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**Didactic Unit
Lleida, city of the future
Science project**

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Lleida, city of the future

Teacher guidelines

Title: LLEIDA, CITY OF THE FUTURE

Age: 14-15 years old

Grouping: students in groups of 4 depending on their interests

The project meet with the Five Keys of Rigorous PBL and the essentials elements:

- **Significant content** – At its core the project is focused on teaching students important knowledge and skills, derived from standards and key concepts at the heart of academic subjects.
- **21st century competences** – Students build competences valuable for today's world, such as problem-solving, critical thinking, collaboration, communication, and creativity/innovation, which are explicitly taught and assessed.
- **In-depth enquiry** – Students are engaged in an extended, rigorous process of asking questions, using resources and developing answers.
- **Driving question** – Project work is focused by an open-ended question that students understand and find intriguing which captures their task or frames their exploration.
- **Need to know** – Students see the need to gain knowledge, understand concepts, and apply skills in order to answer the 'driving question' and create project products, beginning with an 'entry event' that generates interest and curiosity.
- **Voice and choice** – Students are allowed to make some choices about the products to be created, how they work, and how they use their time, guided by the teacher and depending on their age and experience of project-based learning.
- **Critique and revision** – The project includes processes for students to give and receive feedback on the quality of their work, leading them to make revisions or conduct further enquiry.
- **Public audience** – Students present their work to other people, beyond their classmates and teacher

Driving question: (open-ended question)

What makes a city great? (Active citizenship)





Core to learning

Àmbit social

- Competència 5. Explicar les interrelacions entre els elements de l'espai geogràfic, per gestionar les activitats humanes en el territori amb criteris de sostenibilitat
- Competència 11. Formar-se un criteri propi sobre problemes socials rellevants per desenvolupar un pensament crític

Àmbit científico-tecnològic

- Competència 9. Dissenyar i construir objectes tecnològics senzills que resolguin un problema i avaluar-ne la idoneïtat del resultat.
- Competència 11. Adoptar mesures amb criteris científics que evitin o minimitzin els impactes mediambientals derivats de la intervenció humana.

Àmbit digital

- Competència 2. Utilitzar les aplicacions d'edició de textos, presentacions multimèdia i tractament de dades numèriques per a la producció de documents digitals
- Competència 6. Organitzar i utilitzar un entorn personal de treball i aprenentatge amb eines digitals per desenvolupar-se en la societat del coneixement.
- Competència 8. Realitzar activitats en grup tot utilitzant eines i entorns virtuals de treball col·laboratiu.
- Competència 9. Realitzar accions de ciutadania i de desenvolupament personal, tot utilitzant els recursos digitals propis de la societat actual

Àmbit personal i social

- Competència 4. Participar a l'aula, al centre i a l'entorn de manera reflexiva i responsable

Challenge

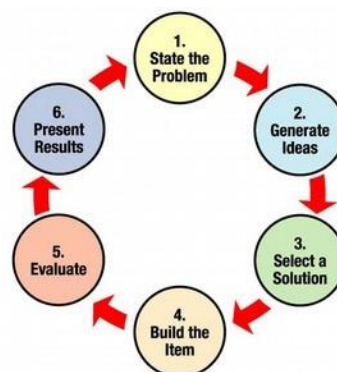
Think about an improvement for Lleida developing an aspect related to our field. Get somebody from the City Council to come to the school to listen to the proposals on how to make a city great

Framework:

We are working developing the EDP
(Engineering Design Process)

Timing: 21 hours

1. HAPPENING (1 hour)





An entry event in order to introduce the topic. An oral presentation from an expert from the University introducing the current situation of cities within a general context where the following problems stand out:

- * Overpopulation
- * Pollution
- * Climate change
- * Lack of Resources

2. CHALLENGE (15 min)

Presentation of the contest: **Lleida, city of the future**

The city of Lleida is launching a contest for students of secondary schools. The proposals consist of the following products:

- A presentation in Prezi, Canva, PowToon... outlining the key concepts of the proposal
- Graphic materials: site plans, floor plans, perspective drawings, physical or digital models, artistic sketches and collages. (Sketchup ?)

3. INITIAL WORK (40 min)

Ideas for the Voice and Choice. Students must write down only two ideas on what makes a city great. They can write them in different post-its and stick them in the blackboard. Then, the ideas will be divided and separated in different clouds.

