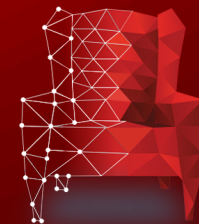# How To Teach ROS

Ricardo Téllez,
ROS teacher at
La Salle University, Barcelona

November, 2019

The Construct

For ROS Developers

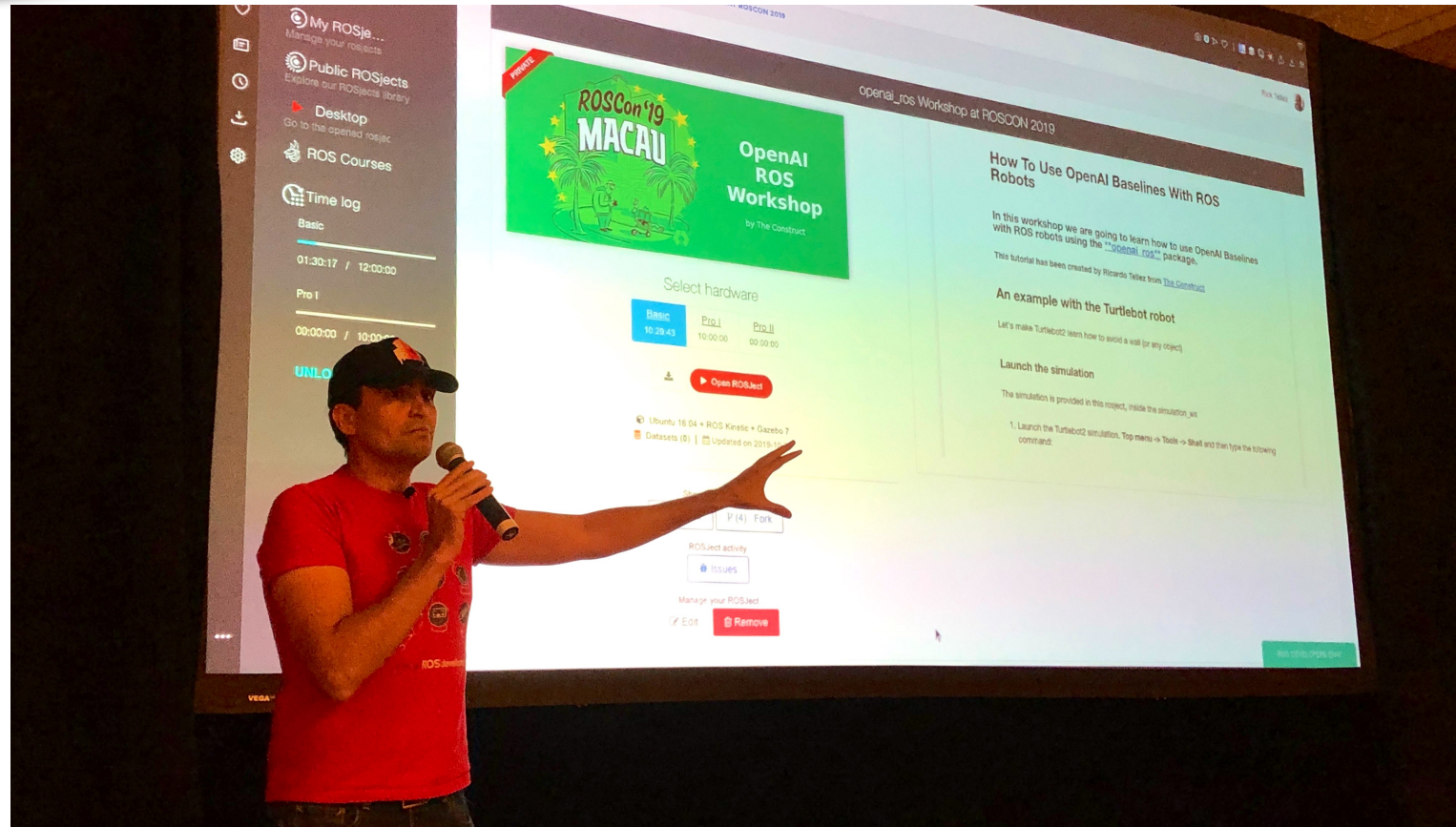# The only way to make students learn ROS is by <u>making them practice</u>

… a lot!

Today You Will Learn

A method for teaching ROS based on practice, without all the problems associated to making students practice ROS

Ricardo Téllez, ROS Teacher at La Salle University

Teaching OpenAI with ROS at **ROSCON 2019**, using this method

(Watch the full webinar here: https://youtu.be/gtBzAH-jeM0)

Ricardo Téllez, ROS Teacher at La Salle University

Teaching ROS at **Master of Robotics** at La Salle University, Barcelona 2019

Ricardo Téllez, ROS Teacher at La Salle University

Teaching **ROS online** every Tuesday at 18:00 CET since 2017

Free attendance here: https://bit.ly/2DxctWl

If you are looking for

- **A fast method to create a ROS course based on slides…**

  - Just search over internet and get one of the trillions available
    - for example, this one by ETH Zurich: https://bit.ly/35OqmLV
  - Change the logo in the slides by your logo.
  - Done.

- **Want it even easier?**

  - Point the students to the ROS Wiki and tell them to study by themselves: wiki.ros.org
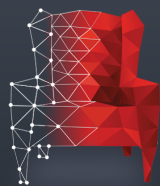 - Done.

