FABLAB to FORMALAB

The idea of creating a FormaLab is to apply the concept of a Fablab to adult education and its integration in a formal educational centre. FormaLab wants to make a Fabrication Laboratory (or FabLab) work to help develop key competences to get an innovative answer to the educational needs of young unemployed adults.

The innovation has to do with the global approach of a group of key competences, with the implication of the users with the process and with the development of creativity and motivation.

The idea of transferring knowledge from the FabLab model into a new model called FormaLab must take its basis of the already developed model of Fablabs.

Although we may find some differences between Fablabs around the world, they have clearly established the basic key points that define them, and what allows them to call themselves a Fablab. In this sense, our starting point is their definition of a fablab and their main characteristics.

This document aims to translate this already established and shared model of FabLab into a “plastic” model to that might be useful in an adult education institution.

A. About Fablabs

A.1. Introduction

"Fablab" is a short term for **“Fabrication Laboratory”**, or, like some people prefer to call it, “Fabulous Laboratory”.
The concept was developed in the Center for Bits and Atoms (CBA) of the **Massachussets Institute of Technology (MIT)**, through a course named *How to do (almost) anything*, lectured by **Prof. Neil Gershenfeld**.

A FabLab consists of a set of digital fabrication tools for rapid prototyping, such as milling machines, laser cutter, vynil cutter machines, electronics workbench, computers and programming tools, supported by open source software. This is a concept created for the community, based on "Learn by doing" education, providing the ideal environment for invention. The projects are conceived in 2D (in the computers) and get real in 3D (by the machines).

What kind of things you can do in the Fablab? Almost anything, it is your imagination that rules! Currently the labs include computer controlled machines with spatial resolution down to microns, and electronics that have time resolution in microseconds. The ability to design and innovate in microns and microseconds puts powerful capabilities into the hands of Fablab users. Communication devices, sensing technologies, building structures, arts and crafts - all are within reach using the tools and materials in a Fablab. High profile projects made in Fablabs include: solar and wind turbines, wireless data networks,a press fit house (no nails, no cement), long range antennas, and sheep sensing and tracking devices. It is an exciting and empowering place to create and innovate, and most users are quite passionate about the lab.
This text was adapted from the Sherry J. Lassiter paper "On the road to the future: Mobile Fablabs for Technical Education".

A.2 The Fablab Model

Before starting with the condition for being a Fablab, two ideas that illustrate the ideals behind the model:
- Developing projects at the intersections between bits and atoms.
- Exploring collaboratively this interactions rather than making (almost) anything...

Conditions for being a FabLab

- public access to the fablab
- support and subscribe to the fablab charter
- share a common set of tools and processes
- participate in the global fablab network (no isolation)

The FabLab conformity rating is a code that describes how closely a lab meets the conditions for use of the FabLab label. It is a quick summary of the lab "now", can change over time. The conformity rating is self-assessed or community-assessed.

Fab Charter

- **Mission**: fab labs are a global network of local labs, enabling invention by providing access for individuals to tools for digital fabrication.
- **Access**: you can use the fab lab to make almost anything (that doesn't hurt anyone); you must learn to do it yourself, and you must share use of the lab with other uses and users
- **Education**: training in the fab lab is based on doing projects and learning from peers; you're expected to contribute to documentation and instruction
- **Responsibility**: you're responsible for:
    - safety - knowing how to work without hurting people or machines
    - cleaning up - leaving the lab cleaner than you found it
    - operations - assisting with maintaining, repairing, and reporting on tools, supplies, and incidents
- **Secrecy**: designs and processes developed in fab labs must remain available for individual use although intellectual property can be protected however you choose
- **Business**: commercial activities can be incubated in fab labs but they must not conflict with open access, they should grow beyond rather than within the lab, and they are expected to benefit the inventors, labs, and networks that contribute to their success.

August 30, 2007

B. What do we want to achieve with the FormaLab?

The objective of the project is to develop a model to help unemployed young adults in educational processes to get some key competences. In this sense, this model must be useful for any adult educational institution that wants to innovate in methodology to develop these competences with their groups.

Which are the key competences we are willing to develop?

The Reference Framework sets out eight key competences:

1. Communication in the mother tongue;
2. Communication in foreign languages;
3. Mathematical competence and basic competences in science and technology;
4. Digital competence;
5. Learning to learn;
6. Social and civic competences;
7. Sense of initiative and entrepreneurship;
8. Cultural awareness and expression.

Competence in the fundamental *basic skills of language, literacy, numeracy and in information and communication technologies* (ICT) is an essential foundation for learning, and learning to learn supports all learning activities.
There are a number of themes that are applied throughout the Reference Framework, which we can consider transversal: *critical thinking, creativity, initiative, problem-solving, risk assessment, decision-taking, and constructive management of feelings* and that play a role in all eight key competences, so they should be considered.

