Curriculum in Engineering Education

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What is Curriculum in the Context of HE?

"MISSING TERM"

Barnett, R., & Coate, K. (2005). Engaging the Curriculum in Higher Education. Maidenhead: Open University Press / Society for Research Into Higher Education.

What is Curriculum in the Context of HE?

- **Curriculum as a product**
  Linear and static: Bobbitt (1918), Tyler (1949) e Taba (1962)

- **Curriculum as a process**
  Focus on the experiences: Caswell & Campbell, (1935), Tanner & Tanner (1980)

- **Curriculum as a project**
  Flexible and Alignment: Zabalza (2009); Biggs (2003); Barnett, et al. (2001).

For a common understanding …

Curriculum is understood as a **project** and includes the **teaching and learning experiences**, the process of its **development** (design, development and evaluation) and the following **key elements** (objectives, content, resources, assessment and teaching and learning strategies), in order for students to develop knowledge and competences related to a given area/domain.

Zabalza, M. (2009). Competencias docentes del profesorado universitario: calidad y desarrollo profesional (2nd ed.). Madrid: Narcea.

Barnett, R., Parry, G., & Coate, K. (2001). Conceptualising Curriculum Change. Teaching in Higher Education, 6(4), 435-449.

Biggs, J. (2003). Teaching for quality learning at university. Maidenhead: SRHE & Open University Press.

3 KEY-IDEAS ABOUT CURRICULUM IN ENGINEERING EDUCATION

"engineering curricula play an important, if not crucial, role in the education process of professional engineers."

(Boud et al., 2009, p. 491)

Curriculum are made by people.

(different interests, visions, opinions about what should be)

"You must not interpret any of the ideas or procedures within this curriculum as final or binding […] we have learned to expect change"
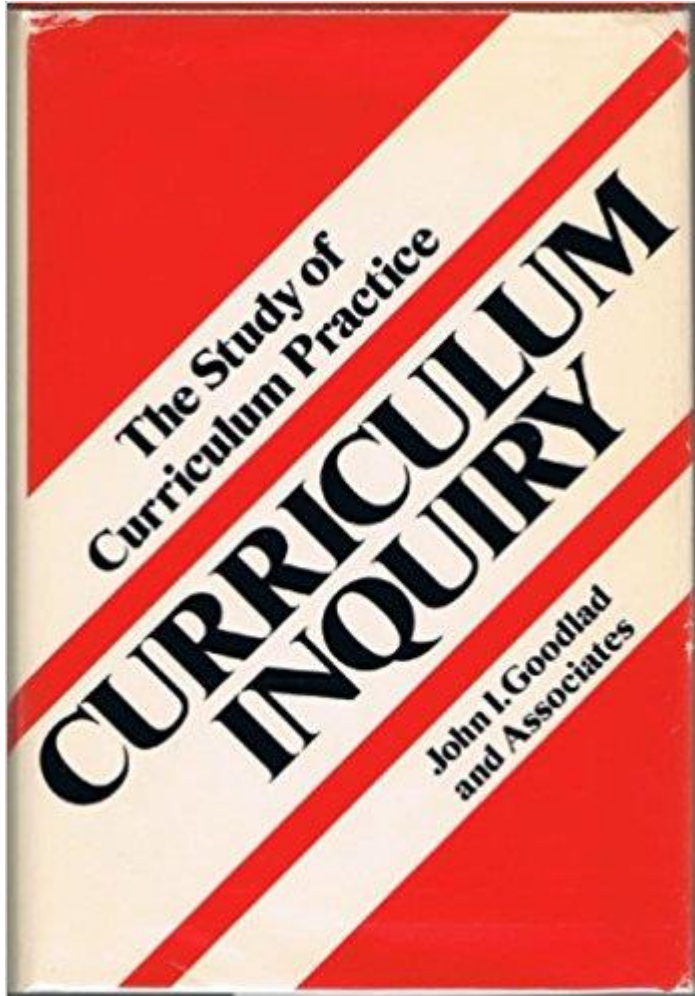
(Goldberg & Sommervile, 2014, p. 23)

Curriculum in Practice

… so we are talking about **curriculum continuous development**!

Enables the **conditions, situations, experiences and opportunities** for students to develop competences related to their professional practice.

In short, it to put the curriculum into **action** which implies **decision making.**

