Tangible Programming & Inclusion

TangIn Toolbox
Length

9 -12+ years old

Length measurement	Scales
Velocity	Floor plan
Probotic	

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Summary

Concept of the floor plan and use of the 1:20 scale. Calculation of real distances from distances in the plant by direct measurement and using indirect measurements such as BOT speed and time.

Expected duration: **50 min** (the lesson plan duration is flexible, and teachers can adapt them accordingly to their needs and class duration).

Learning Outcomes

At the end of the session students are expected to:

- Apply the concept of scale to draw the floor plan;

- Calculate real distances from plant distance and vice-versa;

- Use direct and indirect length measurement such as speed and time to measure distances;

- Program the robot adequately;

- Value STEM areas;

- Develop transversal competencies such as problem-solving, communication and reasoning;

- Develop group work skills, namely, to respect and favor the inclusion of all elements, regardless of gender, culture, etc.

Links With Curriculum Topics

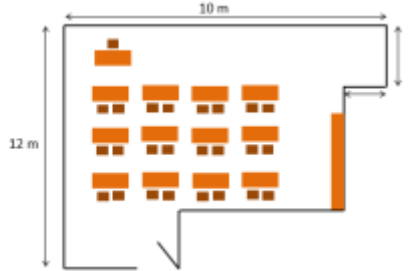| Covered Curriculum Topics		
	Subject	**Topics**
Engineering	**Mathematics**	Geometry and measures • Length Numbers and operations • Scale
	Science	Orientation in space and time • Velocity
	Technology	Programming • Concepts of programming • Programs – Results, errors, and troubleshooting Robotics • Programming objects to solve challenges

Notes for Teachers

The teacher should prepare, in advance, all the materials needed and the classroom according to the activities to be developed.

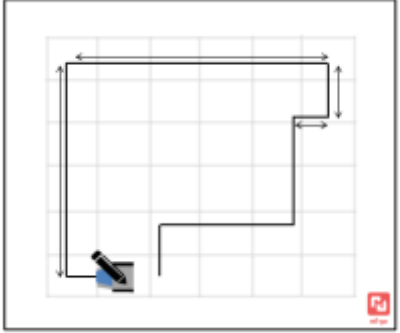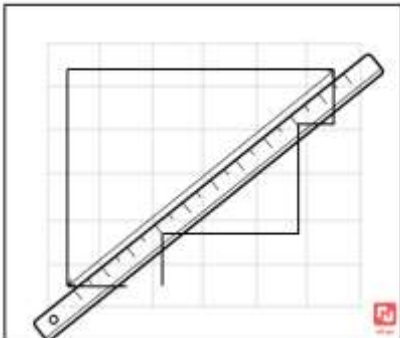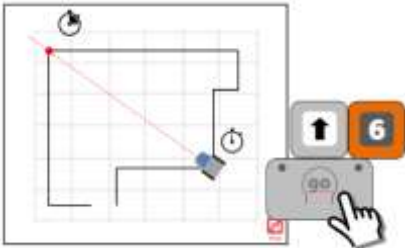The teams should be as heterogeneous as possible to foster the integration of all students.

It's important that clear rules are established in terms of the order of group work. This way, it avoids the most active children assuming the lead and the quitter ones only observing.

The teacher must circulate through the various groups to support the activities and the dynamics of each one. In the end, it should promote a collective discussion of the main issues focused and the constraints and difficulties experienced.

Lesson Plan

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Intro	5'	Class	"Today's mission is to teach MI-GO how to draw a plan." From an example, briefly, address the class and discuss what a plan is: a representation on a smaller scale of a structure seen from above. The teacher asks the class what forms exist to measure distances, exploring the students' answers.	
Prep	10'	Group	The teacher organizes the class into groups. Each group will have a picture with the main dimensions of the classroom (see the example), a measuring tape, paper and pen, a robot kit, a transparent scenario, and a marker. (Alternatively, the activity can be developed in a larger space and with fewer obstacles. In this case, the students themselves must take the necessary measurements.)	

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Challenge	10'	Class	The teacher asks each group to measure the distance that the BOT covers (10 cm for the normal front block and 1 cm for the decimal front block) and how long does it take (only for the normal front block) **Challenge 1:** The teacher asks the groups to draw a plan on a 1:20 scale using the BOT.	
Challenge	10'	Group	**Challenge 2:** Using the drawn plan, ask the students to determine the real distance between two easily accessible points in the classroom (they should be able to make the scale conversion). Ask them to confirm the calculations using the measuring tape and measuring the real distance.	
Challenge	10'	Group	**Challenge 3:** Using the drawn plan, ask the students to determine the real distance between two points in the classroom but, this time, instead of using a ruler, they must use the BOT and a stopwatch. They must calculate the distance from the measured time using the previously determined speed (the speed must be considered constant). Place the BOT on one corner and program it to cover the distance between the two points As the BOT crosses the endpoint register the time on the stopwatch. Note: The teacher can ask the students to achieve the same objective as in Challenge 2 but this time without the ruler.	

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Reflection	5'	Class	Although the teacher circulated through the various groups to support and correct the tasks, at the end it should promote a collective discussion and reflection on the lessons learned from this session, as well as the constraints and difficulties experienced.	

Resources List & Support Material

Per each group:

- A robot Kit with drawing capabilities;

- The picture with the main dimensions of the classroom;

- Transparent scenario with a 6x6 grid;

- Ruler;

- Stopwatch;

- Measuring tape;

- Pen and paper.