C. What can we take from the Fablab model to apply to the new concept of a FormaLab?

Although FabLabs have a whole structure that defines them, only some aspects are useful to define the FormaLab concept. The key point has to do with the “learn by doing” process of learning and getting competences.

Other aspect to be taken into account have to do with some basic equipment, the kind of workshops that can be done and the promotion of a sharing community.

As a result, a **FormaLab can be defined as:**

A specific environment, associated or inserted in an adult education institution, which uses the “learn by doing” methodology to get their students to get some key competences, by providing access for individuals or groups to tools/activities for digital fabrication.

The kind of work done is based on doing projects and learning from peers; although there must always be a trainer guiding the training programme and it might be linked to other educational processes.

The initial access to the Formalab is through the educational institution, attending workshops offered by the formalab. Once the process is finished the “student” can access by himself (or group) to make almost anything (that doesn't hurt anyone).

One of the ideas is that the user must learn to work with others (DIWO), and they must share the use of the lab with other users. Besides, all designs and processes developed in formalabs must remain available for other formalabs and individual users (open, sharing, transferable…).

Regarding the basic infrastructure needed, the study is based in some examples of Fablabs working around Europe. Although dimensions and use of machines may vary, a minimum of standards are recommended in order to get some valid results.

Physical space needed: 60m2, if possible with many electric outlets in all the walls, for 5 to 10 workspaces.

Minimum machines needed to start: we think the construction of the machines are in the process to learn, but we can start with 1 machine if is possible.
Other infrastructure and material needed: long tables (to allow group work), chairs, shelves and cabinets to keep materials.

The kind of workshops that can be done depend on the machines available and the capacities of the trainer. In any case, in the following table some examples are developed relating possibilities of workshops, machines, key competences and level of difficulties.

Machines	Workshops	Key Competences and skills	Level of difficulties	Kind
				Self build kit
				ready made machines

Regarding the Key Competences developed, **each workshop should be tested before implementing it with young adults**.

The testing process should developed implementing the workshop with a group of professionals related to education, integration or other professionals working with our target group. Once the workshop is developed, the testing group should evaluate which of the key competences they feel are targeted with the activity. By their evaluation, the trainer must establish which are the main key competences that the workshop is oriented to develop, and put them in the workshop definition.

After this process, the workshop can be disseminated and used with unemployed young adults.

Therefore, the examples in the table only show the key competences that have been tested before.

Every workshop should have a standard format and information. This makes it easy to share and disseminate.

The format of each activity with and example should be:

Title

Building robots with LEGO

General Objective

- Learn how with a simple construction game we can build a little robot and how they interact with the environment.

Specific Objectives

- Learn to work in a team.
- Learn to work with a specific task.
- Learn to solve little problems.
- Learn to build Lego ®.

Public
Young people with low handicaps and not motivate to study.

Methodology
- time
3 hours
- materials
Lego Mindstorms ®

Individual or group work?
We work in group.

Number of participants per group
4-6 members each group.

General organization
Two groups, two robots, we learn to build a robot a test different sensors and they relation with de environnement. We try to learn a basic and simple programmation. We try to solve little problematic situations (detect objects and change the direction...).

Use of Fablab machines (please indicate which ones)

Not for this workshop.

(list of the available machines at the Fablab).

Skills targeted
- Learning to learn
- Sense of initiative and entrepreneurship
- Cultural awareness and expression