Curriculum in Practice

Curriculum Levels
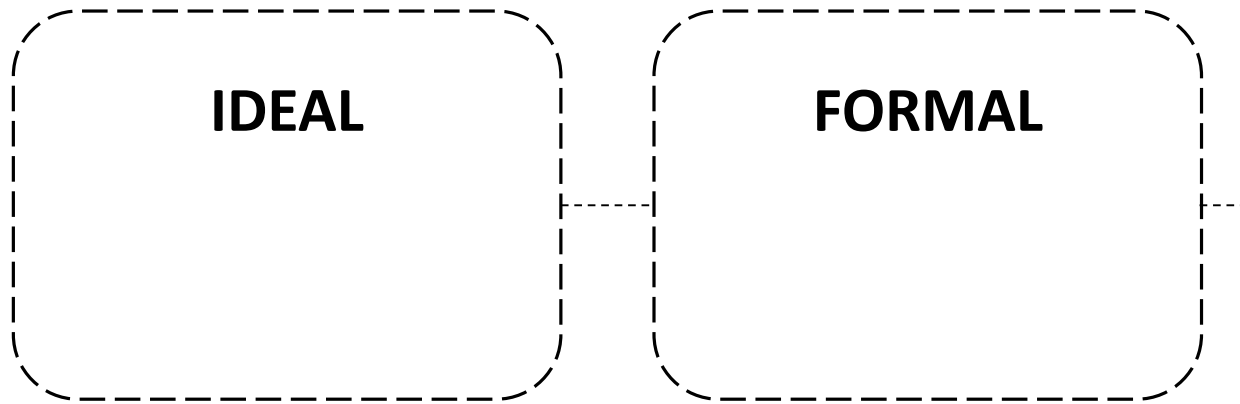J. Goodlad (1979)

Curriculum Levels

IDEAL

IDEAL CURRICULUM
refers to the rational of basic philosophy underlying a curriculum, it represent ideas on believes and intentions. All possibilities are allowed, because it is all about the **ideas.**
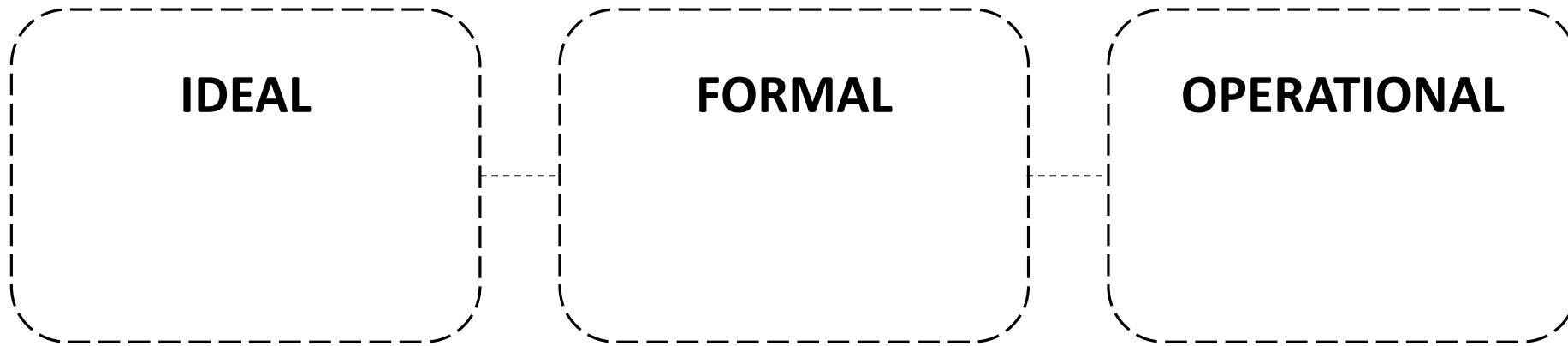
Curriculum Levels

