IN²omath

"INNOMATH - Innovative enriching education processes for Mathematically Gifted Students in Europe"
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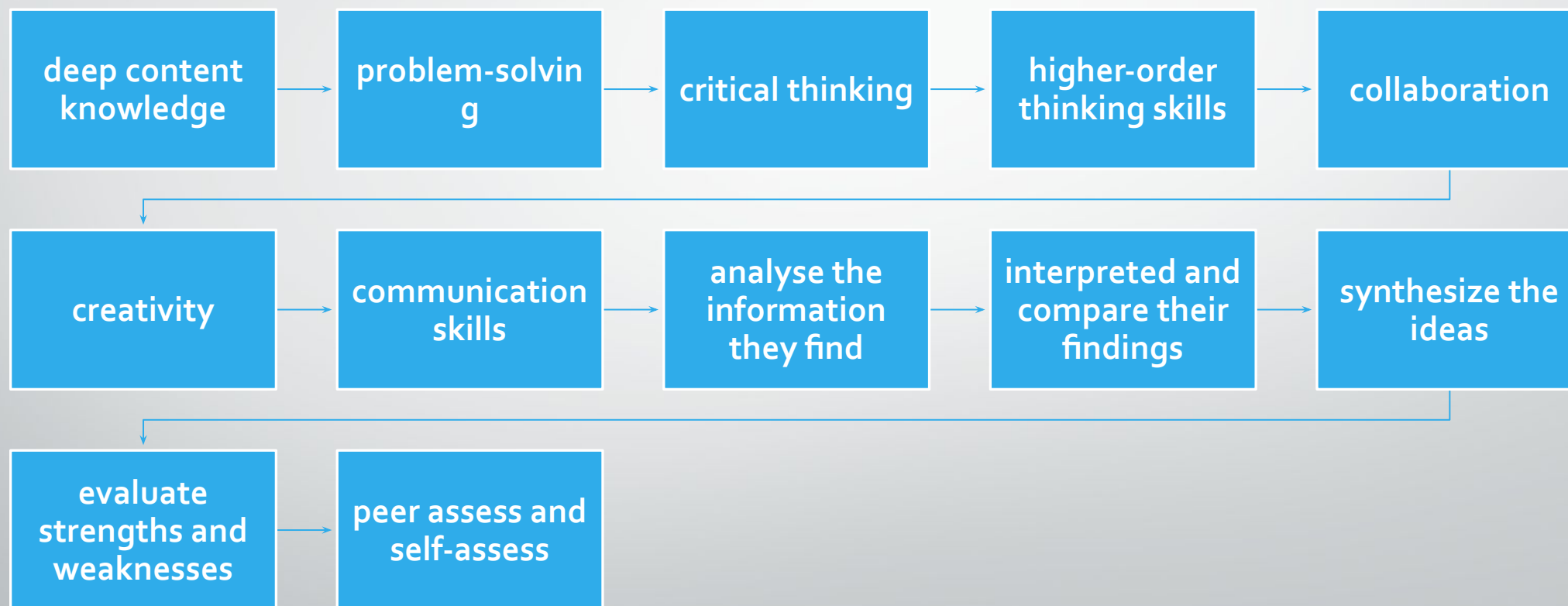
Title of Content: Project Based LEarning
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What is Project Based Learning?

- Project Based Learning (PBL) is a teaching method in which students learn by actively engaging in real-world and personally meaningful projects.

- PBL uses methods such as inquiry – based learning and problem-based learning.

- Having decided to explore a topic or concentration and aspect of your curriculum you can decide use either an inquiry-based approach or a problem based approach or indeed a mixture of the two.

Students develop:

| deep content knowledge | → | problem-solving | → | critical thinking | → | higher-order thinking skills | → | collaboration |

| creativity | → | communication skills | → | analyse the information they find | → | interpreted and compare their findings | → | synthesize the ideas |

| evaluate strengths and weaknesses | → | peer assess and self-assess |

The PBL can be approached in two ways:

1. Your work in your own classroom with your class and the work is kept in there.

2. You decided to collaborative work with other teachers either in your own school, your own country or in another countries.