- Culture and entertainment
- Architecture
- Ecology – Green city – Sustainability – Parks
- Mobility – public transport, bicycle lanes, traffic lights,...
- Cooperation, associations, crowd-funding, sharing,..
- Education
- Health
- Others

A number is given to each issue and students make a list with preferences.

4. GROUPS (10 min)

Teachers make groups of 4 according to their list and trying to balance them.

Reading of the teamwork rubric (target)

5. IDENTIFY THE PROBLEM (50 min)

Students in each of the groups work individually for about 40 min to find information about their topic in the city of Lleida. They take notes about what the city has.

Students should complete individually a table with two columns:

- What do you like about you City?
- What should be improved?

They share the information within the group in order to merge ideas in only one document
GENERAL RESEARCH (1 hour)

The teacher heads this activity. Search for all the information we need to know to make our product.

- The **6 key areas of smart cities**: mobility, society, quality of life, environment, government, economy



6.2. TEAM RESEARCH (1-2 hours)

This activity is only assisted by the teacher.

The teachers give a short guide with some questions related to their fields (culture, architecture, environment, mobility, health, education,...) and some practical examples of solutions in different cities.

7. BRAINSTORM (1 hour)

At this point, the group must choose and focus in just ONE aspect they wish to improve.

A member of the group takes a blank sheet of paper and writes down, using good handwriting, all the ideas from the members.

If there are any similar ideas / solutions among people, they can be written together building clouds on the paper.

IMPORTANT: No judgment, no criticism and no comments yet. It is not time to debate.

8. SELECT BEST OPTION (30 min)

Again in the group, students have five minutes to talk about the options they like most. All members should give their views in a constructive way.

At this point, they have to analyze and evaluate the different options. Make an effort to choose only two or three options (You can use 3 stickers/student to point out the best options).

9. ELEVATOR SPEECH (20 min)

By this time, all groups may have already their proposal

Now they have abt. 40 seconds to explain the problem they want to address and the product (solution) they will present.

10. TASKS DISTRIBUTION (15 min)

Reading of the product rubric. Distribution of the group tasks

11. CREATE (PROTOTYPE) THE SOLUTION (approx. 6-8 hours)

A continuous reflection for each group throughout the project to make them aware of their learning process.

After each session, the students must reflect their job on the learning journal

12. TRY IT OUT. GALLERY WALK (35 min)

A class exhibition. The product of the project is displayed in separated tables in the class. This technique allows students to be actively engaged as they walk throughout the classroom to give feedback to the products displayed.

At their first station, groups will have a look at the products and Students are required to



record one thing they like about the product displayed, one thing they wonder about it, and one thing the creators could do next or improve. (**I Like, I Wonder, Next Steps**), on a chart paper.

After three to five minutes, have the groups rotate to the next station. Repeat until all groups have visited each station.

This can be done before work is submitted to the teacher so that students may use their classmates' feedback to improve their products.

13. NEXT STEPS. SELECTION OF IMPROVEMENTS (15 min)

Students highlight the improvements that they would like to carry out (three or four things)

14. MAKE IT BETTER (1 hour)

Time to carry out the improvements before delivering final product

15. ORAL PRESENTATION (OF LEARNING) (1 hour)

Presenting the final product, idea, and any other relevant artifacts created during the process is a great way to celebrate success as well as get feedback. However, for purposes of growth and learning, presentations need to be more than an introduction to the product or learning artifact.

16. CHOICE OF THE BEST CLASS PRODUCT (1 hour)

After each presentation, your group must fill in the chart with your mark (1-5):

- *What is the most original, unique, innovative, creative, **smart project** for the city of Lleida?*

Group n°	1	2	3	4	5	6	7
Title							
Smart Project							

17. FINAL ASSESSMENT (1 hour)

- Final reflection (teamwork assessment) and group's objectives.
- Self-reflection on project work
 - about yourself
 - about the project
- Self-assessment
- Teacher's feed





SMART CITIES SCHEDULE

Driving Question: What makes a city great?

