

Resources needed

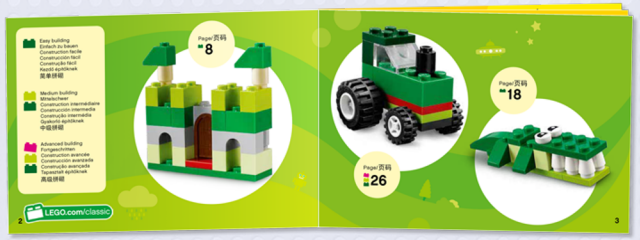
1. Lego Packs (approximately 50 pieces) - the Blue, Red, Green and Orange Creativity Boxes are good for our purposes.

2. Lego Packs must contain simple Lego instructions.

1



2



Set up

Getting the students ready

Students are grouped in pairs

Students should sit opposite each other, or next to each other (easier)

Within each pair, students identify who will be the “**builder**” and who will be the “**instructor**”

Ensure the rules are clearly stated and understood before students open lego kits or instructions

Rules

Instructor is the only one who can see the instruction book and must keep it out of sight of the builder.

Builder is the only one who can touch the lego pieces

Instructor must communicate the instructions using only words (no pointing)

Instructor will only be allowed to look at the instructions after the 1 minute strategy

Students who finish the activity need to call out and wave to indicate that they are finished (this is a race!)

Run the activity

Run the activity

1. Once everyone is ready and each student knows their role start a timer for **1 minute** and let the students open the lego pieces and have strategy discussion time.
2. Time 1 minute
3. Tell students to stop discussion and allow the **instructor** to open the instructions.
4. **Time the activity** - keep track of the fastest team but allow the other teams to continue until complete.

Discussion

Discussion Questions

- Who found that easy or difficult? Why?
- If students were sitting opposite from one another, was it hard for the instructor to use ‘left’ and ‘right’ from the builder’s perspective?
- If you had the strategy discussion time again would you use a different strategy?
- What words did you use to identify your pieces?
- How did you order your pieces before you began? Did you group by colour?

Rerun the activity

Re-run the activity

1. Swap **builder** and **instructor**
2. Tell students to that there is no planning time and allow the **instructor** to open the instructions.
3. **Time the activity** - keep track of the fastest team but allow the other teams to continue until complete.
4. Briefly discuss the differences with doing it a second time. What did you learn from the first run that you applied to the second?

Tying it back to the Curriculum

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There are 3 key ways to relate this activity to the Digital Technologies curriculum:


Algorithms


Data Representation including transformation from one data representation to another


Tracing and Testing

Tying it back to the Curriculum

Algorithms:

You needed to describe a set of steps to solve the problem of building the lego figure (ACTDIP010)

You needed to be precise in your explanations of each step (ACTDIP010)

You needed to have a common language to enable the communication of the steps. This common language is related to algorithms because of the need for precision but also related to Data representation because the common language is a convention we agree on to represent data (the instructions) (ACTDIK008, ACTDIP010)

Tying it back to the Curriculum

Data Representation and Transformation from one type of data to another:

How was the data (in the form of the lego pieces on the table) organised? By colour or by function, or some grid-representation with coordinates? If you needed to do the activity again would you lay the pieces out differently to begin with? (ACTDIK008)

There were two ways that the data involved in the instructions were represented...

Prompt for student ideas -- guide students towards the idea that the instructions were in visual form and needed to be transformed into verbal form (including text representation because of language) (ACTDIK008)

Tying it back to the Curriculum

Tracing and Testing

How would the activity differ if the builder and instructor were back to back?

Prompt for student ideas - guide the students towards the idea that the instructor would not know if the builder had placed a piece correctly or not, so the error could not be identified (ACTDIP029)

Appendix

Differentiation

- **For older students**: Ensure students sit opposite each other to add confusion of having to convert left and right directions.
- **For older, more capable students:** Have them sit back to back to add difficulty of communication without being able to see progress. *Link to testing and feedback*
- **For younger students:** Use larger bricks and simpler instructions.
- **For very young students:** Each child chooses 5 pieces that they put together and write an algorithm for how to make their shape (*also take photos*). Take the shape apart and instruct the builder to build their shape.

Thank You!

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