When you take this broader approach the rewards of collaboration can be of enormous benefit both to you and your students. The benefits of exchange and peer learning really does help you to consolidate your approach to changing teaching practice through discussion what other teachers.

How does PBL differ from "doing a project"?

DESSERT
"DOING A PROJECT"

OR

MAIN COURSE
PROJECT BASED LEARNING
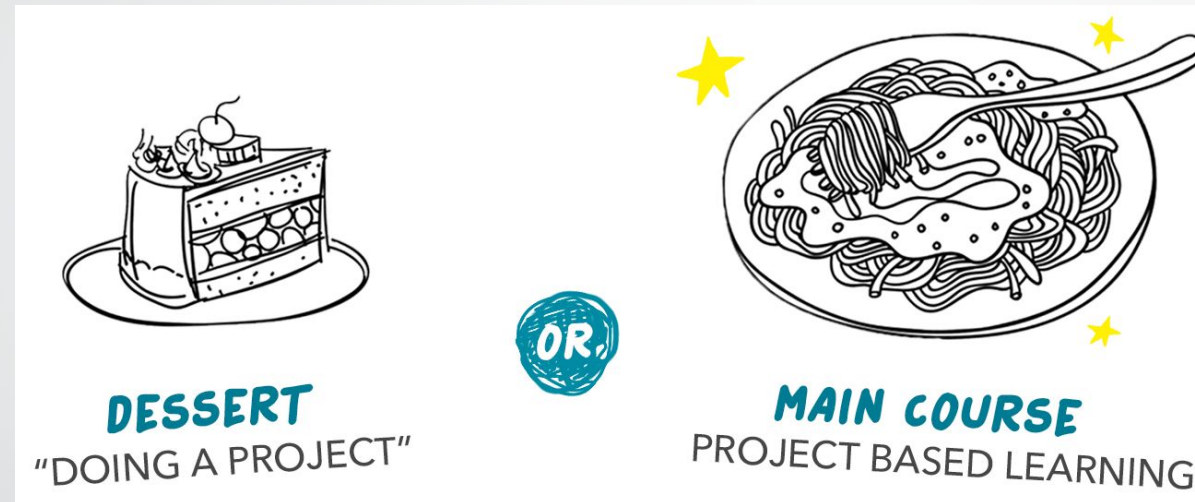
Teachers have been assigning projects to students for years but PBL is completely different.

We like to say it's the main course, not dessert!

DESSERT "DOING A PROJECT"	MAIN COURSE PROJECT BASED LEARNING
An add-on to the traditional instruction; at the end (or alongside) of the unit	Instruction integrated into the project (The project is the unit!)
Follows direction of the teacher	Driven by student inquiry
Focused on product	Focused on product and process
Often unrelated to standards and skills	Aligned to academic standards and success skills
Can be completed alone and/or at home	Involves collaboration with students and in-class guidance from teacher
Remains within the school world	Has a real-world context and application
End result of project displayed in the classroom	Results of project shared beyond the classroom with a public audience

So   do you know the difference?
Here's a little quiz!

Impact on students

- PBL blends content mastery, meaningful work, and personal connection to create powerful learning experiences, in terms of both academic achievement and students' personal growth.

- PBL can be transformative for students, especially those furthest from educational opportunity. Now more than ever, we need young people who are ready, willing, and able to tackle the challenges of their lives and the world they will inherit - and nothing prepares them better than Project Based Learning.

Here are just some of the ways that PBL transforms students' educational experiences:

- **Engaged hearts and minds**

Students actively engage with PBL projects that provide real-world relevance for learning. Students can solve problems that are important to them and their communities.

- **Deeper learning**

PBL leads to deeper understanding and greater retention of content knowledge. Students are better able to apply what they know to new situations.

- **Exposure to adults and careers**

Students interact with adults, businesses and organizations, and their community, and can develop career interests.

- **A sense of purpose**

A great project can be transformative for students. Seeing a real-world impact gives them a sense of agency and purpose.

- **Success skills**

Students gain skills valuable in today's workplace and in life, such as how to take initiative, work responsibly, solve problems, collaborate in teams, and communicate ideas.

- **Rewarding teacher relationships**

Teachers work closely with active, engaged students doing meaningful work, and share in the rediscovered joy of learning.