STEPS		CONTENT	RESOURCES	TIMING (20 hours)
1. HAPPENING	MIRA QUÈ PASSA	Situació ciutats segle XXI. Problemàtiques actuals: *Sobrepoblació *Contaminació *Canvi climàtic *Falta Recursos	Possible presentació per una persona EXPERTA	1 hora
2. CHALLENGE	REPTE	Escull la Lleida que tu vols. Propostes de millora per la ciutat.. CONCURS	Presentació per part de l'Expert o dels professors	15 min
3. INITIAL WORK	GRUPS INICIALS	What makes a city great? Ideas for Voice & Choice SS vote the 6 more relevant ideas	*Post-it a la pissarra Clouds de diferents temes	40 min
4. GROUPS	GRUPS DE TREBALL	Teachers make groups of 4 according to preferences Reading of teamwork rubric	*Teamwork rubric (Target)	10 min
5. IDENTIFY THE PROBLEM	EXPLORACIÓ	What do you like abt. Lleida? What should be improved? Group sharing	Treball individual de recerca de la ciutat *2 columns table (individual)	50 min
6.1. GENERAL RESEARCH	INVESTIGACIÓ	Recerca sobre tot allò que necessitem saber: *Key areas of a Smart City	Treball cooperatiu dirigit pel professor *Fitxes de treball sobre Smart Cities	1 hora
6.2. SPECIFIC RESEARCH	INVESTIGACIÓ	Recerca sobre qüestions fetes pel propi grup	Treball cooperatiu assitit pel professor *Fitxa amb qüestions de cada àmbit amb exemples concrets	1-2 hores
7. BRAINSTORM	IMAGINEM	Recull de múltiples propostes de millora i de productes	Treball cooperatiu *Guia de projecte	40 hora
8. SELECT BEST OPTION		Selecció de la solució més prometedora		15 min
9. ELEVATOR SPEECH	EXPLICACIÓ SOLUCIÓ	Alumnes expliquen en 40s la seva proposta de millora per la ciutat	Group sharing	20 min
10. TASKS DISTRIBUTION	DISTRIBUCIÓ DE TASQUES	Reading of product rubric Distribution of group tasks	*Full de tasques *Product rubric	35 min
11. CREATE (PROTOTYPE) THE SOLUTION	REALITZACIÓ PRODUCTE	Reunions finals de cada sessió	Ordinador I material divers * Fulls de reflexió diari d'aprenentatge	6-8 hores
12. GALLERY WALK	EXPOSICIÓ MILLORES	Feedback entre igual Quines millores podem realitzar?	1 taula-1 ordinador-1 grup 1 membre es queda, els altres visiten l'exposició *Feedback amb full recollida	35 min



STEPS		CONTENT	RESOURCES	TIMING (20 hours)
13. SELECTION IMPROVEMENTS	SELECCIÓ	Selecció de millores a realitzar		15 min
14. MAKE IT BETTER	MILLORAR	Realització de les millores		1 hora
15. ORAL PRESENTATION OF PRODUCTS	COMUNICACIÓ	Presentació a classe de cadauna dels productes finals Selecció de 1 vídeo / 1 producte Entre tots 4 alumnes		1 hora
16. CHOICE OF THE BEST PRODUCT	CO-AVALUACIÓ	Selecció millor proposta de la classe	*Auto-avaluació a partir de rúbrica	1 hora
17. FINAL ASSESSMENT	AVALUACIÓ FINAL	Avaluació objectius grup Reflexió personal i de grup Autoavaluació	*Reflexió sobre aprenentatge i avaluació del projecte. Diari d'aprenentatge	1 hora



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ENGINEERING DESIGN PROCESS



FLOATING GARDEN CHALLENGE



practicalaction.org/floatinggardenchallenge

PRACTICAL ACTION
Technology challenging poverty



What problems are caused by climate change?

Look at the pictures given to you by your teacher

- What is happening?
- Where do you think it is happening?
- What long term problems may result from events like this?
- Is there anything that links all the pictures?

ACTIVITY: Sort your pictures into two groups. You decide how....

Flooding and drought

You may have divided your pictures into different groups:

- Flooding and drought, or
- Affecting Spain and other countries.

Either way is correct ☐☐

Flooding and drought are caused by changing weather patterns and are having devastating impacts in the Spain and around the world.



Impacts of changing climates

Communities living in Bangladesh experience some of the worst effects of climate change.



