

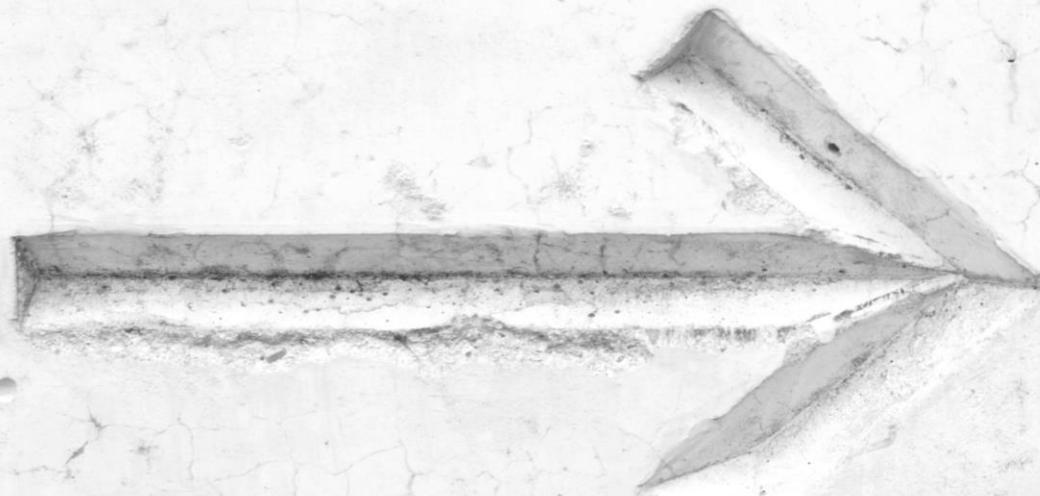
CHALLENGING  
CONVENTIONAL  
THINKING



In theory, CBL is nothing else  
than another name for PBL and  
PjBL.  
*True or false?*

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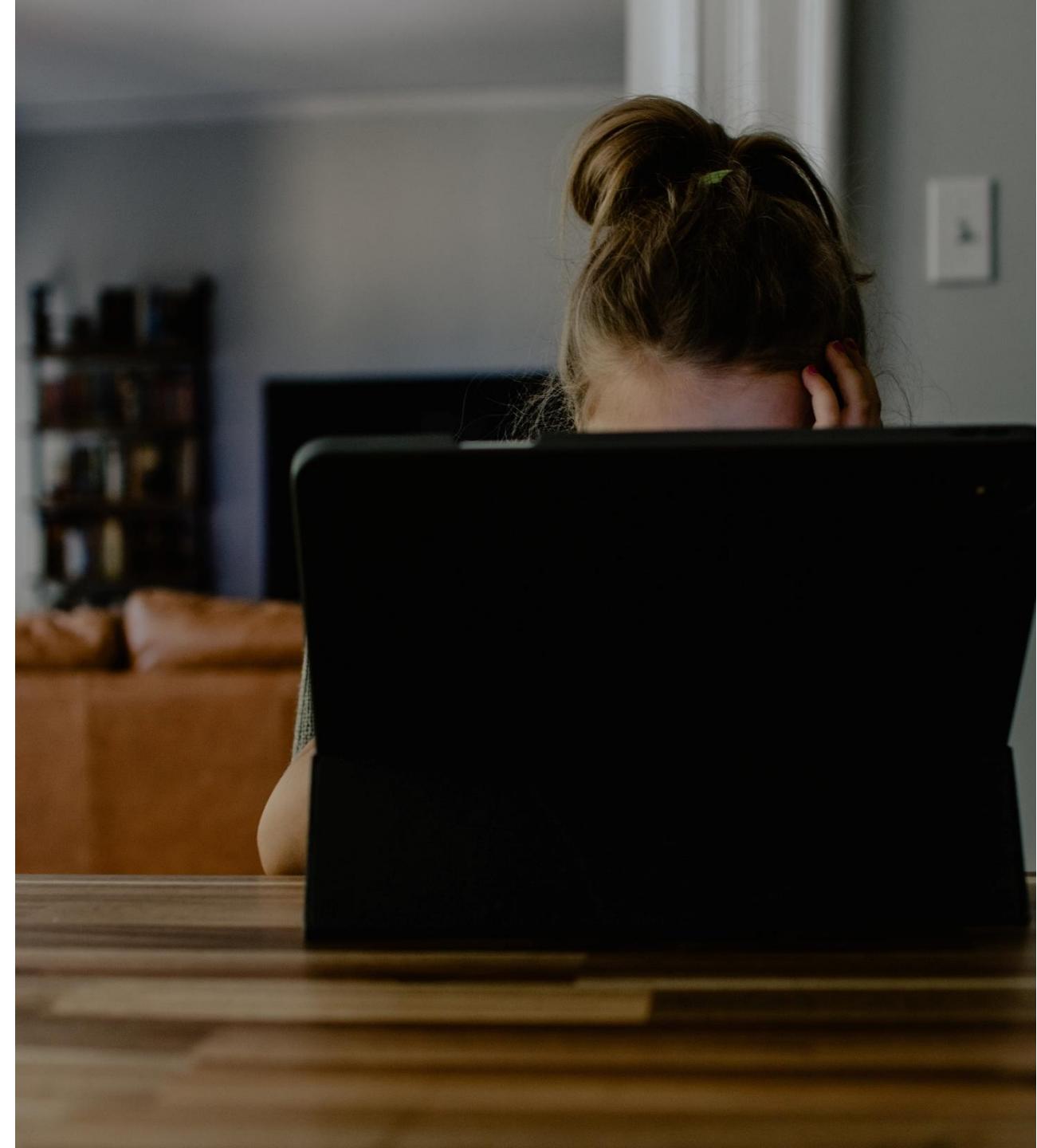


