



# Guide to build a pedagogical project in science



IGEM TEAM INSA-UPS FRANCE - 2017



## CONTENTS

PUT YOUR PROJECT IN ACCORDANCE WITH THE EDUCATIONAL OFFICIAL GUIDELINES .....	1
PROSPECTION AND IMPROVEMENTS .....	2
THE INVESTIGATION PROCEDURE .....	3
ACTING IN CLASSROOMS.....	5
ACKNOWLEDGEMENT.....	7
REFERENCE.....	7

## PUT YOUR PROJECT IN ACCORDANCE WITH THE EDUCATIONAL OFFICIAL GUIDELINES

Firstable, you must establish a preliminary project in accordance with the guidelines of your national education council and determine the different elements you have to transmit to the children.



### Our project:

In France, our project was included in the field of natural and techniques system. The goal is to teach the pupils the basics of their scientific culture to discover the nature and its phenomena.

The analysis of the guidelines gave us several questions:

- How to raise the curiosity of the pupils, their motivation to ask questions?
- How to implement and execute a scientific approach?
- In order to lead the scientific process: which experimentations can be done in safety outside the lab?

It validated some of our ideas: the scientific process' goal is to explain and understand our world by a rational approach founded on observations and verifiable hypothesis, and also to distinguish opinion believes and scientific facts. It also induced us to deliver a message about individual and collectives responsibility on the field of health and environment.

## PROSPECTION AND IMPROVEMENTS

The second step is to present your pedagogical project to school teachers. It is important to establish a dialogue and get feedback about your work and inspiration, especially about the practice workshop you would like to set up.



### Our project:

We presented our pedagogical project to school teachers and a lot of them were enthusiastic about leading our project in their class. The main statements that emerged from the discussion were:

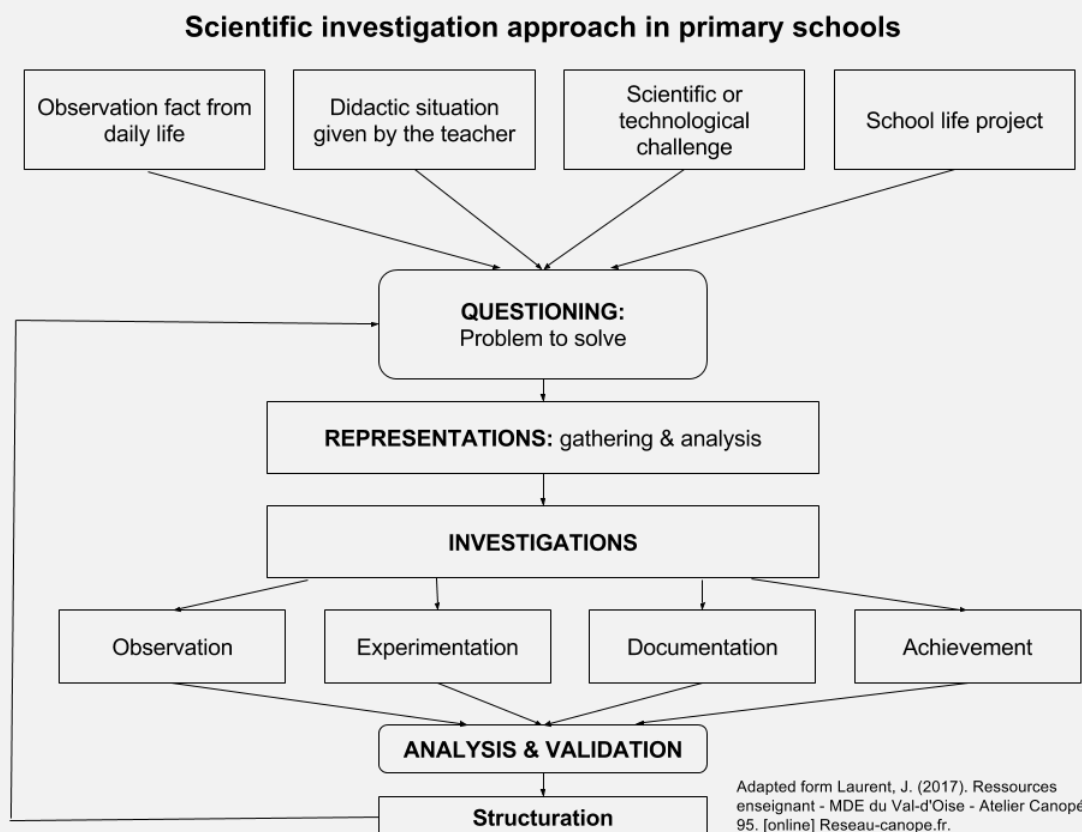
- How to evaluate the knowledge of the pupils before the intervention?
- How to include the diversity of the knowledge levels in our work?