- Floods affect over 1 million people in Bangladesh and last longer each year.

- During the monsoon season, many families lose their crops and the vegetables they were growing to feed their families.



Your Challenge



The problem: The land where crops used to grow now gets regularly flooded

The challenge: Design and build a **model** of a structure that farmers could grow their crops on even when it floods

What should you consider?

1. For crops to grow on flooded land they need to be planted on a raft-like structure, or 'floating garden', so make sure your model floats.
2. You can use any materials provided by your teacher. Think about making your raft stable.
3. The top of your model should be fairly flat so you could grow your own garden on top of it.
4. Your model must not be wider or longer than 23 x 30 cm, but can be as deep as you like.
5. The winning group will be the one whose raft holds the most weight before it sinks.



FLOATING GARDEN CHALLENGE

Student Worksheet

NAME: **CLASS:**

Please draw your design in the box below – DESIGN 1



A solution developed in Bangladesh...

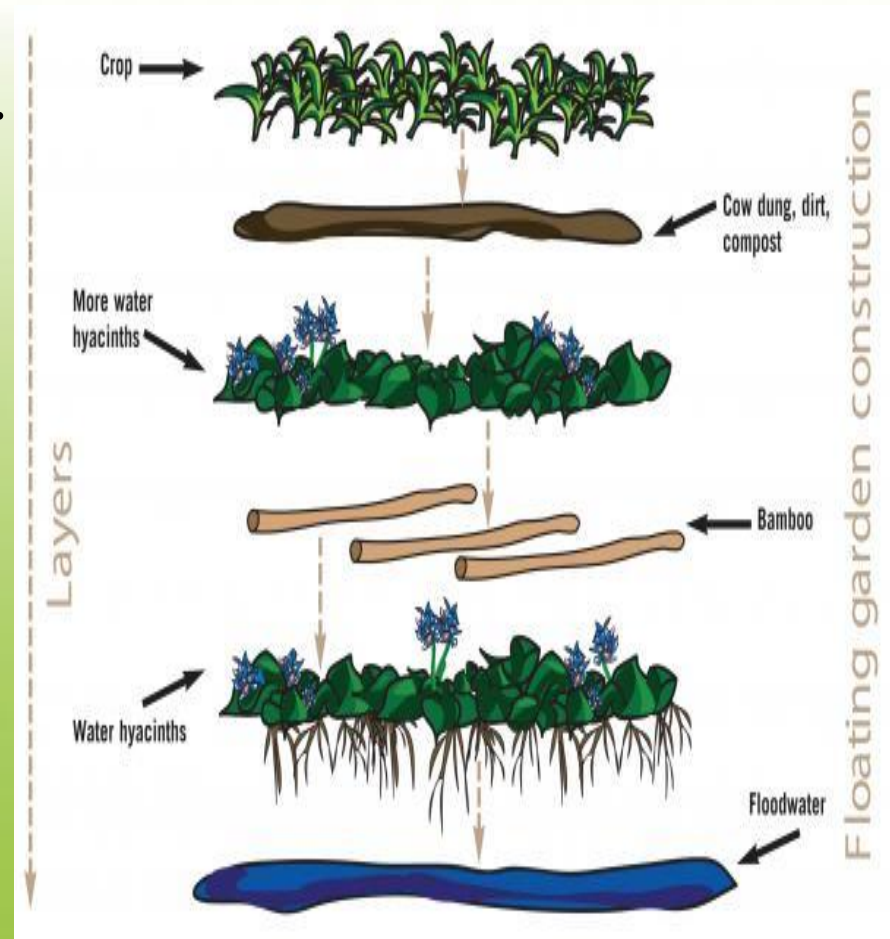
Practical Action works with people to develop sustainable technologies and skills that enable people to have a decent quality of life - we call this TECHNOLOGY JUSTICE.

In Bangladesh, Practical Action worked with farmers to develop 'floating gardens', a technology that uses locally available materials to grow vegetables even during the floods.



How are floating gardens made?

- The rafts are approximately 8 metres long and 1 metre wide.
- They are made up of layers of water hyacinth, bamboo, cow dung and compost.
- The crops are then grown on the top layer of soil.
- The garden floats to the top of the water during the rainy season and returns to ground level when the floods subside.