**THE SHIFT**

# THE SELECTION



# ISSUES?





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# TEAMING UP



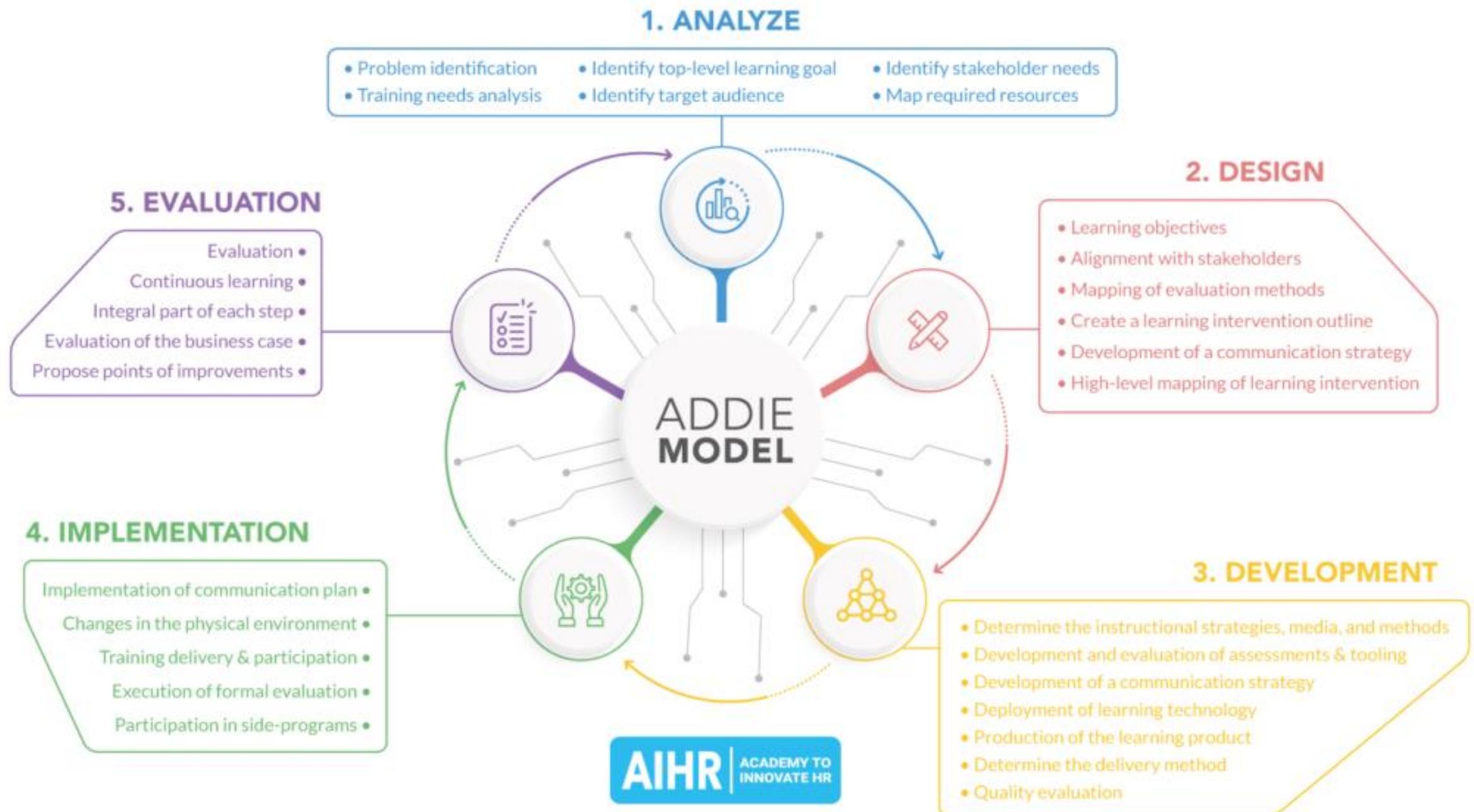
