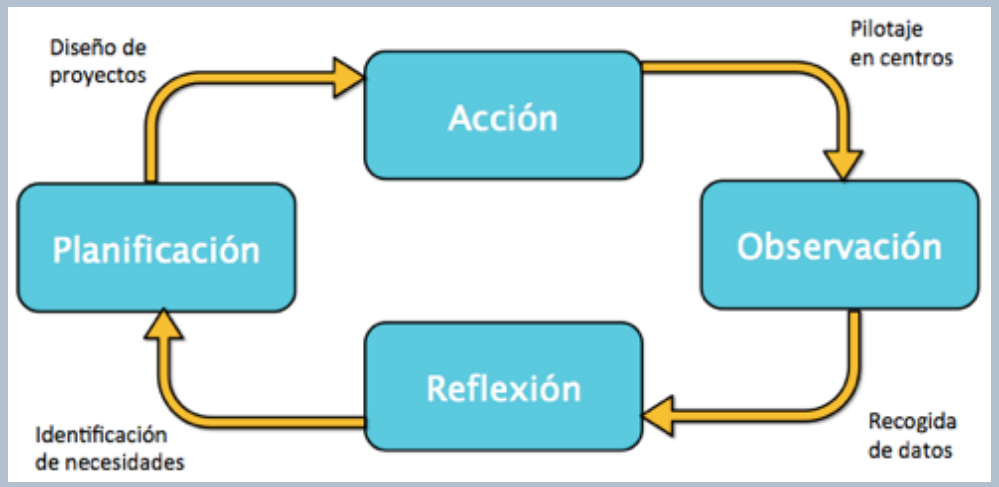
STE(A)M LESSONS LEARNED:

FROM STEM4MATH TO STEAM-CT

UVa

Belén Palop del Río

stem4math

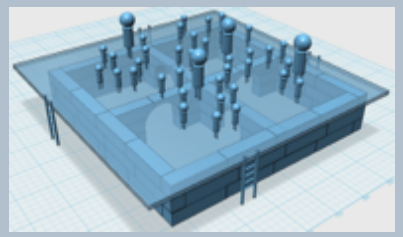


www.stem4math.eu

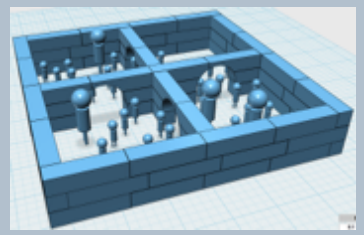
Integrative STEM education refers to technological/engineering design-based learning approaches that intentionally *integrate the concepts and practices of science and/or mathematics education with the concepts practices of technology and engineering education. Integrative STEM education may be enhanced through further integration with other school subjects, such as language arts, social studies, art, etc. (Sanders & Wells, 2006)*[1]