This webinar is not for selling you anything

I'm going to provide you with real practical stuff for your teaching:
a method, a structure, code, simulations and documentation…
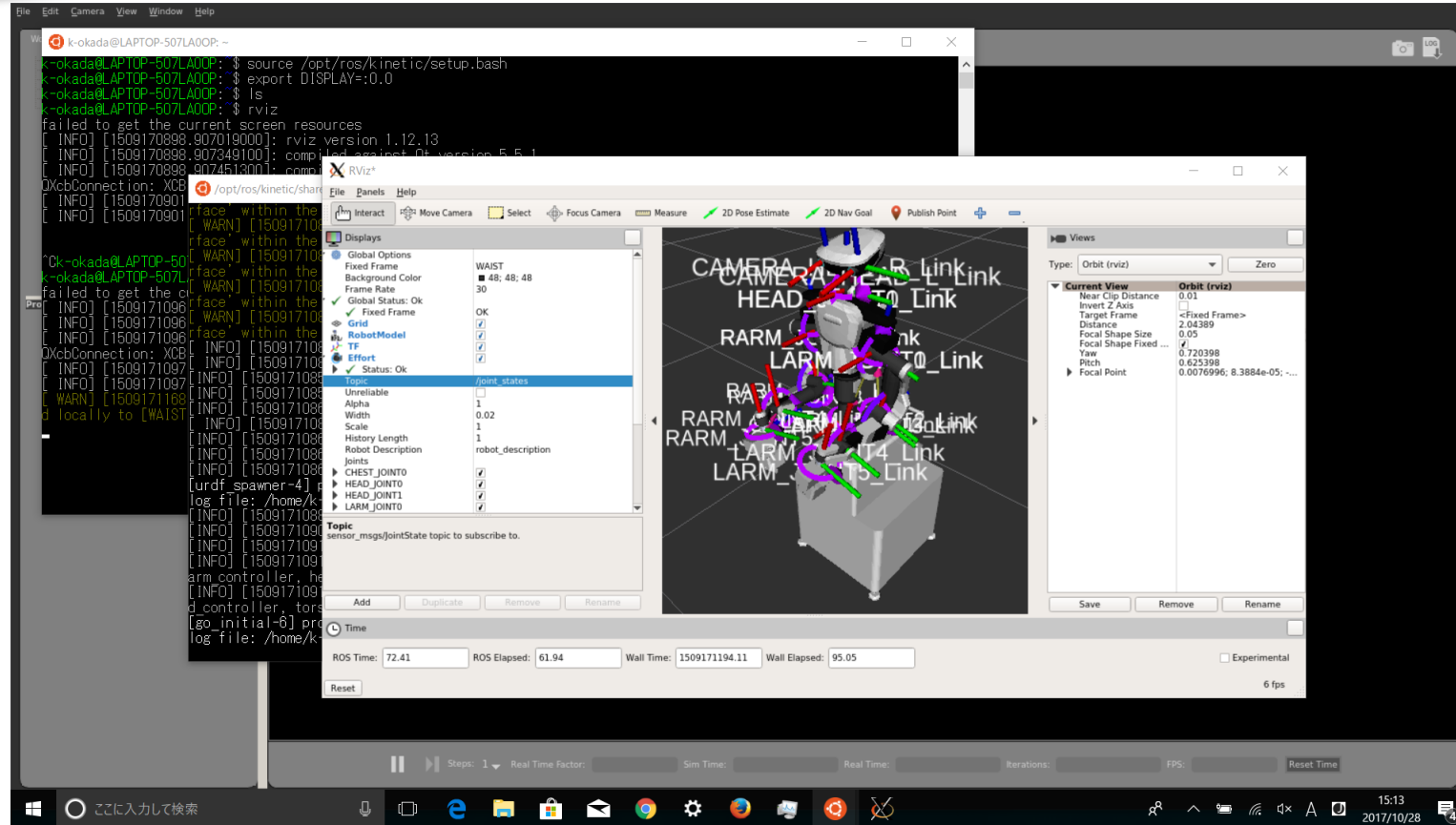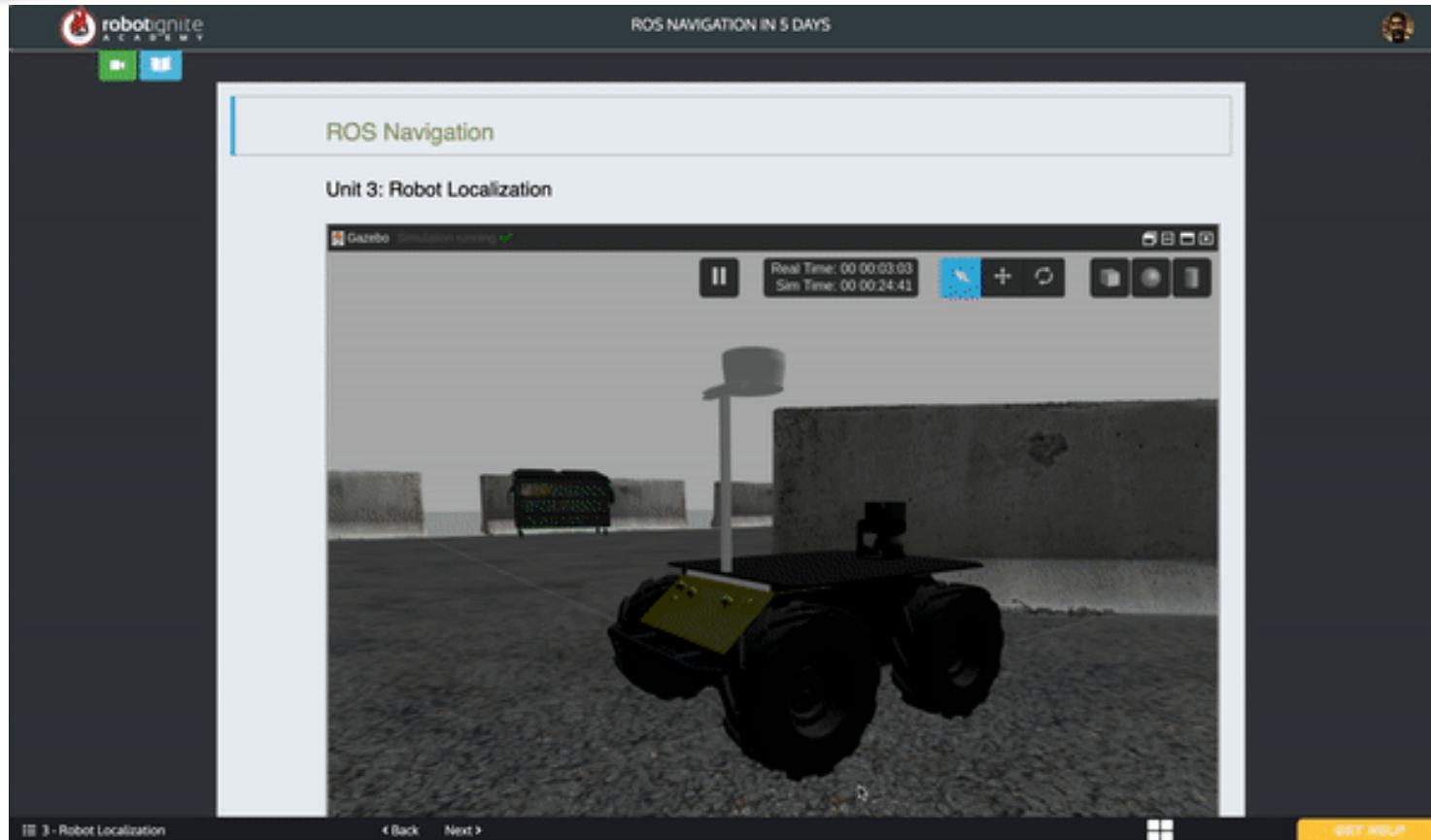**all for free**

