

TECHNOLOGY ENTREPRENEURSHIP EDUCATION

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OBJECTIVES

- Age group: 12 year-old learners
- Problem-solving skills
- Encourage technological projects in entrepreneurship
- Prepare for international competitions

INTRODUCTION

The main *motivation* of this project is to establish a link between technology (or innovation) and entrepreneurship. While the former one is taught in scientific and technical streams, the latter one is mainly taught in commercial streams. While in the *Générale* stream, entrepreneurship is part of the curriculum, the *Classique* learners can choose entrepreneurship as an optional class.

This project provides an environment for cross-disciplinary learning. Learners will require mathematics, reading and writing skills to realize their projects. Teachers and learners will have the opportunity to acquire essential competencies by learning *through* entrepreneurship instead of simply learning *about* entrepreneurship. [1] [2]

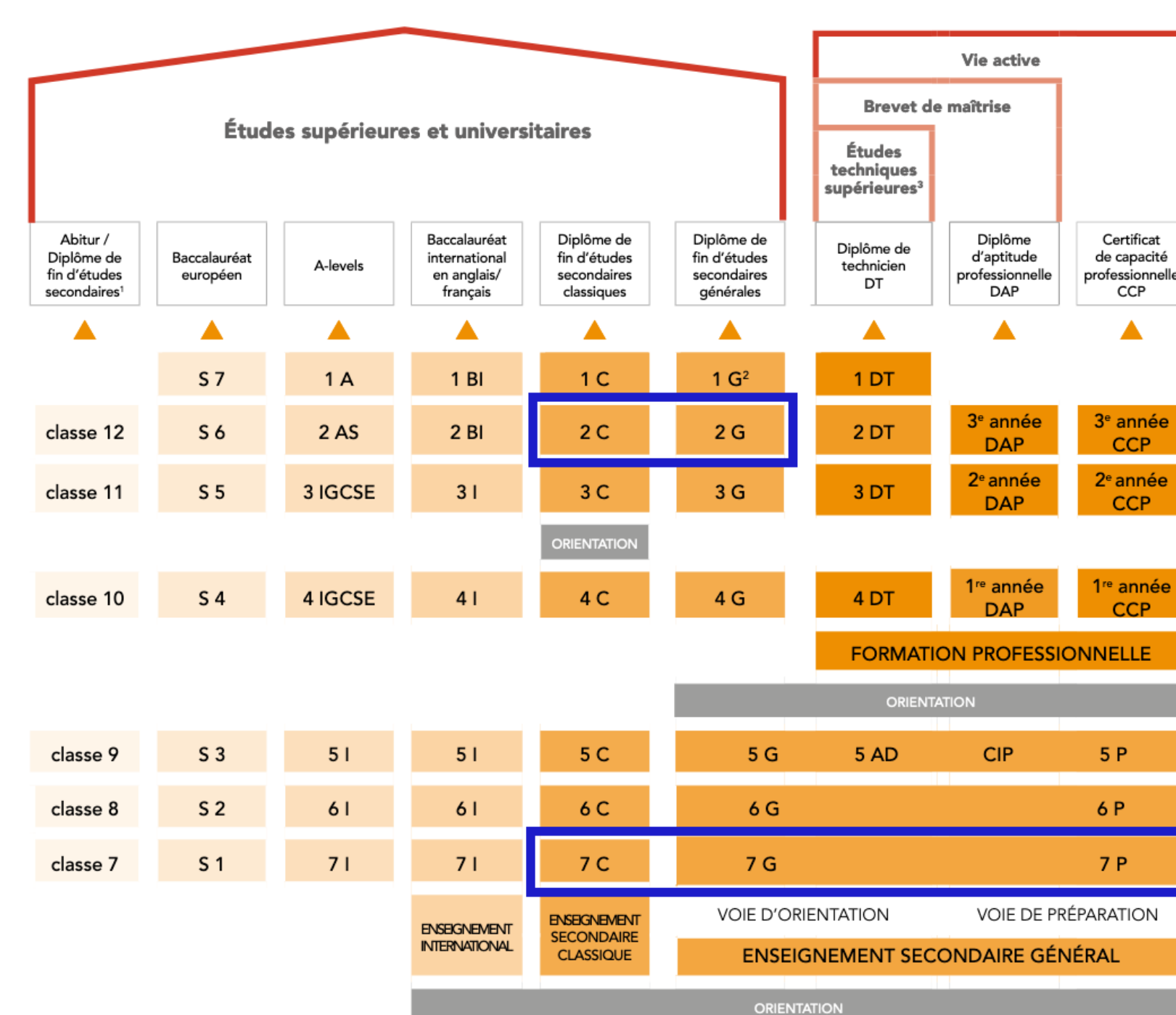


Figure 1: Luxembourg public school system

PUBLIC POLICIES

The Luxembourg public school system is characterized by an *early streaming* of the learners. There are of course many extra-curricular activities that propose environments where learners from different backgrounds and streams can come together to learn and create. One of these initiatives is the *Makerspace*, which is meant to provide to learners the technical setup for creation.