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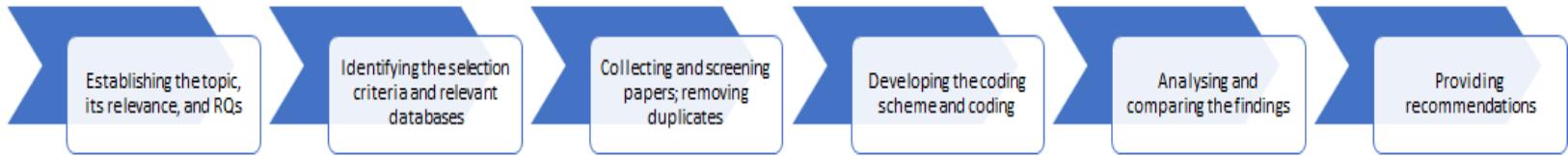
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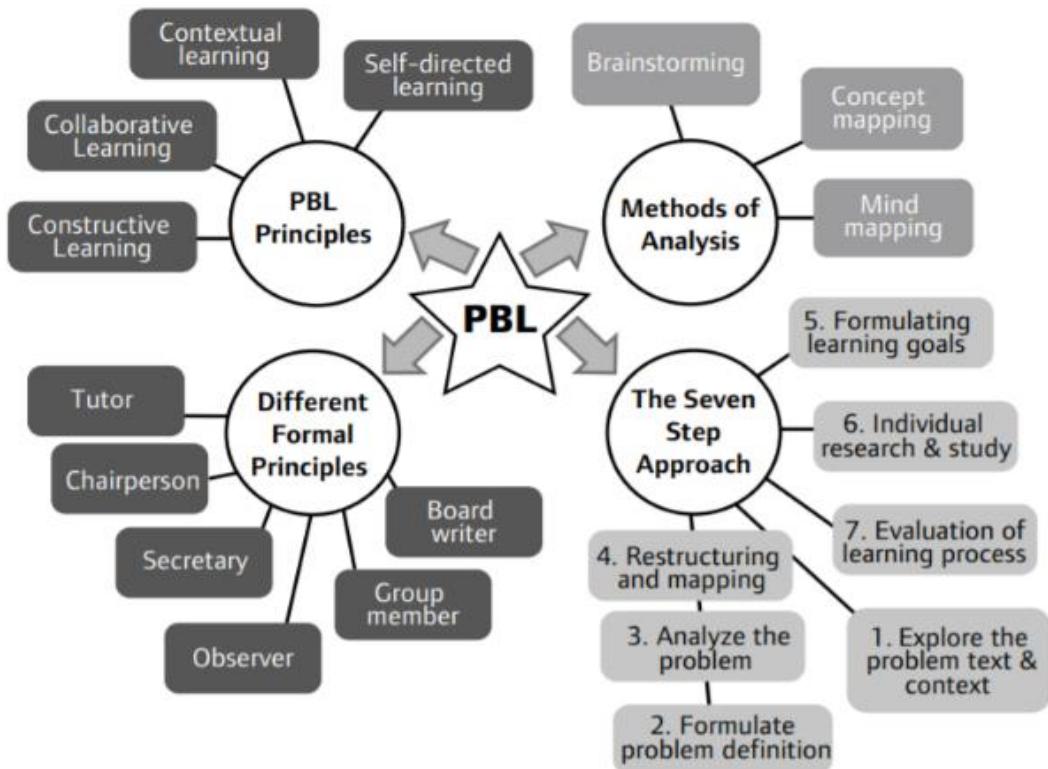


