EDUCATION POLICY: Creating a primary school lab

SECTION 1: SUMMARY

1. **Author**: Marina Ruano Garau. Garbí Pere Vergés Foundation. In charge of Maths, Science and Technology department (pedagogical team).

2. **Background**: I am a pharmacist and a teacher. Garbí Pere Vergés Foundation is composed of 2 schools: one in Esplugues and the second one in Badalona. This last one is the one where we focused on when explaining this policy. We are 170 teachers and 2021 students in the whole Foundation. That's the main reason for writing this policy: I represent a big group of constituents that are going to take a benefit of that. As the main responsible of the STEM department of the school, I must encourage my team to let students learn things by doing, as it's the best way of building knowledge. In Esplugues' school, we have a primary lab, and there are lot of children that benefit from it: they are taking scientific lessons there, with an expert on scientific method, on hour per week. They can experience what they've previously worked in on the books, and most of them concur that they can understand it better. On the other hand, on Badalona's school, we haven't got neither a lab, nor an expert to make the lessons inside this space. As we defend that we walk to have one project, two schools, we are on our way to reach this ambitious aim. However, we need your help in order to be able to give the same opportunities to all our children.

3. **Descriptive title**: Learning by doing: adapting a space to have a science lab for primary students.

4. **Abstract:** The best way of learning how to make something is making it. So, the best way of learning science is making science. 3 main requirements are included on that statement: time, knowledge and a place to do that. And here is where my focus is on: enabling a space of one of our schools in order to make STEAM projects. Around 300 students and 22 teachers will benefit of this project: not only primary teachers, but highschool ones too, as it will be a permanent space of the school available for everyone interested on it. The project (seen as the adaptation of the space) is thought to start on april 2022 and end on september 2022, with the inauguration of the new lab. Everybody who loves science, and who thinks that critical, collaborative and creative people need science to develop better his/her competences will understand that making school science is essential to become a world citizen, as it gives you the ability of understanding (and not just understanding, but explaining too) lots of things happening in our daily life. Some resources will be needed to reach our objective, and I'm sure we can jointly make it.

SECTION 2: GOALS

1. General goals

It is well known that new generations are very familiar with technology and that they are apparently well prepared for new requirements of life. However, they are too used to have what they want immediately. So they don't ask anything themselves, or in the best case, they think about an interesting question and they google it.

We must help our students to stop, think and take part in research. Real research. They must learn how to look for searchable questions and give them the tools for answer them.

2. General goal description

Science is not like the other subjects we teach at school. We can't limit the study of it to books and theories (USA Lab Equipment, 2020). Effective teaching and learning of this subject involves seeing, handling, and manipulating objects of real life (Danhauser, 2018). Students are naturally curious. That's a big opportunity for us, teachers, to involve them in learning science, because it tries to explain what's happening around us. And that's what children want to know! The study of science aspires to develop scientifically informed, caring and responsible individuals who can think critically and make informed choices about themselves, the environment and society (Senri International School Foundation, 2007). It allows students to explore and discover, being an active subject.

Having justified the importance of science education, we can now move to the role of laboratories in science teaching. Some important education influencers, like Dewey, defend that 'experience' provides a rich resource for learning that helps students understand concepts in unforgettable ways (Smart, 2016). In fact, Blosset (2010) attributes to the use of the laboratory in science classes a huge list of advantages:

1. Skills: manipulative, inquiry, investigative, organizational, communicative...
2. Concepts: hypothesis, theoretical model, taxonomic category…
3. Cognitive abilities: critical thinking, problem solving, application, analysis, synthesis…
4. Understanding the nature of science: scientific enterprise, scientists and how they work, existence of a multiplicity of scientific methods, interrelationships between science and technology and among the various disciplines of science…
5. Attitudes: curiosity, interest, risk taking, objectivity, precision, confidence, perseverance, satisfaction, responsibility, consensus, collaboration…

In short, it prepares for life. It gives the 21st century required competences. It lets our students inhabit the world, and not just live on it.