LEVELS OF INTEGRATION

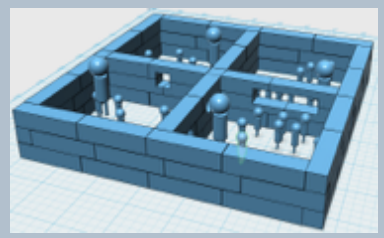
Transdisciplinary



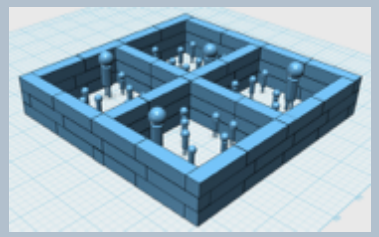
Interdisciplinary



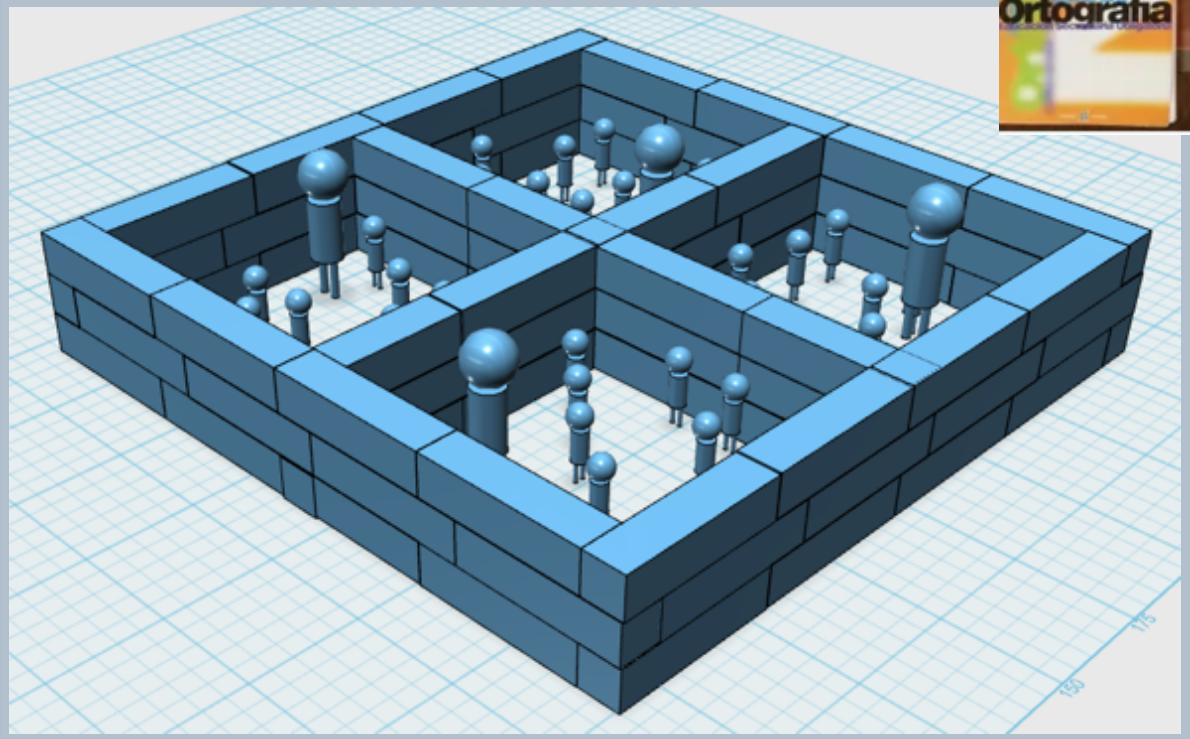
Multidisciplinary



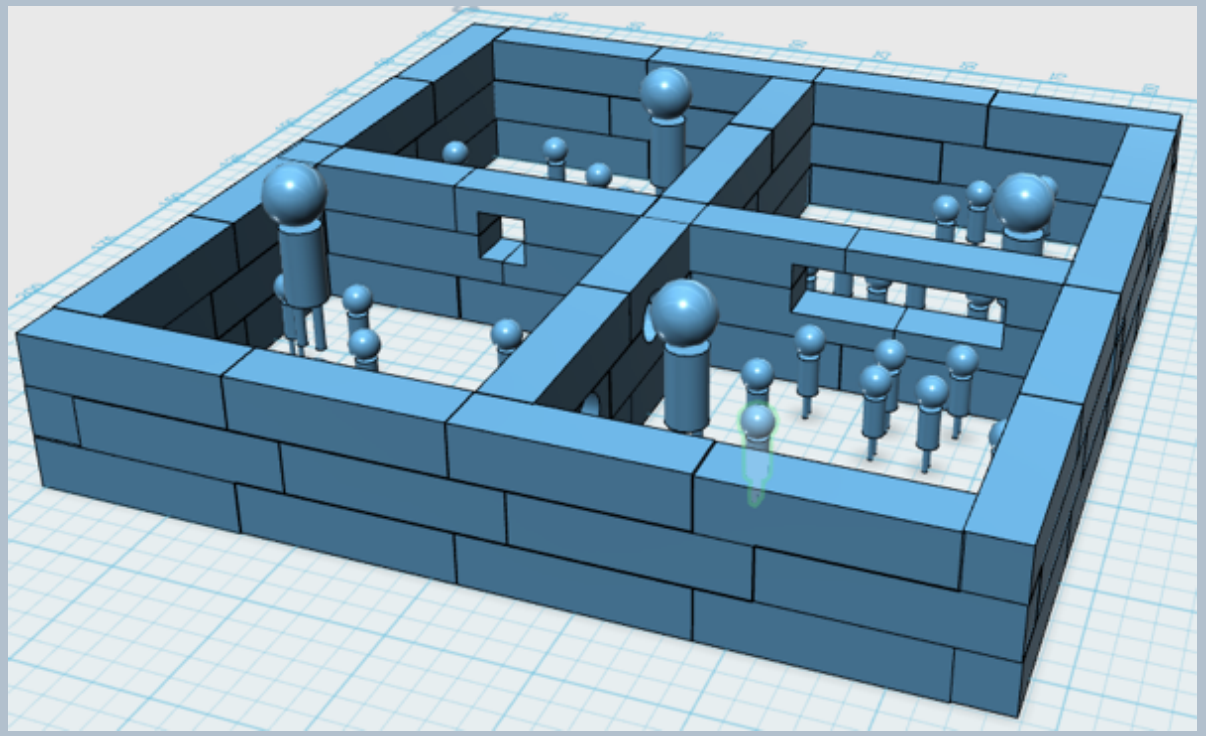
Juxtaposition



JUXTAPOSITION



MULTIDISCIPLINARY



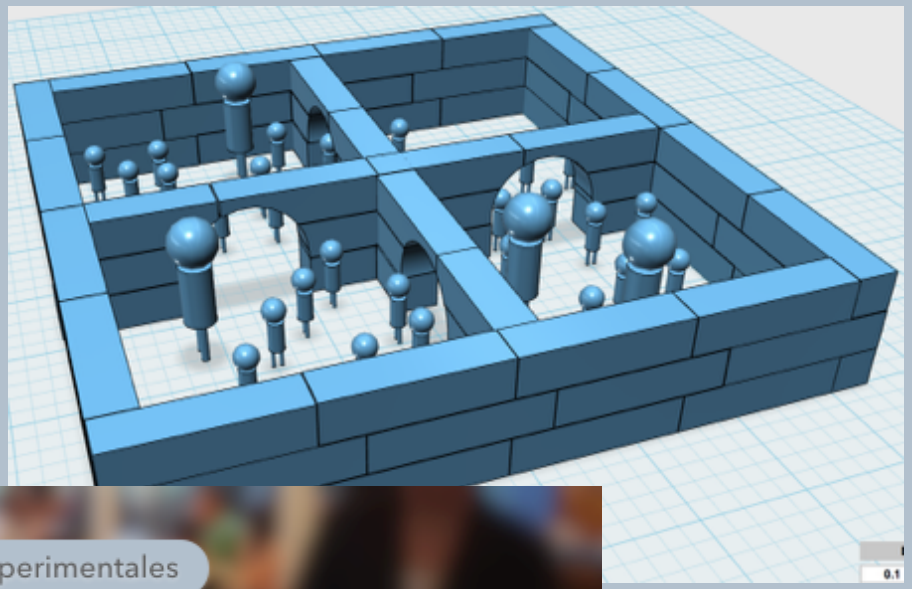
Las actividades propuestas para 4º de ESO son, vinculada

- Lengua y Literatura: "Léxico heredado" análisis de la que se puede encontrar en una *domus*. El producto f términos queden registrados.
- Geografía e Historia: "Domus". La materia actúa com torno a la casa romana por lo que, a lo largo de varia trabajarán con sus alumnos el concepto de *domus* y romano. Así mismo, durante la primera jornada en la romana de Julióbriga, contaremos con un experto (D Cantabria) quien, con una breve introducción, inaugu
- Matemáticas, Física y Química: "Juego de escape". L educativo, resulta gratificante y realmente útil. El obje resolución de pruebas, a un elemento final u objetivo son problemas y acertijos vinculados con las Matema
- Física y Química: "Mi imperio es una joya". En la mat procesos de cristalización. Aprovechando esta circun para las mujeres romanas, como por ejemplo: colgar

Multidisciplinary team approaches utilise the skills and experience of individuals from different disciplines, with each discipline approaching the patient from their own perspective. Most often, this approach involves separate individual consultations. These may occur in a "one-stop-shop" fashion with all consultations occurring as part of a single appointment on a single day. It is common for multidisciplinary teams to meet regularly, in the absence of the patient, to "case conference" findings and discuss future directions for the patient's care. Multidisciplinary teams provide more knowledge and experience than disciplines operating in isolation.