Problems Teaching ROS

Problem #1

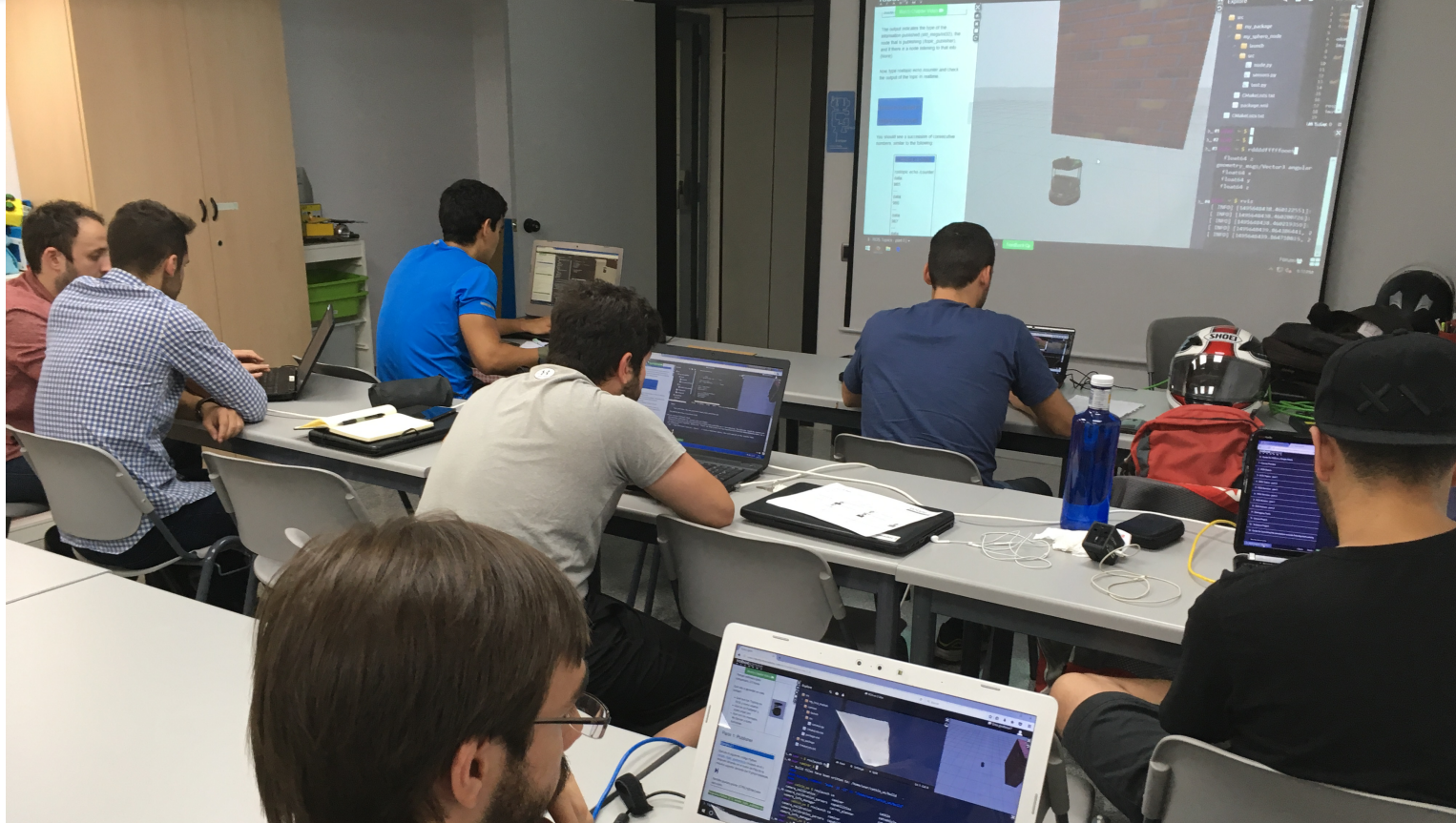Students don't know about Linux nor Python/C++

Problem #2

Installing ROS in students' computers is difficult (mostly Windows computers)

Problem #3
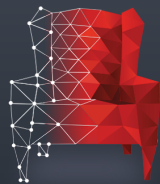
Preparing the curriculum is a hard work

Problem #4
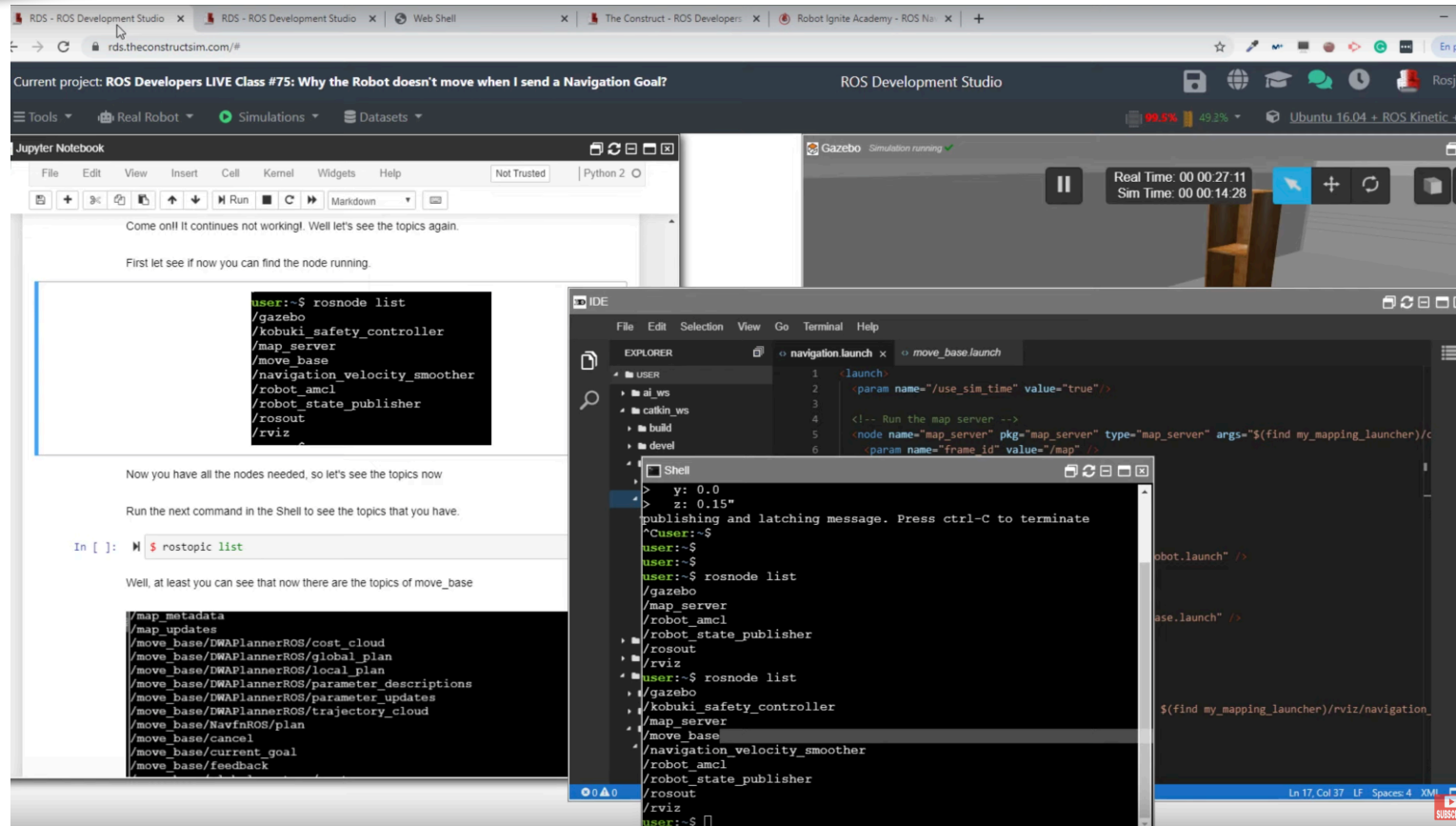
Making students practice is difficult