Another initiative is entrepreneurship (*mini-entreprise*) in the schools. These are compulsory courses for learners from the *général* stream, and optional for learners from the *classique* stream.

While the Makerspace initiative is open to learners of all age in the secondary school, the Mini-entreprise course is only available for higher classes (17-18 year old learners).

TECHNOLOGY ENTREPRENEURSHIP

Technology entrepreneurship is the interface between the more established academic fields of entrepreneurship and technology based innovation.

ENTREPRENEURSHIP

This course is about learning the process of creation, which is central to entrepreneurship. It is not a course in coding and building devices, which is already covered by the Makerspace. Learners will learn to observe and analyse their environment and the existing markets. They will understand the needs of our society and encouraged to propose solutions. Paper and pencil will be the main tool of the learners in the early stages of the project.

Learners will start by drawing up a list of two to four ideas that they can define and research before selecting one to run with. In this process they will make use of their established skill or knowledge.

Alternatively they may seek for markets that look ripe for development and then acquire the necessary technique and knowledge to propose a product.

MAKERSPACE

A Makerspace is a dedicated location for learners who want to become creative. Around 20 secondary schools in Luxembourg offer this workshop. Learners have access to *microcontrollers* (Arduino, Raspberry Pi), *robotics* (Lego EV3), *3D printing*, laser cutting, and other electronics tools (soldering).

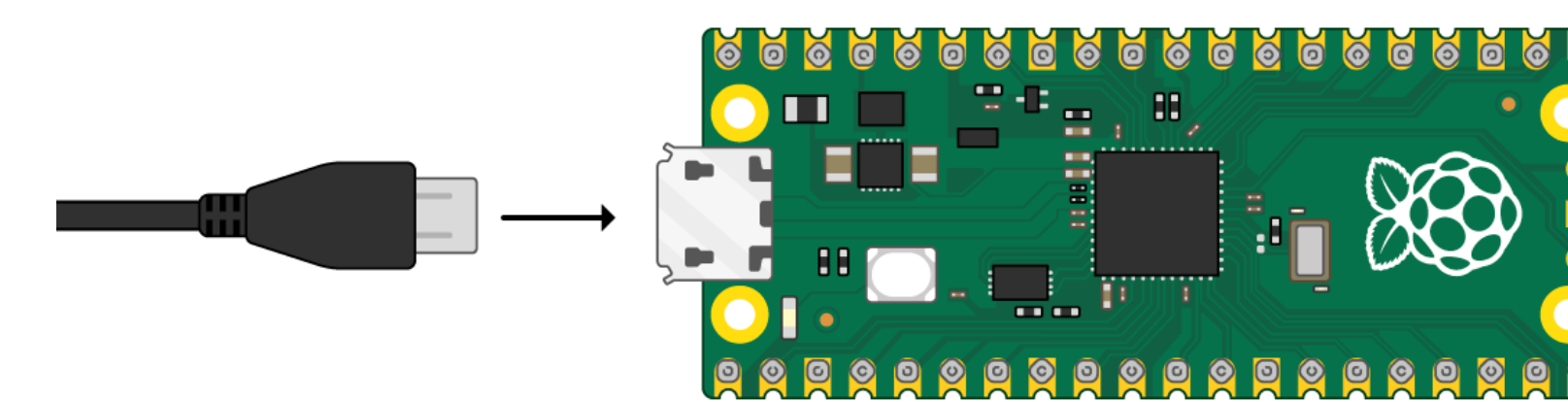


Figure 2: Raspberry Pi Pico

COURSE FORMAT

Learners, of age 12, can choose this workshop (2 hours per week) among a set of other optional course (*Club de Midi*).

Teams of 2-3 learners, ideally from different background, will be given *challenges*. They have to do the market analysis and design a product. The final product has to be developed using a *Raspberry Pi Pico*. This choice is motivated by the (i) low cost (5€), (ii) ease of coding (MicroPython), and (iii) availability of extensions (sensors, motors).

Learners are not expected to be able to code at the end of the year. They must learn to work as a team and specialise in a domain required to finalise the project.

CONCLUSION

This is a first attempt to combine entrepreneurship with technology for learners aged 12 years.

Learners will learn to develop and document a *process*, which starts from the market analysis until the design and the production of a first prototype.

Learners will have assignments that encourage critical thinking and collaborative learning. The learners will produce reflection papers that contain descriptions and instructions of their project. They will be encouraged to share their work following the open-source idea.

ADDITIONAL INFORMATION

- Makerspace: <https://www.bee-creative.lu/makerspaces>
- First Lego League: <https://www.first-lego-league.org/>
- Tinkercad: <https://www.tinkercad.com/>
- BlocksCAD: <https://www.blocks3d.com/>

REFERENCES

- [1] Nathalie Duval-Couetil, Michael Ladisch, and Soohyun Yi. Addressing academic researcher priorities through science and technology entrepreneurship education. *The Journal of Technology Transfer*, 46(2):288–318, 2021.
- [2] Lorin W Anderson and David R Krathwohl. *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman,, 2001.

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