INTERDISCIPLINARY

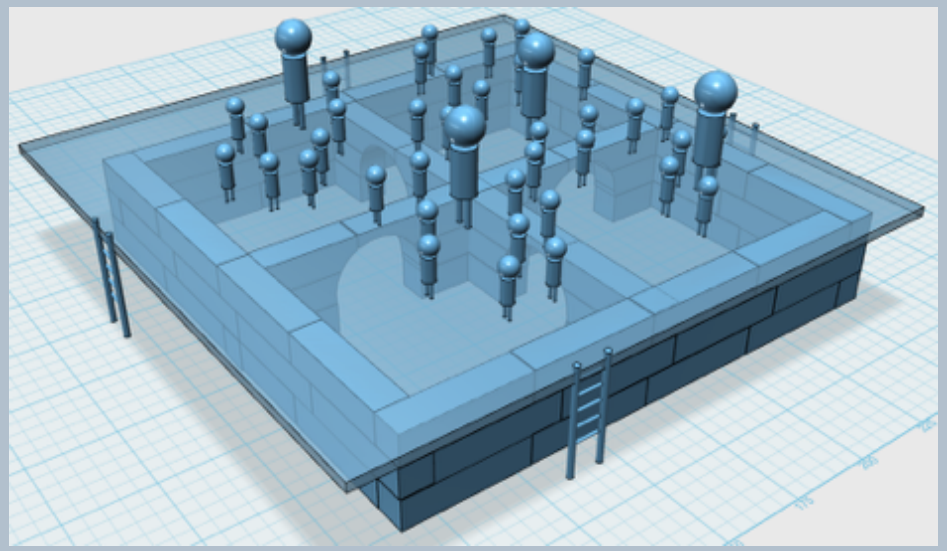
Interdisciplinarity involves researchers, students, and teachers in the goals of connecting and integrating several academic schools of thought, professions, or technologies—along with their specific perspectives—in the pursuit of a common task.



TRANSDISCIPLINARY

Aristotle's main focus as a teacher was cooperative research, an idea which he founded through his natural history work and systematic collection of philosophical works to contribute to his library. His students were assigned historical or scientific research projects as part of their studies.

French philosopher Pierre Levy argues, in his 1994 Collective Intelligence, that the publication of Frenchman Denis Diderdot and Jean d'Almbert's Encyclopedie (1751-1772) marks "the end of an area in which a single human being was able to comprehend the totality of knowledge."



STEM

- Juxtapositon+ (1/4)
- Allows learning from each subject
- Not present in Teacher's Education
- Not experienced by present teachers