How To Teach ROS

ROS Development Studio http://rosds.online

A full ROS cloud environment in your browser

Create a free account

Decide Teaching Setup

- Decide which **robotics subject** to teach

- Decide which **ROS Distribution** to use

- Decide **programming language** to use

- Subject: **Robot Navigation**

- ROS Distribution: **ROS2 Eloquent**

- Programming language: **Python**

The
Construct

Pre-Requisites

○ Make students learn the requisites:

  ○ Learn Linux

  ○ Learn Python

○ Make them take these online free courses:

○ **Linux for robotics**: https://tinyurl.com/yxuo5urh

○ **Python for robotics**: https://tinyurl.com/y2en8pl8

○ Already filtered for you all the knowledge into the useful bites for robotics

○ Take the exam and get evaluation for you.


The Construct

Decide Units of Course

- Unit 1: **Odometry based navigation**

- Unit 2: **Sensors for robot navigation**

- Unit 3: **SLAM Map Building**

- Unit 4: **Monte Carlo Localisation**

- Unit 5: **Rapid Random Trees Path Planning**

- Unit 6: **Dynamic Window Approach**

- Project: **Patrol Control**
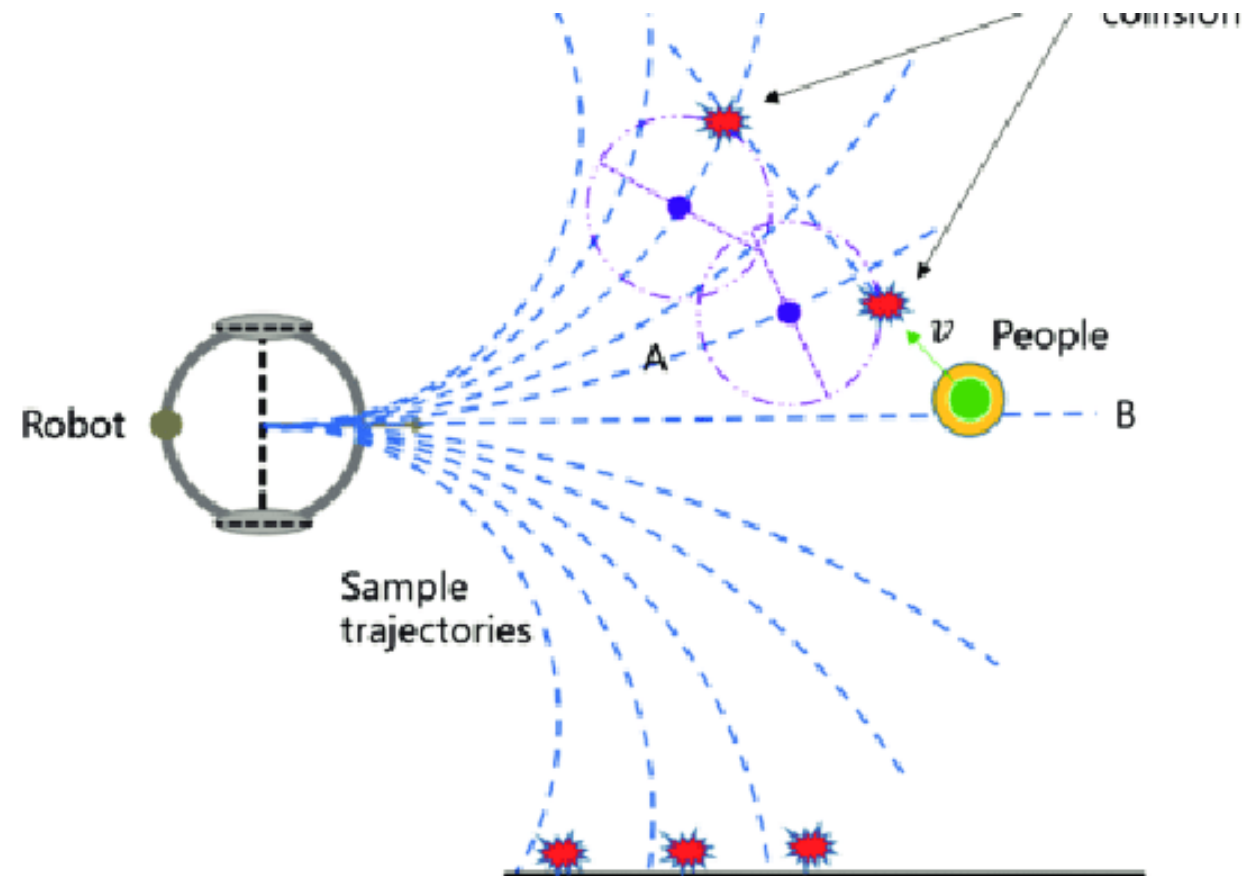
Decide Robots To Use