# Our methodology



Method	Search terms	Initial number of papers across the selected DBs	Reasons for sample reduction	Final number of papers
<b>Problem based learning</b>	'problem based learning' OR 'problem-based learning' AND and 'engineer'	109	<ul style="list-style-type: none"> <li>Irrelevant implementation context;</li> <li>Full text unavailable;</li> <li>Describe a different method</li> <li>Not focused on HEIs;</li> </ul>	65
<b>Project based learning</b>	'project based learning' OR 'project-based learning' AND 'engineer'	252	<ul style="list-style-type: none"> <li>Irrelevant topic;</li> <li>Irrelevant implementation context;</li> <li>Full text unavailable;</li> <li>Method not presented;</li> <li>No distinction made between the methods</li> </ul>	103
<b>Challenge based learning</b>	'challenge based learning' OR 'challenge-based learning' AND and 'engineer'	59	<ul style="list-style-type: none"> <li>Not based on empirical data;</li> <li>Not focused on HEIs;</li> <li>Describe a different method/did not follow the given definition of CBL although it was called CBL in key words or abstract</li> </ul>	9
<b>Total:</b>		<b>420</b>		<b>177</b>

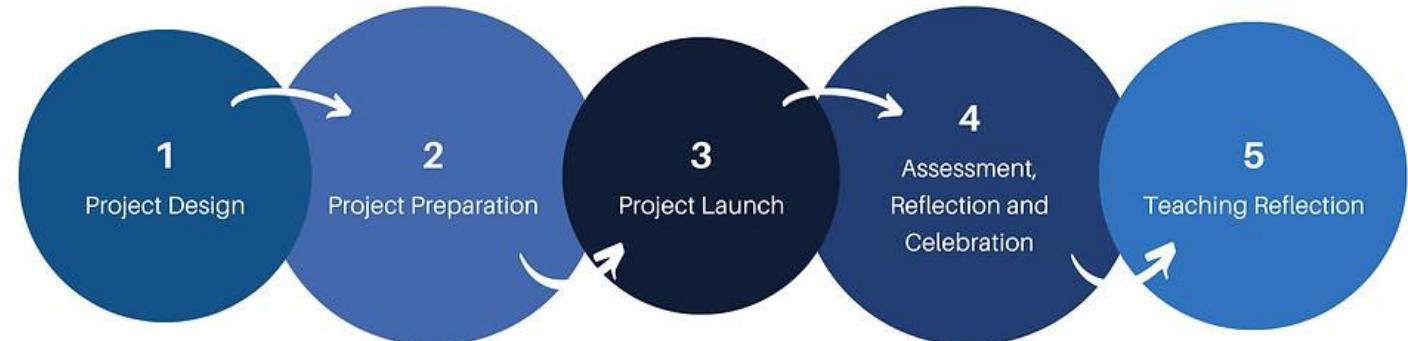
# The three methods



PjBL (Tukamushaba and Musinguzi, 2016)



CBL (as described by Nichols et al., 2016 and visualized in ECIU university project)



PjBL (by IEG Consulting)

# Reported differences between PBL, PjBL, and CBL

Dimension	Project-Based Learning	Problem-Based Learning	Challenge-Based Learning
Learning	Task to complete a project	Content applied on problems	Real problems to complete a challenge
Focus	Solution for real problems	Solution for real/fictitious problem	Real solution for open problem
Product	Presentation or execution	Process and results	Solution that results in a concrete action
Process	The project generates products for the learning	The problem tests their ability to reason and apply their knowledge	Students analyze, design, develop and execute the best solution to address the challenge
Teacher	Project manager	Professional guide	Coach and co-researcher

(Chicharro et al., 2019)

# OUR FINDINGS



**ADDIE model** (Colman, 2021)



Dimensions of comparison	PBL	PjBL	CBL
Analyze	<p>Teachers implement PBL with the aim to address:</p> <ul style="list-style-type: none"> <li>(1) students' <b>lacking practical skills,</b></li> <li>(2) students not being able to <b>use their knowledge in practice,</b></li> <li>(3) educating <b>life-long learners</b> and independent thinkers,</li> <li>(4) <b>empowering</b> students to live in knowledge-based economy, future and ever-changing context.</li> </ul>	<p>Teachers implement PjBL with the aim to:</p> <ul style="list-style-type: none"> <li>(1) <b>improve</b> students' <b>meaningful learning</b> and deep understanding and</li> <li>(2) <b>connect theory and practice</b> of solving problems typical in real-life work contexts.</li> </ul>	Teachers implement CBL because it is a <b>university policy or initiative</b> , or <b>demand</b> from external stakeholders.
Design	<p>Teacher decides <b>when, why, and what</b> situations might be formulated as problems.</p>	<p>Design stage is related to the analysis stage; the teacher makes decisions about the <b>implementation</b> and the use of <b>technology</b>, composition of <b>teams</b>, and including external <b>stakeholders</b>.</p>	Teacher designs the course so that students can <b>take responsibility</b> of their <b>own learning</b> .