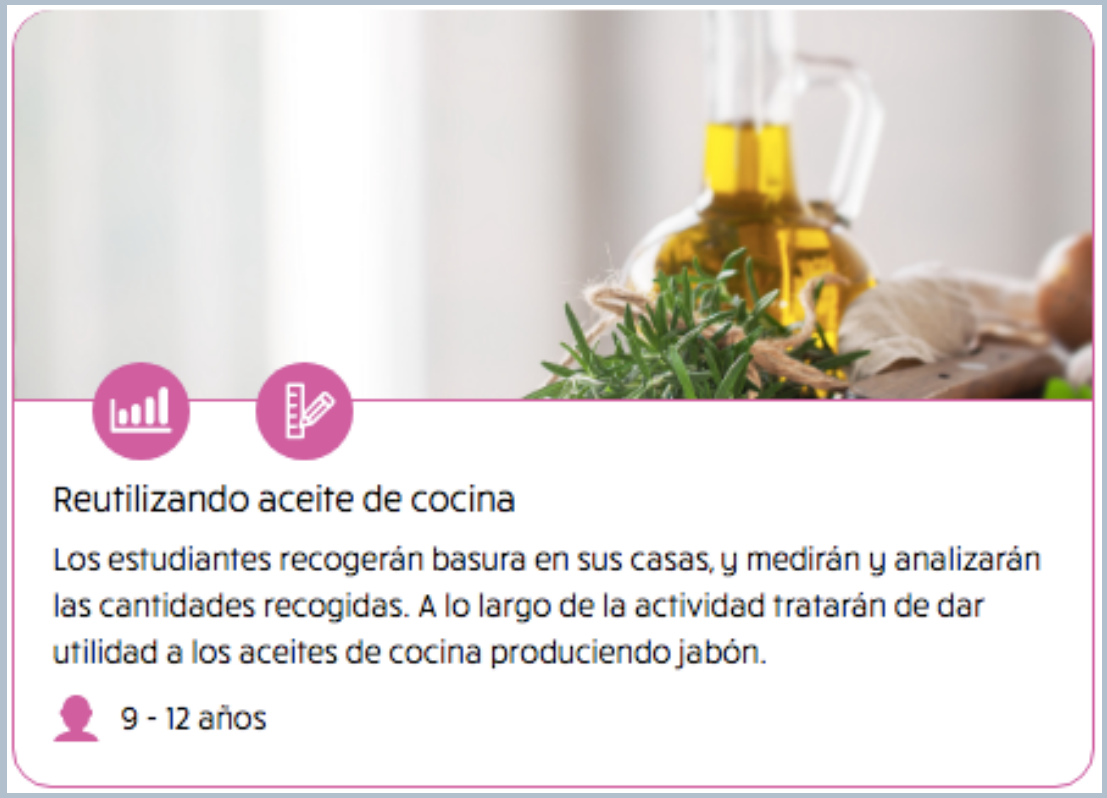
STEAM EDUCATION

- Interdisciplinary+ (4/4)
- Integrated learning
- Only methodological background in PBL (if any).
- No content knowledge.
- Not experience nor learned

WHEN IS IT STEAM4MATH EDUCATION?

- The problem that motivates the project is realistic
- The learning process is active
- The skills and contents learned are motivated by the problem
- New knowledge is discovered through experimentation in an autonomous way
- There is (a lot of) interaction between the students and the teacher
- There is a balance between manipulative/pictorial/abstract levels.
- The activities are thought-provoking (critical, deep, meaningful)
- The teacher, who has very clear goals, is not the center of the classroom and has more questions than answers
- Assessment is essentially formative
- Los aprendizajes suceden en el área transdisciplinar

CASO PRÁCTICO: REUTILIZANDO ACEITE DE COCINA



Reutilizando aceite de cocina

Los estudiantes recogerán basura en sus casas, y medirán y analizarán las cantidades recogidas. A lo largo de la actividad tratarán de dar utilidad a los aceites de cocina produciendo jabón.

9 - 12 años

CASO PRÁCTICO: JOIN THE GREEN SIDE

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45 min. — ***The teacher introduces the context of the activity: Reuse of cooking oils***

Students will have to collect school/domestic trash during one week.

180 min. — Each group recollects and measures each kind of trash in each day and shares this with the class.

The students put their measurements in tables and graphics in order to analyse (for example, in excel).

45 min. — In small groups students read, analyse and discuss the text on the worksheet (p.6) about used cooking oils and environmental consequences. Then they share conclusions in big group.

225 min. — En grupos pequeños, analizan el texto *"¿Cómo hacer jabón reutilizando aceite de cocina?"* de la hoja de trabajo y deciden las cantidades de cada material a utilizar en proporción con el aceite de cocina usado que han recogido.

Actividad de laboratorio (grupos pequeños)

45 min. — Evaluación final: debate en grupo

CASO PRÁCTICO: JOIN THE GREEN SIDE

APLAZADO

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Nueva incorporación

SOCIAL SCIENCE

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stem4math

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COLLECTING THE RUBBISH –GETTING READY

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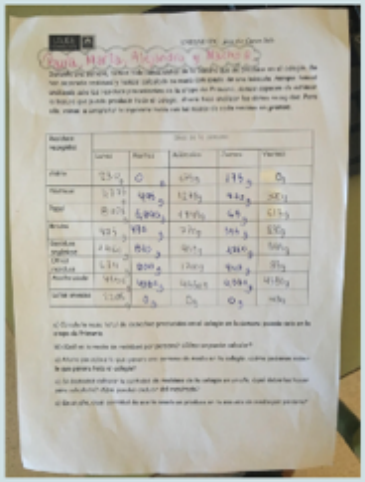
COLLECTING THE RUBBISH - AFTER