- Unit 1: **Summit XL** by Robotnik

- Unit 2: **Husky** by Clearpath

- Unit 3:**Turtlebot 2** by Yujin

- Unit 4: **Velocity** by Botnuvo

- Unit 5: **ROSBot** by Husarion

- Unit 6: **RB-1** by Robotnik

- Project: **Turtlebot 2** by Yujin

The Construct
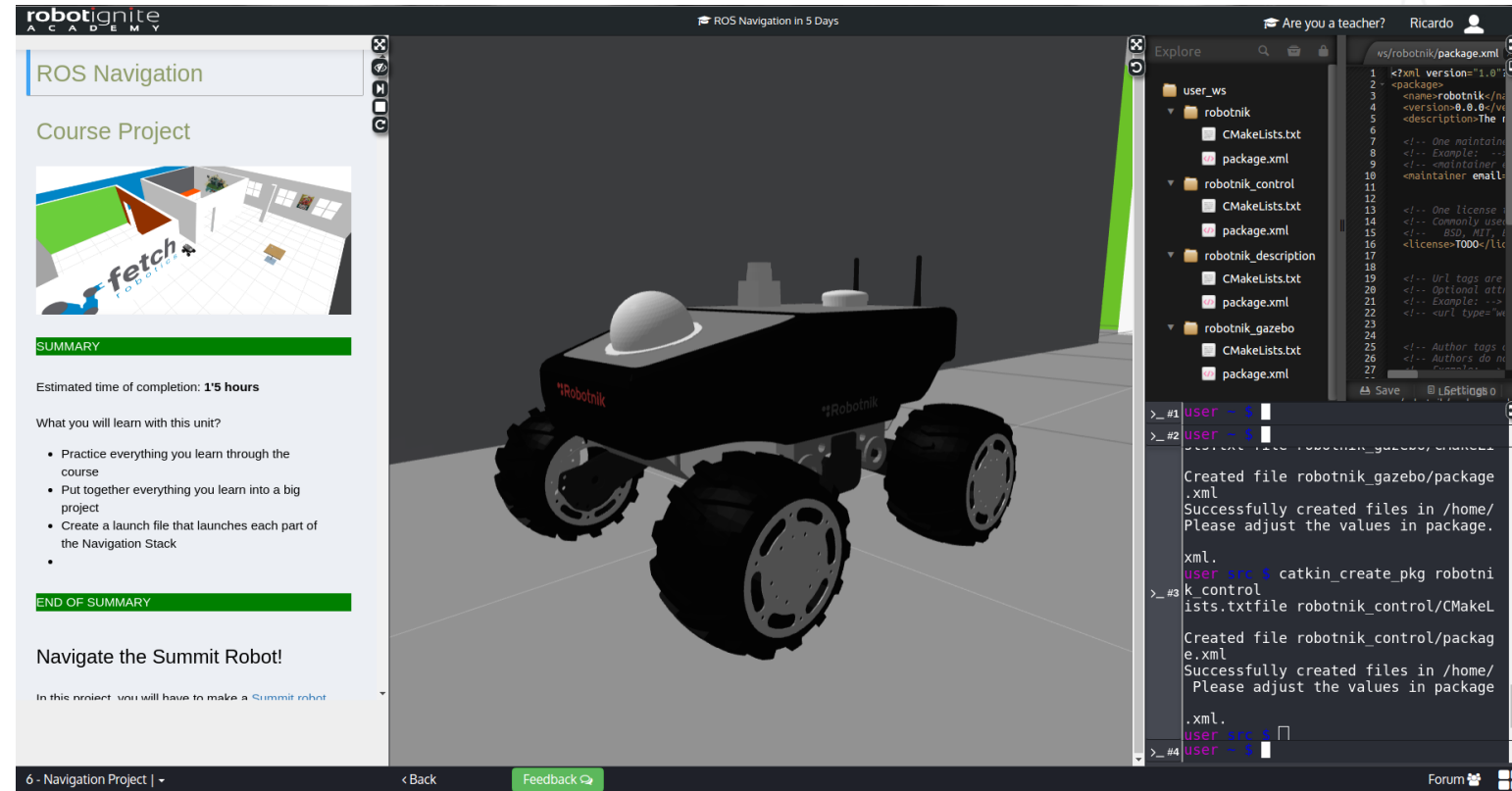
For Each Unit Do

Create a ROSject

- **ROSject** means **ROS** pro**ject**

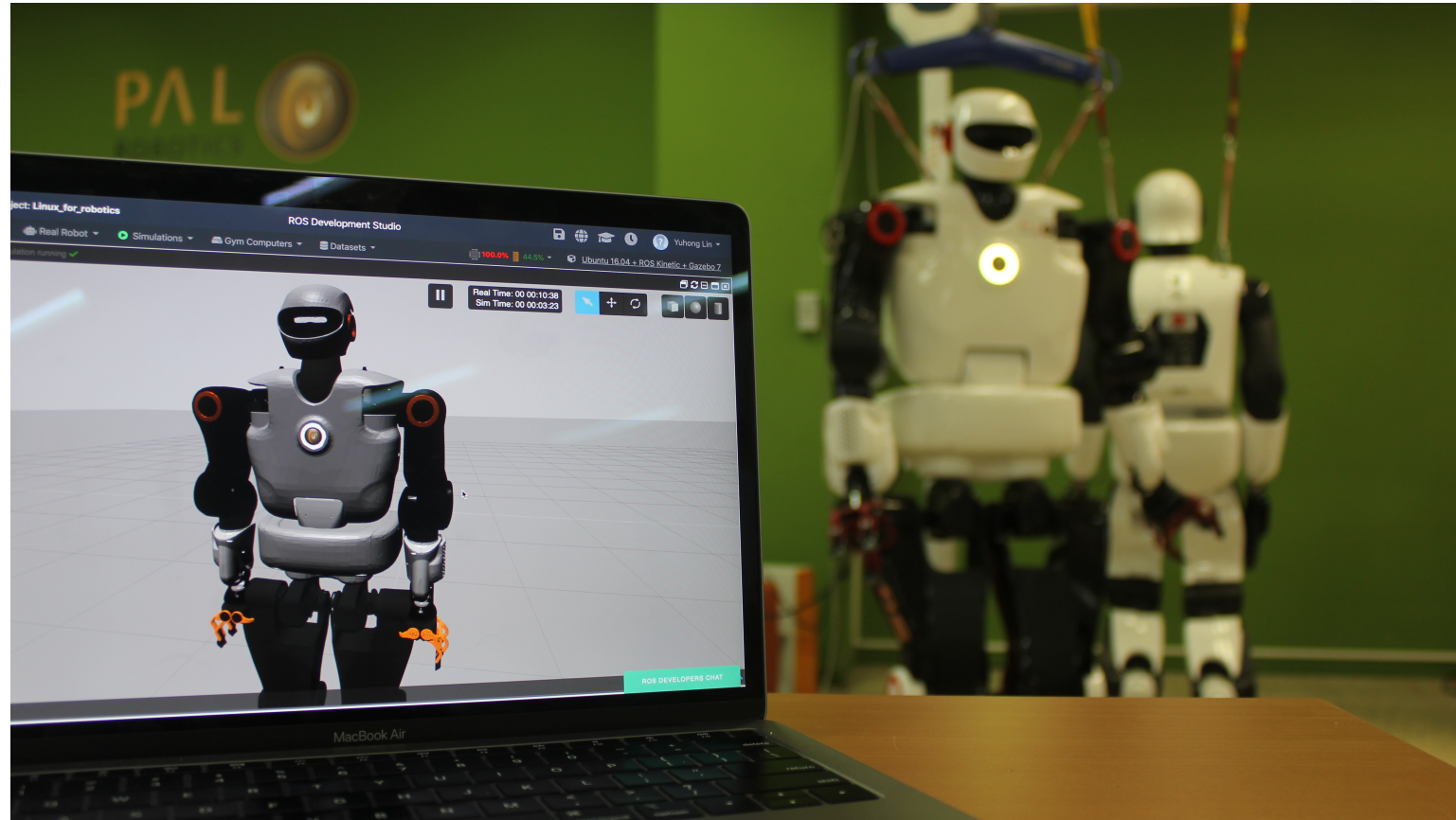- It will contain all the **teaching material for each Unit**