Material needed, tools, cost

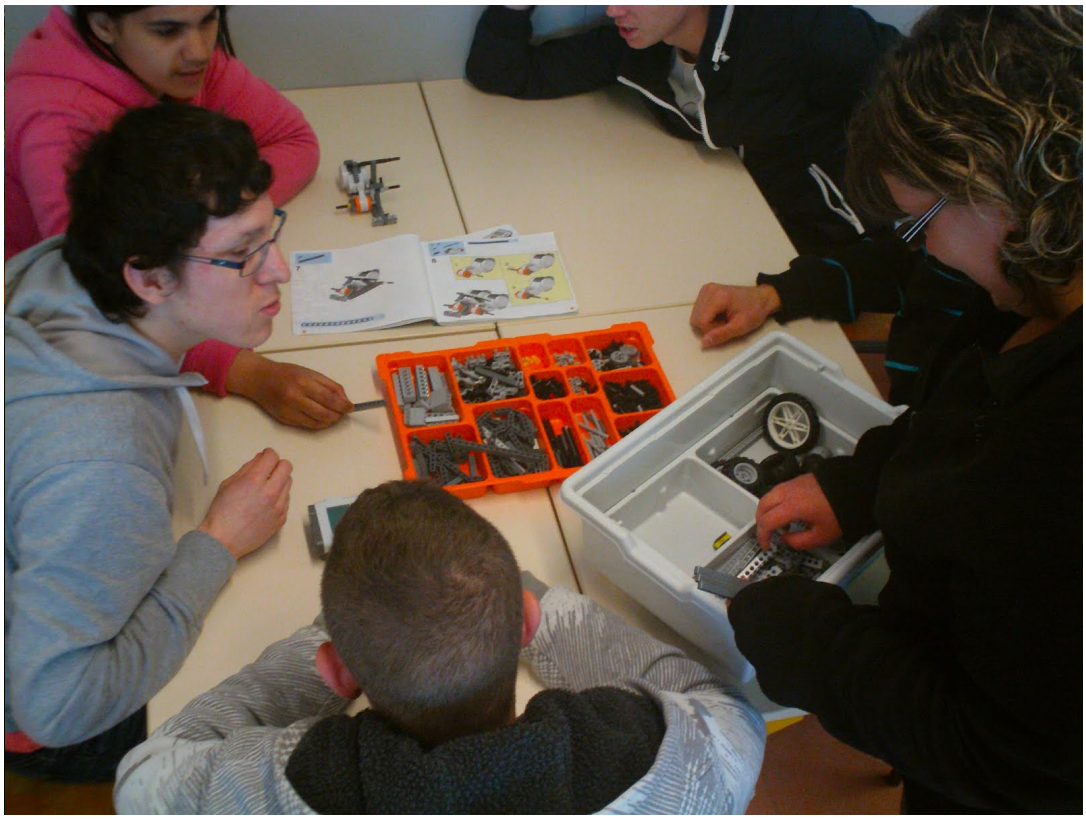
Lego Mindstorms ®

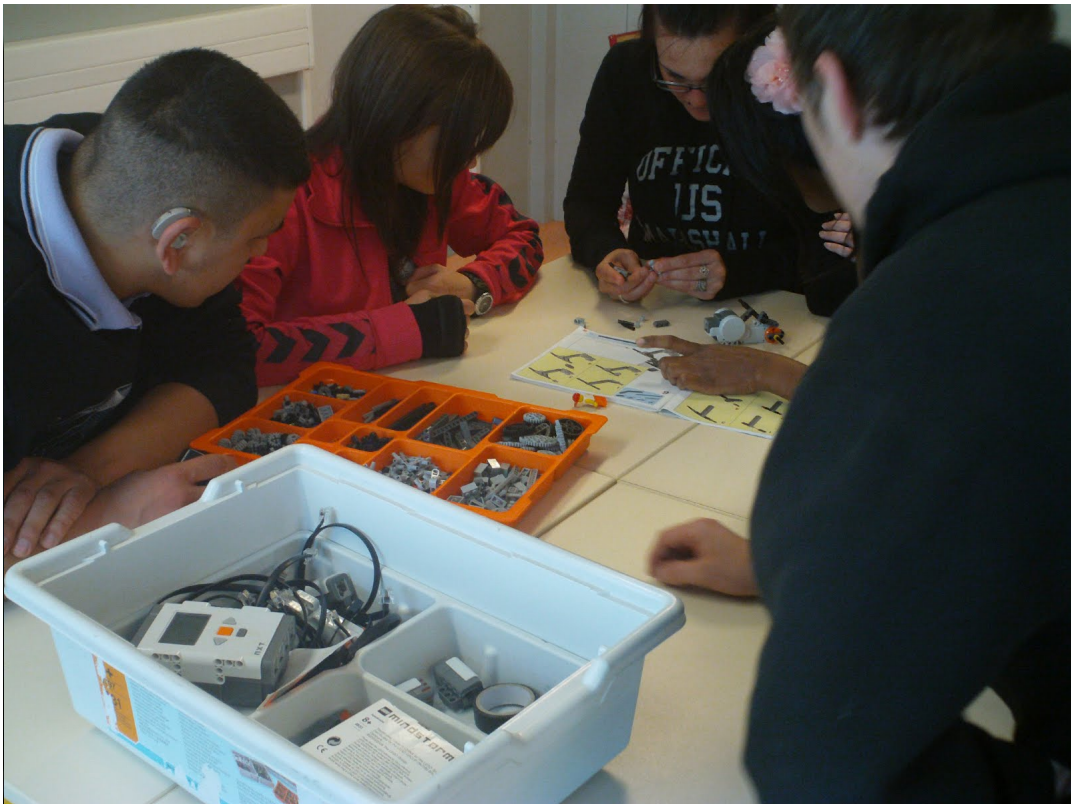
Expertise of the trainer
The trainer need basic knowledge about Lego Mindstorms ®

Organisation (depending on the number,...)
Two trainers for 10 or 12 students. Other trainers are welcome to participate.

Results
Build two robots and test different sensors. Ultrasound sensor for detecting objects near the robot, sensors of light and sound, sensor of touch.

Pictures/video





Other sessions
The workshop could be completed with two half days of work before the day of the robots.

- 1 half day
With a specific work in learn to work in a team.

- 1 half day
Learning to learn. Learn to follow a set of steps for build an object.