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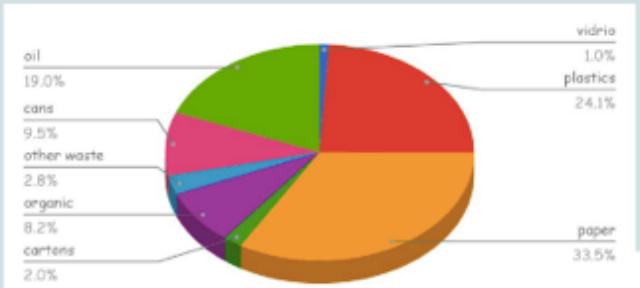
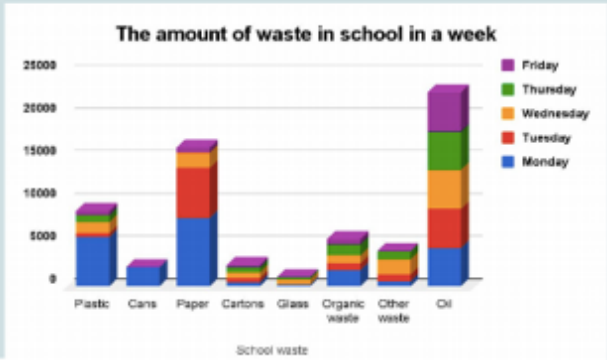
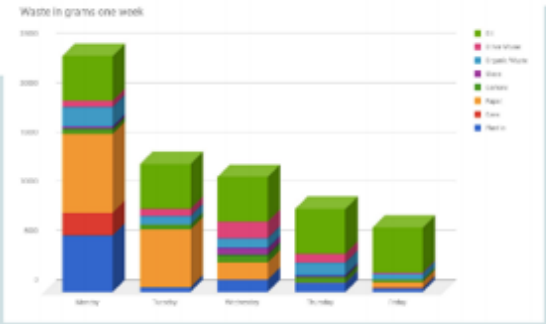
ICT







Giving students choice about how to represent data in graphic form using Google Sheets.

Critical thinking skills - justifying their choice.

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Nueva incorporación

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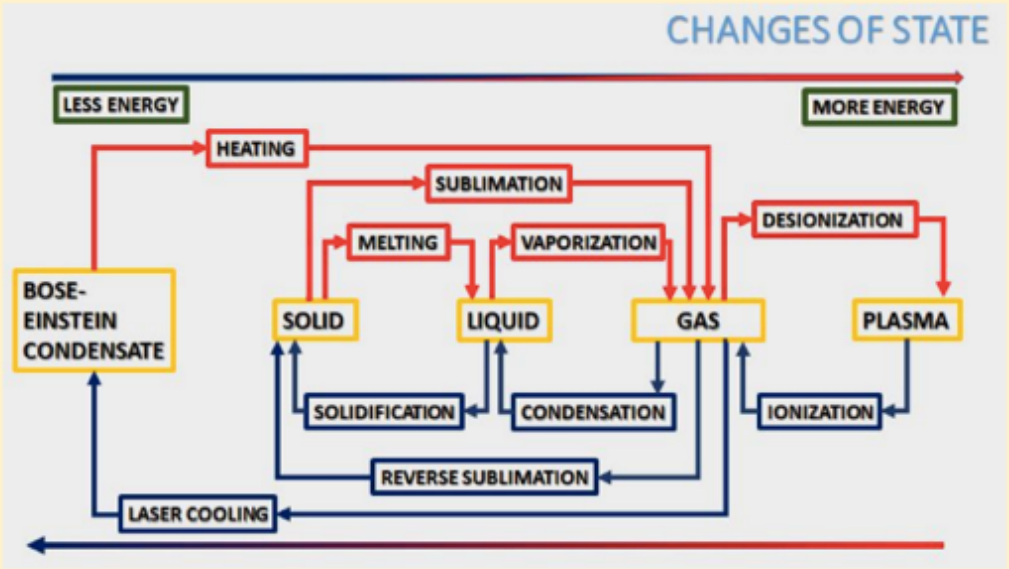

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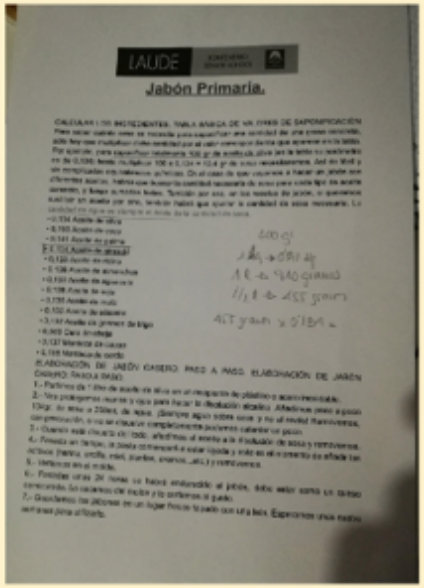
Actividad de laboratorio (grupos pequeños)

MAKING SOAP - AFTER



We talked about the saponification process and worked with different quantities and types of oil to calculate how much caustic soda and water we would need.

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steam

CT

Formación online para docentes

Proyectos de aula y marcos temáticos

Evaluación de la competencia computacional

Modelo didáctico STEAM-CT

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