Get the simulation

- Need to use robot simulations to practice

- Get simulations from repos or included in ROSDS

- **The Construct open source simulations repo** (for Kinetic or Melodic):

    - https://bit.ly/2Gp601m

Create Unit Text

- **Use Jupiter Notebooks**

- Include text explanations

- Embed videos and pictures

- Embed Python code

- Interact with the robot directly from the notebook
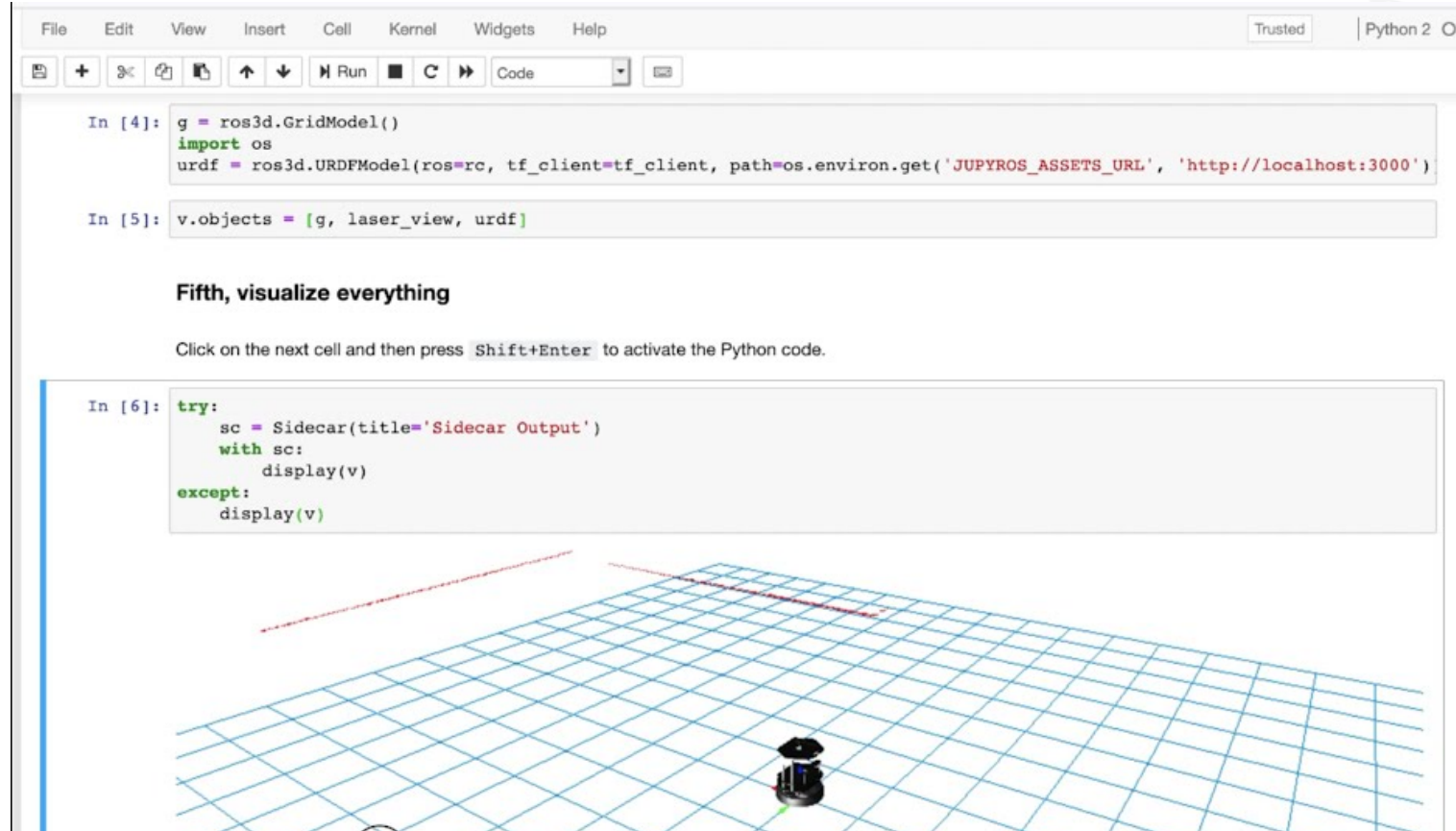
Provide Sample Code

- Add some code to the Unit so the student can use or modify.