## ADDIE model (Colman, 2021)



Dimensions of comparison	PBL	PjBL	CBL
<b>Develop</b>	Teacher <b>discusses</b> the updated course content, etc. <b>with other teachers</b> .	Develop stage is not described in depth, but some information relates to <b>learning resources</b> such as <b>online tools</b> to assist students in the learning process. Also, <b>innovation management tools</b> , such as “Bono hats, TRIZ...”. Some include <b>guides</b> for students. Some papers include Information about <b>work groups</b> composition and the impotence of group formation. For validation, some papers include the importance to work with a <b>team of teachers and companies</b> .	Not described
<b>Implement</b>	Teachers <b>facilitate</b> students' <b>self-directed learning</b> process in which <b>students decide</b> what to study based on the problem case, question, or scenario that drives their learning. Working in <b>teams</b> and <b>individually</b> , students <b>develop</b> a problem solution.	The process does not always follow the same number of <b>stages</b> , they are <b>often merged</b> . Building <b>teams</b> with <b>diverse profiles</b> and <b>competences</b> and <b>teamwork</b> are very important aspects. The process is <b>facilitated</b> by the <b>teacher</b> and <b>team leaders</b> who act as a <b>link</b> between their teammates and the teacher.	Teachers, partners-trainers, and students first meet to <b>discuss the expectations</b> . Students later take <b>theory classes</b> and <b>visit the company</b> that is going to <b>consult</b> them. After that, they <b>continue learning</b> theory in their classes and spending extra time on solving the challenge. <b>Prototypes</b> and <b>simulations</b> are <b>developed</b> , which are later <b>improved</b> and <b>implemented</b> in a physical environment.

**ADDIE model** (Colman, 2021)



Dimensions of comparison	PBL	PjBL	CBL
Evaluate	<p>Evaluation is done by <b>teachers</b> and, in some cases, by <b>external reviewers</b> such as the scientific staff. Students also give each other <b>peer-review</b>. Often, there is <b>no final examination</b>, and students are <b>evaluated</b> based on their <b>reports</b> and <b>presentations</b>. All evaluation is done based on <b>rubrics</b>.</p>	<p>Evaluation is done by the <b>teacher</b> and is often <b>supplemented with peer review and feedback</b> by external stakeholders. Students are evaluated based on <b>rubrics</b> that assess <b>different aspects</b> of their written reports, prototypes, exams, presentations, overall performance, and final products. All evaluation is done based on <b>rubrics</b>.</p>	<p>Evaluation is done <b>similarly</b> like in PjBL and PBL. A slight difference is inclusion of <b>self-assessment</b>. All evaluation is done based on <b>rubrics</b>.</p>

Dimensions of comparison	PBL	PjBL	CBL
<b>Teacher's role</b>	Teacher is the learning <b>facilitator, coach, or guide</b> , as well as a <b>partner</b> in problem solving. Teachers' role in PBL involves a lot of <b>communication, discussion, mutual interaction, group work, reading, writing, teamwork, drafting and evaluating</b> the students' presentations in class. PBL requires the instructor to be <b>more prepared and expert</b> in <b>designing</b> problems, <b>coaching</b> students and <b>evaluating</b> student performance and experiences.	In PjBL, teachers <b>design</b> a course, <b>make decisions</b> how and to what extent to <b>involve industrial partners</b> . Teachers are <b>facilitators</b> , they <b>monitor</b> students' work at different phases of PjBL, they also are the <b>link</b> between the <b>students</b> and the <b>industrial partners</b> . Sometimes teachers <b>create environments</b> where students have to change their roles to being experts in the field.	Teacher <b>transitions</b> from lecturing to facilitating and mediating. In CBL, teachers are <b>challenge designers, coaches, tutors, mentors, evaluators, and coordinators</b> of different parts of the learning process. CBL loves <b>team teaching</b> . A team from <b>different fields/disciplines</b> may teach <b>together</b> as well as different persons not being teachers by profession might teach together.



# CONCLUSIONS



# LET'S DISCUSS



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