And...why are we focusing on primary students? We can come back to the beginning of the general goal description. At an early age, all children have the capacity (and willingness!) to observe, explore, and discover the world around them (NSTA Board of Directors, 2014). Current research indicates that young children have the capacity for constructing conceptual learning and the ability to use the practices of reasoning and inquiry. Another important reason for focusing on this early age is the fact that kids form a basic opinion about science shortly after beginning school. This construction is extremely important to ensure their engagement on science when older (University of Texas, 2021).

After all this research, we can justify the need of having a primary science lab at our school, in order to help children unlearn preconceptions on science knowledge and make them the main characters of their learning process.

In all the projects thought to be presented in this lab, maths will be directly or indirectly involved. And I am not referring here just to calculate. I am thinking of optimizing processes

or thinking if it's necessary to have an exact number or we can move forward just with an estimation of the calculation, for example.

3. **Strategic goals**

· Turn a space of the school into a science school lab.
· Fill the lab with all material and tools required.
· Train as many teachers as possible on school science.
· Shadow good schools of the same district that already have a lab on their facilities.
· Plan some lessons and STEAM projects to take profit of the space.

SECTION 3: TARGETS

1. **Beneficiaries and recipients**

The main beneficiaries and recipients in this case are the primary students (300) and primary teachers (22) of Badalona school. However, other teachers and students will take profit on this space.
It's just one strategic goal that has as recipients the teachers and the beneficiaries the students, that is the trainee on school science.

2. **Special needs**

We should choose a classroom accessible to everyone to transform it into our lab. While a current classroom can be used interchangeably by older or younger pupils (of course adapting what is necessary), if we just have one lab, everyone must be able to reach it, no matter their disability (if this is the case).

SECTION 4: The Value Proposal

1. **Value proposal**

Making science helps build unforgettable knowledge.

2. **Results**

· Turning a space of the school into a science school lab.
    INDICATOR: In september 2022, a useful science lab is abilitated.
· Training teachers on school science.
    INDICATOR 1: From september to december 2022, 50% of primary teachers are trained on school science (11 teachers)
    INDICATOR 2: On june 2023, 100% of primary teachers are trained on school science (22 teachers)
· Shadow good practices on science lab teaching.
    INDICATOR: During the school year 2022 - 2023 we have visited at least 2 different schools which inspire ourselves.
· Plan some lessons and STEAM projects:
    INDICATOR 1: At the end of the school year 2022 - 2023 we have designed (or adapted from others') 2 projects/level.
    INDICATOR 2: At the end of the school year 2023 - 2024 we have designed (or adapted from others') 4 projects/level.
    INDICATOR 3: At the end of the school year 2024 - 2025 we have designed (or adapted from others') 4 projects/level.

3. **Impact**

We aim to increase the amount of students that choose a scientific bachelor when they finish their compulsory schooling (indicator: from 35% - actual - to 50% in 5 years).
We aim to improve critical thinking and problem solving on our students (qualitative test at the beginning and at the end of the year).

SECTION 5: Costs

1. **Cost structure:**

· External consultants:
   - Architect + trainers: 8000€
· Furnishing:
   - Construction of the lab: 10000€
· Miscellaneous services:
   - Lab material and tools: 3500€.

You can see the details here:

	preu unitat	unitats	preu total
Bidó plàstic amb aixeta 5L	14,5	2	29
Bidó residus	6	4	24
Càpsules de petri (500)	52,03	1	52,03
Embut 50 mm diàmetre	0,6	50	30
Flascó comptagotes 125 mL	0,75	10	7,5
Gerres de plàstic 250	2,4	20	48
Gerres de plàstic 500	2,6	20	52
Matràs aforat 50	14,5	20	290
Matràs aforat 100	17	20	340
Matràs aforat 250	23	20	460
Pipetes graduades 1mL (500)	61,7	1	61,7
Pipetes graduades 2mL (500)	73,8	1	73,8
Pipetes graduades 5mL (200)	43,7	1	43,7

Pipetes Pasteur 1mL (500)	9,7	1	9,7
Pipetes Pasteur 3mL (500)	9,7	1	9,7
Vasos precipitats 25 mL	3,6	25	90
Vasos precipitats 50 mL	4,25	25	106,25
Vasos precipitats 250 mL	6	25	150
Vasos precipitats 100 mL	4,85	25	121,25
Proveta plàstic 10 mL	4,8	25	120
Proveta plàstic 50 mL	8,5	25	212,5
Proveta plàstic 100 mL	9,7	25	242,5
Proveta plàstic 250 mL	14,5	20	290
Proveta plàstic 500 mL	19,35	10	193,5
Proveta plàstic 1000mL	32,7	4	130,8