- You can provide it **as a template**
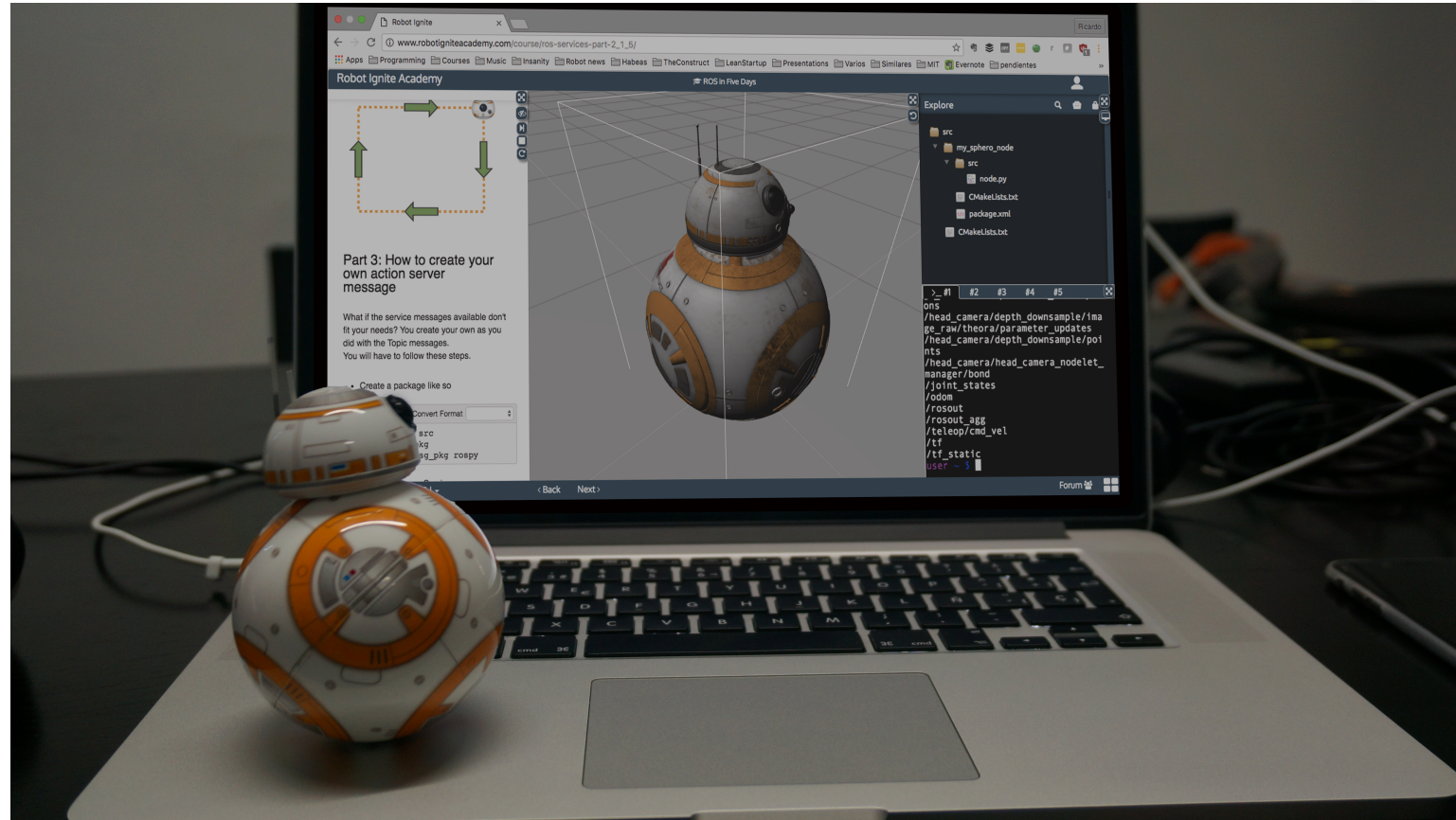
Repeat For Each Unit

Add Final Project

- Create an additional ROSject

- The project must contain an exercise that includes all the units knowledge

- Include if possible connection with real robot

Add An Exam!

- EXAM IS SUPER IMPORTANT!!!