Asking teachers to do a preliminary drawing workshop with their pupils was the ideal way to get their representations and beliefs about microorganisms. The inclusion of diversity was more delicate. We tried to investigate it according to the statement of the equal opportunities and gender equity.

## THE INVESTIGATION PROCEDURE

Investigation in science is a long-term process and is based on observation, experimentation and documentation. It has 6 steps:

1. Introduction
2. Questioning time
3. Collection and analysis of the representation of the pupils
4. Investigation time
5. Feedback and validation of the activity that has been achieved
6. Structuration of the knowledge: the “know how” and the “know how to be” involved in the investigation.



### **Our project:**

We solicited the support of several interlocutors: Mallaury Wolff, student in a master degree in education, Thomas Lautier, researcher at the LISBP with experience in science popularization and Marc Zanoni, school inspector.

Their experience and their dedication in the field of pedagogy brought a lot in our project to define how to perform an investigation procedure. They suggested us to set our intervention in a long-term perspective and to practice the investigation process instead of the hypothesis process. Indeed, the formulation of a hypothesis requires deep reflection, theoretical knowledge and state-of-the-art references about the question. The hypothesis also requires a methodology supported by reproducible results, the refutability principle, and the notion of controllable and independent variable. That is why the hypothesis does not seem to be adapted to school activities.



## ACTING IN CLASSROOMS

Consistent pedagogical interventions with pupils are complex to set up. Teaching is a profession. As iGEMers, we cannot spontaneously improvise as teachers. It is important not to make the mistake of coming in a class as a scholar. The intervention would not have any educative value for the pupils. The theme of microorganisms is complex for pupils as they cannot see them. Considering the pupils, their interest, their motivation and their questions is essential. Pupils have to be the key actors of your pedagogical intervention: they are asking questions and creating together the investigation process adapted to their abilities.



Furthermore, as iGEMers, you must engage yourself to establish pedagogical programs according to the values of school: reduction of the burden of social inequalities and promotion of science both for girls and boys. The intervention has to be part of a sequence: in one session it is only possible to consolidate representations, the pupils with less interest on the theme or with less knowledge will steer clear of the key knowledge. To contribute to reduce inequalities at school and to enhance the interest of the girls and of the teachers to science, a long-term intervention is needed.



### Our project:

Building a long-term intervention was fruitful both for pupils and teachers. The pupils are, like true scientists, able to follow a scientific protocol to do an experiment and to observe a biological phenomenon (in our case the growth of bacteria on a Petri dish). That is why we wanted with this project to rise the curiosity of the pupils and to bring answer elements to their questions.



## ACKNOWLEDGEMENT

This pedagogical guide could not have been produced without the help of people acting in education and in science popularization. We would like to thanks Mallaury Wolff, student in a master degree in education and now school teacher in Toulouse, who helped us to build a complete project from our ideas, Thomas Lautier, researcher from our laboratory who has a great vision and practical advices in science popularization, and finally Marc Zanoni, school inspector in Ardèche, who gave us precious advices from his years of experiences in national education.

## REFERENCE

Socle commun de connaissances, de compétences et de culture ; NOR: MENE1506516D ; décret n° 2015-372 du 31-3-2015 - J.O. Du 2-4-2015 MENESR - DGESCO A1

## Support document for iGEM pedagogic project

From iGEM Toulouse 2017 based on investigation process

<b>Week 0</b>	Seance 0	Contact with the teacher explanation of the pedagogical project
<b>Week 1</b>	Seance 1 the teacher	Class warming up, introduces the subject. The teacher questions the pupils about the project to establish a list of question and if possible to a statement or a problem to solve. The pupils lead the investigation .The pupils produce their representation with a written trace. The teacher transmit the representation and the questionment to the iGEMers
<b>Week 1</b>	Preparation the iGEMers (the teacher)	Analysis of the the representation and the questionment. Workshop design to answer to the pupils question. For example : experiment, documentation (movie, picture simulation) to answer to a difficult question the teacher and the iGEMers are working together
<b>Week 2</b>	Seance 2 (2h) the iGEMers	Animation of an investigation session to answer to the questionment thanks to the workshop. Explanation of the investigation process for the observation or experiment that will be realized.
<b>Week 2 et 3</b>	Observations the iGEMers	The pupils are true scientist and continue their workshop every day if possible. They send an illustrated report to the iGEMers.
<b>Week 3</b>	Seance 3 the teacher	Consolidation of the knowledge by the teachers
<b>Week 3</b>	Seance 4	The teacher transmits to the pupils the feedback of the iGEMers on the observation of the pupils. The teacher proceeds to the final evaluation of the pupils (same questions as the first seance). The teachers send the evaluation to the iGEMers
<b>Week 3</b>	Debriefing with iGEMers	Analysis of the final evaluation with the teacher, evacuation of the Petri, and distribution of the diploma