Total de tot			**3187,93**

2. **Funding opportunities**

We'll try to be fund by 'next generation' program.
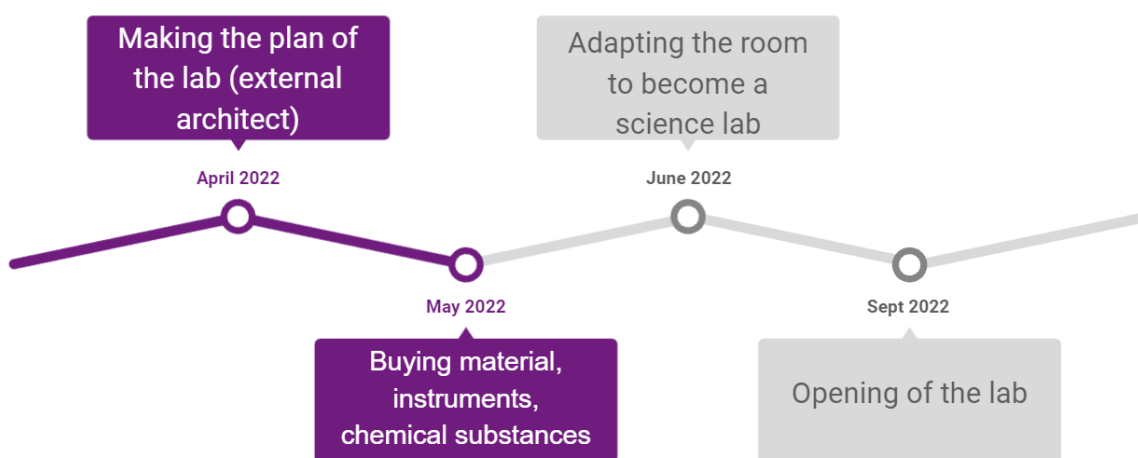
Acquisition of scientific equipments:
https://exteriors.gencat.cat/ca/ambits-dactuacio/afers_exteriors/ue/fons_europeus/detalls/noticia/20210610_equipaments-cientifics-mrr

Innovative teaching:
https://exteriors.gencat.cat/ca/ambits-dactuacio/afers_exteriors/ue/fons_europeus/detalls/noticia/20210906_premi-docencia

SECTION 6: Action plan
1. Activities

Making the plan of the lab (external architect)

April 2022

Adapting the room to become a science lab

June 2022

Buying material, instruments, chemical substances

May 2022

Opening of the lab

Sept 2022

SECTION 7: Risk Management

7.1. Competition
1. Risk description: limited time
2. Probability: 2
3. Severity: 3
4. Mitigation strategy: very well planned project. Some people are involved. Realistic objectives.

Table 7.1 – Risks/Competition		
1	Risk description	List the main activities required to implement your policy. Optionally, you can add an estimated duration for each of them.
2	Probability	Assign an integer value in the range 1-4, with 1 equal to very low probability and 4 equal to very high probability
3	Severity	Assign an integer value in the range 1-4, with 1 equal to negligible impact on the project and 4 equal to high risk of failure.
4	Mitigation strategy	Describe what you would do to avoid or mitigate the risk

7.2. Opposition
1.
   · Risk description: teachers opposing this new way of teaching.
   · Probability: 4
   · Severity: 4
   · Mitigation strategy: giving them good training. Making a good accompaniment. Getting involved in ALL the process, to encourage them to do it too.

2.
   · Risk description: other schools with similar aims, depending on the same funds.
   · Probability: 1

· Severity: 3

· Mitigation strategy: let's share resources! If we depend on the same funds, we'll probably be close to each other. We could share the space.

7.3. **Miscellaneous menaces**

1. Risk description: other teachers of the same school against leaving the space that will be the lab.
2. Probability: 1
3. Severity: 2
4. Mitigation strategy: i'm sure that with the correct explanation (it's important to invest time on explaining what we are planning! That's the best way to make your team understand you) they'll defend it's a good idea.