- **Creativity and technology**

Students enjoy using a spectrum of technology tools from research and collaboration through product creation and presentation.

Gold Standard PBL: Essential Project Design Elements

- **A research-informed model for improving, calibrating, and assessing your practice.**
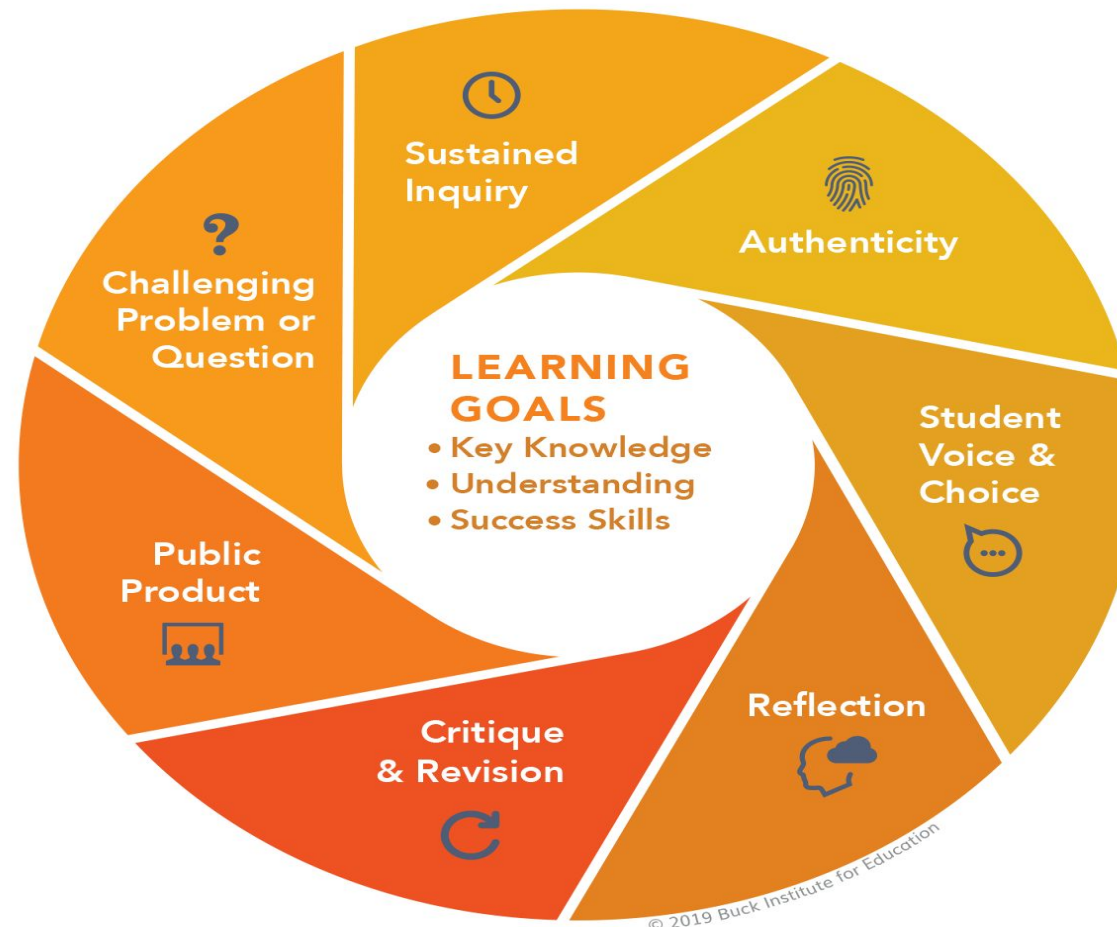
Student learning goals for projects include standards-based content as well as skills such as critical thinking, problem solving, communication, self management, project management, and collaboration.

What is Gold Standard PBL?

To help teachers do PBL well, we created a comprehensive, research-informed model for PBL to help teachers, schools, and organizations improve, calibrate, and assess their practice. In Gold Standard PBL, projects are focused on students' acquiring key knowledge, understanding, and success skills.

A Challenging Problem or Question

The project is framed by a meaningful problem to be solved or a question to answer, at the appropriate level of challenge.

Sustained Inquiry

Students engage in a rigorous, extended process

of posing questions, finding resources,

and applying information.