Are the gardens making a difference?

Many families are benefiting from their floating gardens as they're able to grow vegetables such as okra and leafy vegetables throughout the year.

Some are even keeping their goats and chickens on them!



Other things to think about



- Why are hyacinth roots and bamboo used instead of man made materials?
- What do you think happens to the ‘raft’ once the crops have been harvested?
- Families who grow crops also keep livestock such as goats. What do you think happens during the floods? Can you guess what Practical Actions’ solution has been?
- Do you think floating gardens can be used elsewhere in the world?

To find out more go to practicalaction.org/floating-gardens

Which are the steps of the design process?



IDENTIFY
constraints

COMMUNICATE
your solution



TEST

and evaluate
your prototype



BRAINSTORM
multiple solutions
for the problem



PROTOTYPE
your solution



SELECT
the most
promising solution

ITERATE

to improve
your prototype



DEFINE

the problem





THE ENGINEERING DESIGN PROCESS

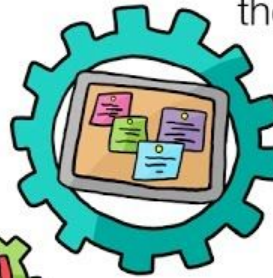
COMMUNICATE

your solution



DEFINE

the problem



IDENTIFY

constraints on your solution (e.g. time, money, materials) and criteria for success

BRAINSTORM

multiple solutions for the problem



SELECT

the most promising solution

ITERATE

to improve your prototype



TEST

and evaluate your prototype

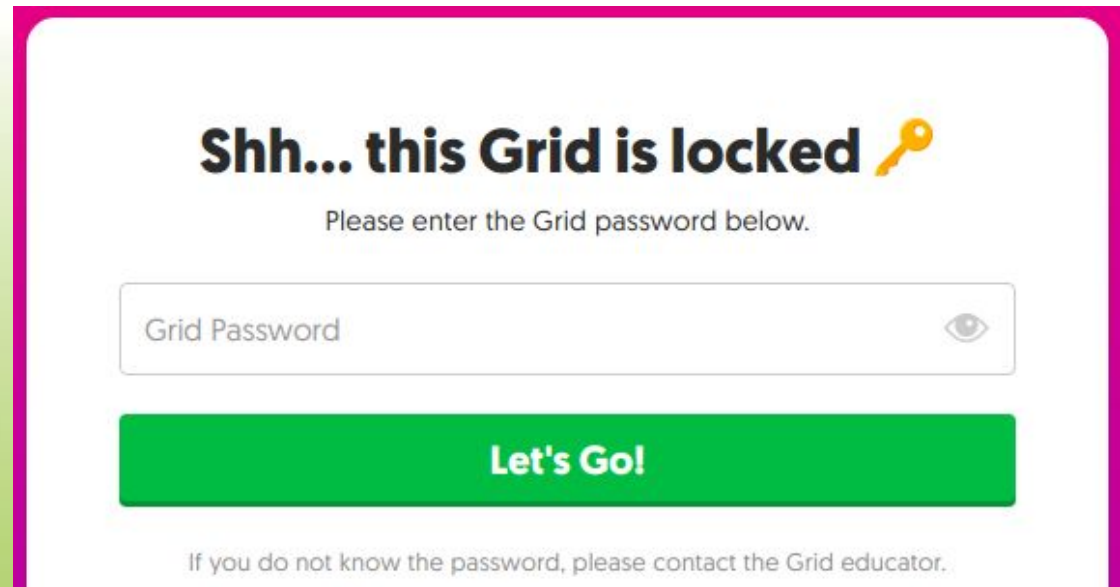


PROTOTYPE

your solution

Which is the most important step in EDP?

FLIPGRID



Shh... this Grid is locked 

Please enter the Grid password below.

Let's Go!

If you do not know the password, please contact the Grid educator.

- 1.- You will receive a mail with the link to this page
- 2.- Download the app if using a mobile device / tablet
- 3.- Type in the Grid Password ... **TechNology**
- 4.- Post a response to the question.