- Not only to evaluate, but also to make them learn

- Create additional ROSject with it
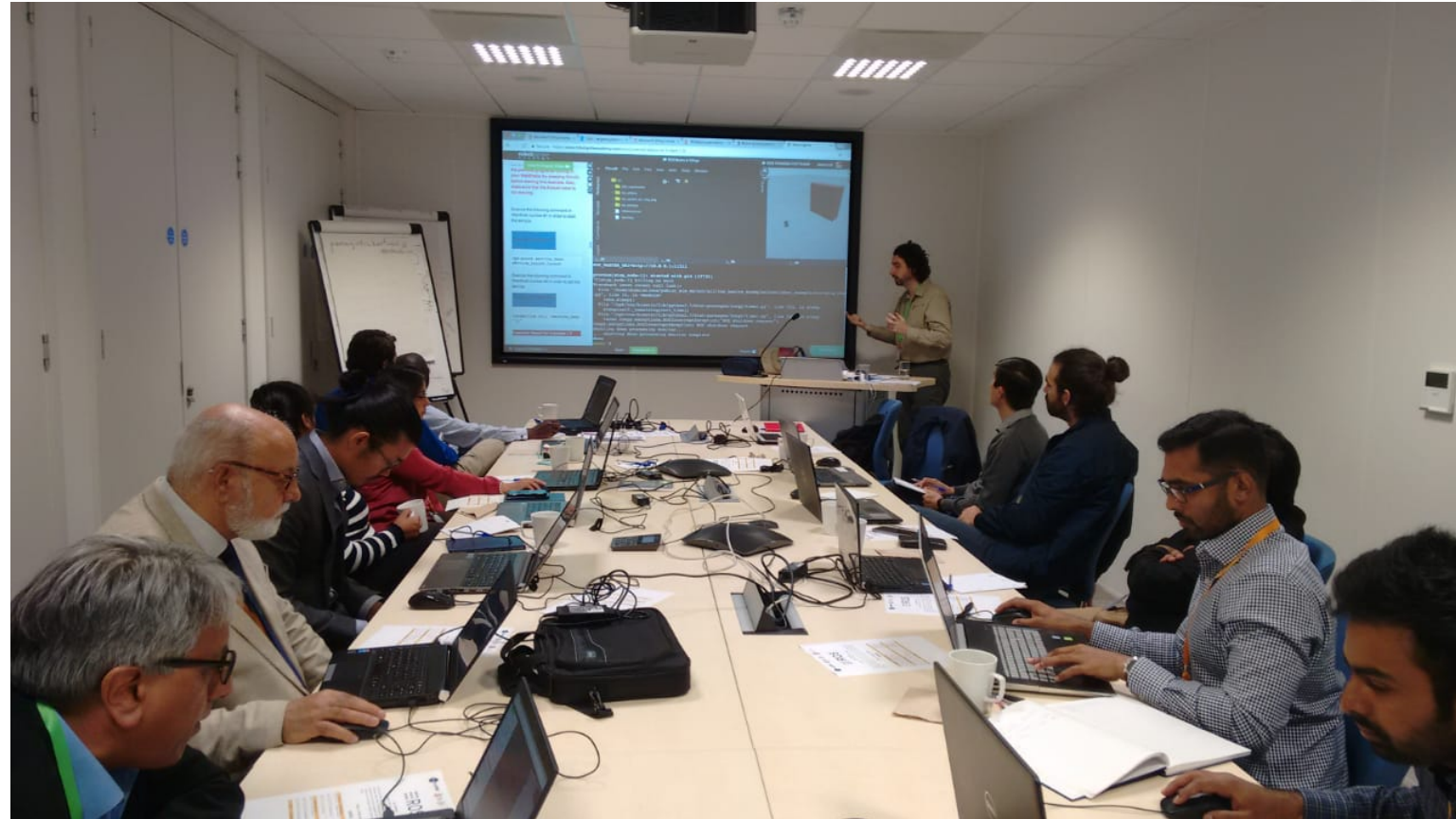

The Construct

Share With Students

- Generate the rosject link and share with the students
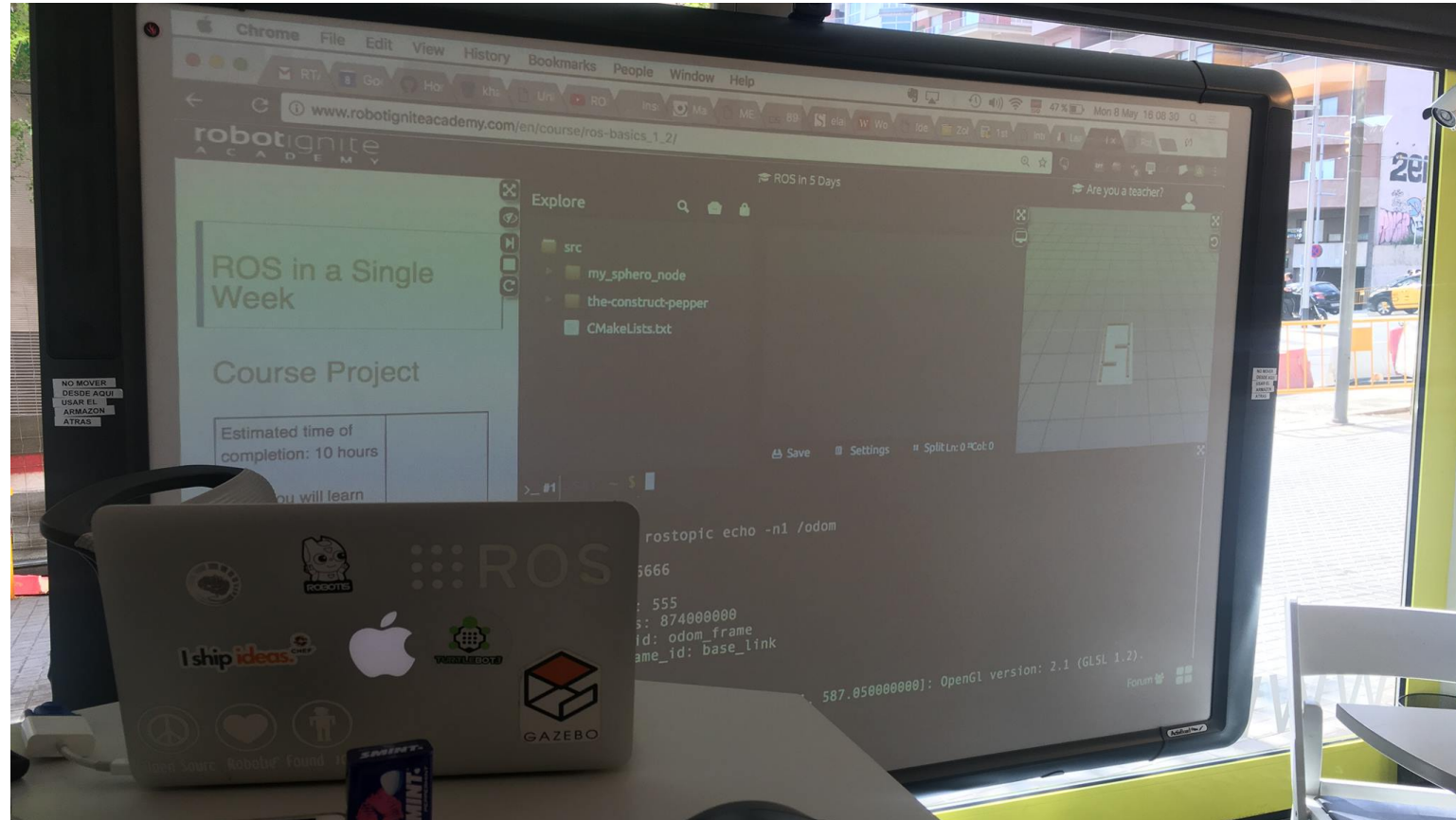
Enjoy Teaching!

- Use the ROSject docs as a guide for you

- Make students practice with you while you are explaining

- Make them do exercises

- Support your students with their questions

The Construct

Summary Of The Process

1. Decide:

    • Subject to teach

    • Units of the course

    • Programming language.

2. Create a rosject for each unit

3. Get a robot simulation for each unit

4. Create a Jupyter notebook for each unit

5. Create some sample code

6. Repeat for each unit, project and exam

7. Share with students

The
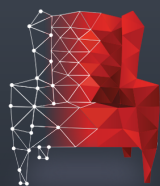Construct

30

ROSject Examples

- **Unit 1**: http://www.rosject.io/l/b5c1af3/

- **Project**: https://bit.ly/2K1RCNq

- **Exam**: http://www.rosject.io/l/b5e14b5/

The Construct

We Have An All Set Solution

The Construct
For ROS Developers

Advantages of our solution

- All students set in 1 minute after you start first class
- No matter which computer they use
- Get a control of the students work
- Get all the material done ready to teach
- Get exams and correction of them
- Provide LinkedIn certificate

- Enjoy yourself to teach instead of wasting your time with the preparation

The
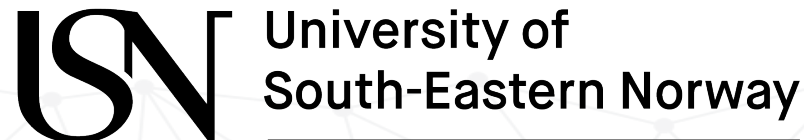Construct

Some Universities Using Our Solution

Clarkson UNIVERSITY

HERIOT WATT UNIVERSITY

The University of Tokyo 東京大学

FH AACHEN UNIVERSITY OF APPLIED SCIENCES

uni.lu UNIVERSITÉ DU LUXEMBOURG

UNIVERSITY OF MICHIGAN

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

laSalle RAMON LLULL UNIVERSITY

UNIVERSITÉ DE REIMS CHAMPAGNE-ARDENNE

AALBORG UNIVERSITET

THE UNIVERSITY OF SYDNEY

USN University of South-Eastern Norway

The Construct

"With The Construct our students can jump right into ROS without all the hardware and software setup problems. And the best: they can do this from everywhere"

Steffen Pfiffner

Lecturer at University of Weingarten

The Construct

BONUS:
FREE 30 MIN CONSULTANCY

Questions about ROS & Teaching?
Book a consultancy with me and learn how you can
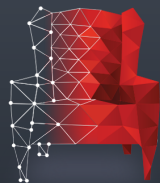implement the teaching method at your own universities.

Schedule it here:
 https://app.hubspot.com/meetings/rtellez1

The
Construct

Contact

Ricardo Téllez
+34 687 672 123
rtellez@theconstructsim.com

www.theconstruct.ai