Authenticity

The project involves real-world context,

tasks and tools, quality standards, or impact,

or the project speaks to personal concerns,

 interests, and issues in the students' lives.

Student Voice & Choice

Students make some decisions about
the project, including how they work
and what they create, and express their
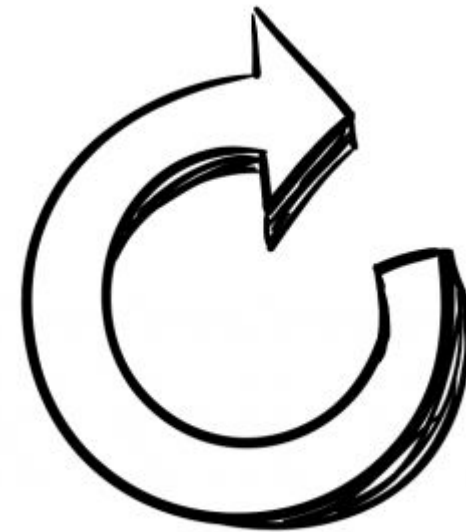own ideas in their own voice.

Reflection

Students and teachers reflect on the learning,

the effectiveness of their inquiry and

project activities, the quality of student work,

and obstacles that arise and strategies

for overcoming them.

Critique & Revision

Students give, receive, and apply feedback

to improve their process and products.

Public Product

Students make their project work public by sharing it presenting it to people beyond the classroom.

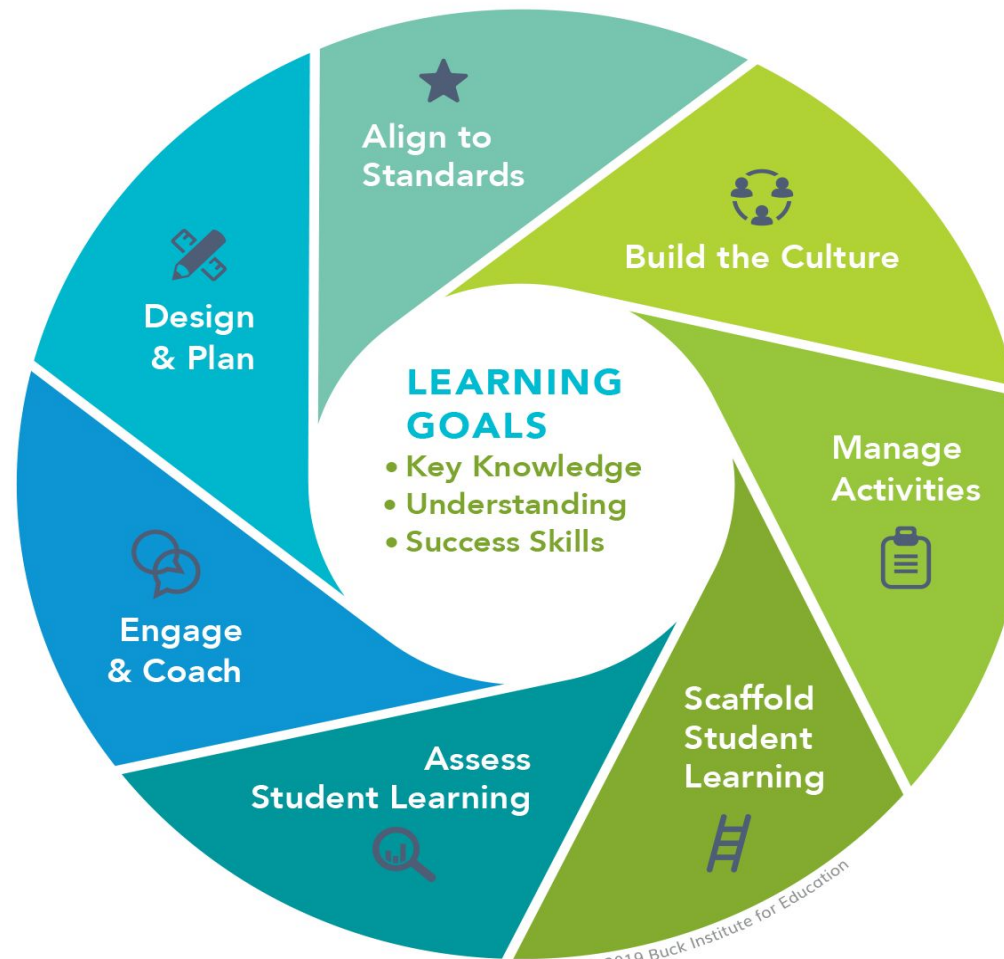# Gold Standard PBL: Project Based Teaching Practices