USE OF SMARTPHONES IN OUR CLASSROOM

**Should Smartphones be allowed in our Classroom?
Oriol Llobera**

THEORETICAL FRAMEWORK

- Developing digital citizenship among students (Social constructivism)
- 21st century Skills:
 - Critical thinking
 - Creative thinking
 - Collaborating
 - Communicating
 - Media literacy
 - Flexibility
 - Initiative
 - Social skills
 - Productivity
- Students work independently, construct their own understanding based on their experience and interests

SEE WHAT'S UP!!

France to ban mobile phones in schools from September

Pupils, teachers and parents seem less than convinced by measure prohibiting use in primary, junior and middle schools



▲ The ban on mobile phones was part of Emmanuel Macron's successful presidential election campaign this year.
Photograph: Alamy Stock Photo

SEE WHAT'S UP!!

More schools use cellphones as learning tools

Josh Higgins | USA TODAY
Published 6:38 p.m. UTC Aug 7, 2013



Students, Emme McCleary, 13, and Brenna Toshner, 13, use iPhones and an HP Notebook computer for a class assignment in their language arts class at Willis Junior High in Chandler, Ariz.

Michael Schennum, The Arizona Republic

PROS



SHOULD SCHOOLS
WELCOME CELL
PHONES IN CLASS?

CONS



TEAMWORK



- We form 1 pro-team (benefits) & 1 cons-team (drawbacks)
- We designate a **facilitator**, a **recorder**, a **spokesperson** and a **reflector** in each team.
- Every member writes in a post-it a benefit or a drawback for using cell phones in class
- He/she sticks the post-it in the blackboard and explain briefly his argument.

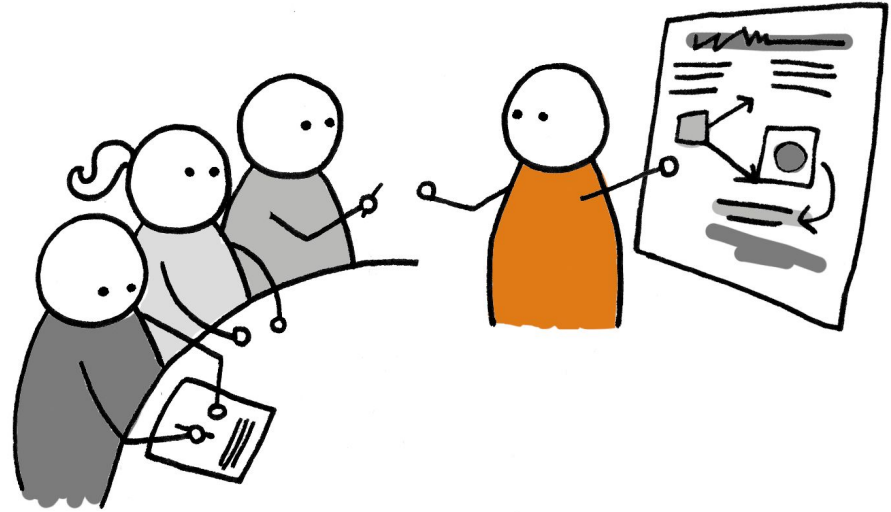
TEAMWORK



- The **reflector** organizes the post-its in clouds with similar ideas.
- The **facilitator** ensures that all have room in the conversation.
- All members place two stickers on the sentences that they like the most.
- The **recorder** takes note of the results of the poll

DISCUSSION

The **spokesperson** of each group explains the other team the reasons for being in favour or against the cell phones



CAN WE AGREE ON
A CELL PHONE
POLICY?

IN WHICH SITUATIONS CAN WE USE THE CELL PHONES IN CLASS?

WHICH RULES MUST BE INTRODUCED?

WHAT HAPPENS IF WE DON'T FOLLOW THIS RULES?

It's
swap
time

The ONES that were
against the cell phones in
class must decide....

IN WHICH SITUATIONS CAN WE USE THE CELL PHONES IN CLASS?

1. Phones will be used to...
2. Phones will be used to...

It's
swap
time

The ONES that were in favour of the cell phones in class must decide....

WHICH RULES MUST BE INTRODUCED?

1. Phones won't be used to...
2. Phones will be used...

WHAT HAPPENS IF WE DON'T FOLLOW THIS RULES?

If a student the following measures will occur:

1st offence

2nd offence

3rd offence

CELL PHONE CONTRACT



- Signature of the parents
- Signature of the student
- Signature of the teacher