When transitioning to PBL, one of the biggest hurdles for many teachers is the need to give up some degree of control over the classroom, and trust in their students. But even though they are more often the "guide on the side" than the "sage on the stage," this most certainly does not mean that teachers don't "teach" in a PBL classroom. Many traditional practices remain, but are reframed in the context of a project.

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Design & Plan

Teachers create or adapt a project for their

context and students, and plan its implementation

from launch to culmination while allowing

for some degree of student voice and choice.

Align to Standards

Teachers use standards to plan the project and make sure it addresses key knowledge and understanding from subject areas to be included.

Build the Culture

Teachers explicitly and implicitly promote

student independence and growth,

open-ended inquiry, team spirit,

and attention to quality.

Manage Activities

Teachers work with students to organize tasks

and schedules, set checkpoints and deadlines,

find and use resources, create products

and make them public.

Scaffold Student Learning

Teachers employ a variety of lessons,

tools, and instructional strategies to support

all students in reaching project goals.

Assess Student Learning

Teachers use formative and

summative assessments of knowledge,

understanding, and success skills, and

include self and peer assessment of team

and individual work.

Engage & Coach

Teachers engage in learning and
creating alongside students, and
identify when they need skill-building,
redirection, encouragement, and celebration.

Projects

Math Grades11-12

How can we create a financial plan for a family?

Project Summary

In this project, students take on the role of financial planners and help local families to plan for goals such as retirement, college tuition, and mortgage reduction. With the help of a professional financial expert and their math teacher, students understand basic financial principles and formulas that are exponential and logarithmic functions. As a team, students interview their clients to determine their financial goals, then perform and calculate appropriate savings and investment plans using algebraic, graphical, and table representations.

Math GradesK-4

In case of a fire, what is the best way to safety?

Project Summary

In this project, students make a fire escape plan for their homes and school using measurement concepts. They review existing school emergency plans, gather input from local fire officials, and engage in inquiry about fire safety and different units of measurement.

Using what they learn, students calculate and communicate the distance between each turn, using standard (feet, meters) and nonstandard (steps) units of measurement, and then add those quantities together to calculate the total distance of each route. Students use their calculations to compare distances and to determine the fastest and safest route out of the building. The plans students develop receive feedback from local firefighters and are presented to local fire officials, students, and other members of the community.*

Math Grades 5-7

How can we as comic book designers build superhero worlds that teach others about math?

Project Summary

Although the worlds of comic book superheroes are fantastical, they are also filled with complex mathematical problems to solve, such as "How many aliens will have come through the portal before Shuri manages to close it?" "How many people can Iron Man rescue before the building explodes?"

In this project, students are challenged by a comic book publisher to create an engaging and mathematically meaningful comic book that will teach others about algebraic reasoning and mathematical modeling. Students explore the imaginary world(s) of superheroes in order to generate problems that their favorite characters might face. They model these problems using algebraic expressions or equations and use these ideas to create their own algebra comic books. Throughout the project, students will reflect on the ways in which the problems they create in their comic books mirror real-life situations.

Preliminary checklist

- The project idea?

- The time frame proposed?

- Is it manageable?

- Between you and your class or other teachers in your school/other countries?

- Working language of the project?

- What subjects could be integrated into the project?

- What technical tools. If any, will you use?

- What are the planning stages in relation to the school year?

7 steps to successful PBL

- Step1 : Involve your students from the beginning

- Step 2: Break down the topic into well defined tasks

- Step 3: Plan well, set goals, define outcomes

- Step 4: Divide your class into working groups with well defined tasks

- Step 5: Create a tangible artefact as an outcome

- Step 6: Arrive at a conclusion

- Step 7: document and present to a public audience

INNOMATH Consortium