IDEAL

FORMAL

FORMAL CURRICULUM
is a transformation of the ideal curriculum in **formal documents**. Can be develop at different contexts: Ministry of Education (macro), University (meso), Teacher (micro).
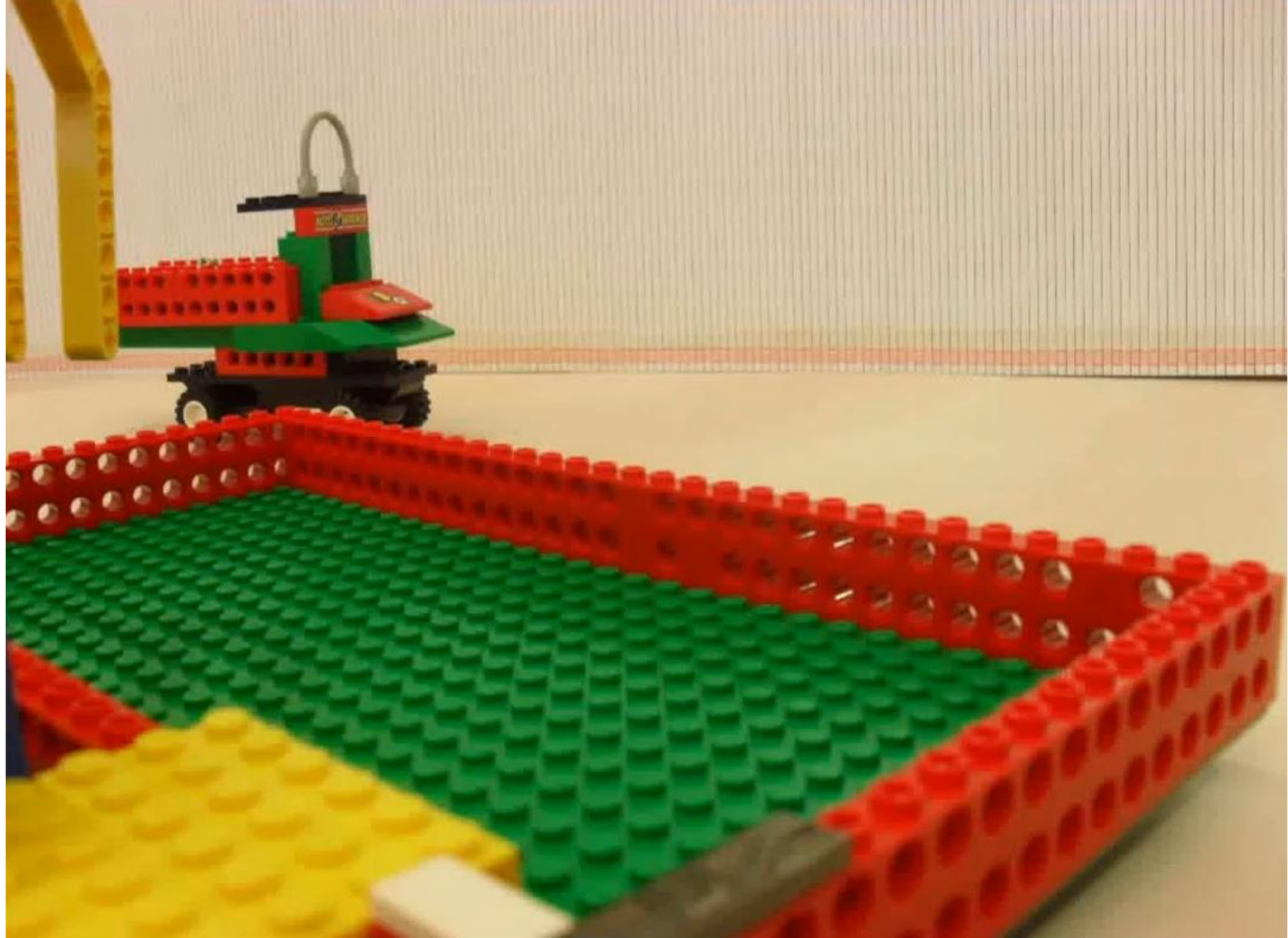
C/E	LO_CODE	LO
C	UM2_11_1_1	Interpret and analyze a production system behaviour (both for production and services applications)
	UM2_11_1_2	Develop models for simulation projects
	UM2_11_1_3	Develop simulation programs
	UM2_11_1_4	Analyze experimental results and drive conclusions for simulation projects
C	UM2_11_2_1	Identify, describe, compare, discuss and apply techniques, paradigms, tools and methods used Production and Operations Management for different production environments depending on product and demand patterns
	UM2_11_2_2	Be able to establish and implement relevant measures of performance towards evaluating production schedules and systems performance.
	UM2_11_2_3	Communicate well, in writing and orally, using standard technical language.
	UM2_11_2_4	Understand technical "dialects" used in practice, towards good communication
C	UM2_11_3_1	Build Simulation Models, Run them, interpret and analyse the results, outline conclusions about the behaviour and performance of a production system
	UM2_11_3_2	Describe, compare, identify differences, and quantify the advantages of each method of Production Management in different production environments and demand
	UM2_11_3_3	Identify the activities of a project, program and control them using methods for allocating limited resources
	UM2_11_3_4	Measure performance and apply the results to improve the production systems
	UM2_11_3_5	Communicate well on the subject, both on the theoretical and practical perspectives.
C	UM2_11_4_1	identify and develop the necessary competencies to implement marketing corporate strategies as a factor of competitive advantage.
	UM2_11_4_2	apply Strategic Management and Marketing methodologies and techniques to real case situations by using case studies.
	UM2_11_4_3	analyze systematically a case study in any scientific area related to Strategic Management or Marketing.
	UM2_11_4_4	work as part of a team and develop critical and analytical skills.
C	UM2_11_5_1	To develop skills for solving problems (deterministic models), with emphasis on Supply Chain Optimization problems.
	UM2_11_5_2	To know the Operations Research techniques and methods presented in this course, and to be able to apply them in the solution of small size instances.
	UM2_11_5_3	To develop the capacity to analyse complex systems, to create models to describe them, to obtain solutions for those models using adequate computational software solvers, to validate the models developed, to interpret the solutions, and to elaborate recommendations for the system under analysis.
	UM2_11_5_4	To understand the importance of assessing the solutions, and to be able to make sensitivity analysis.
	UM2_11_5_5	
C	UM2_11_6_1	To recognize the scope of "Supply Chain Otimization" as a business management activity;

... UMinho_IE-Ms | UMinho_IE-Ms_LO | UMinho_ES-Ms | **UMinho_ES-Ms_LO** | UPorto_IEM-IM | UPorto_IEM-IM_L ...

Curriculum Levels

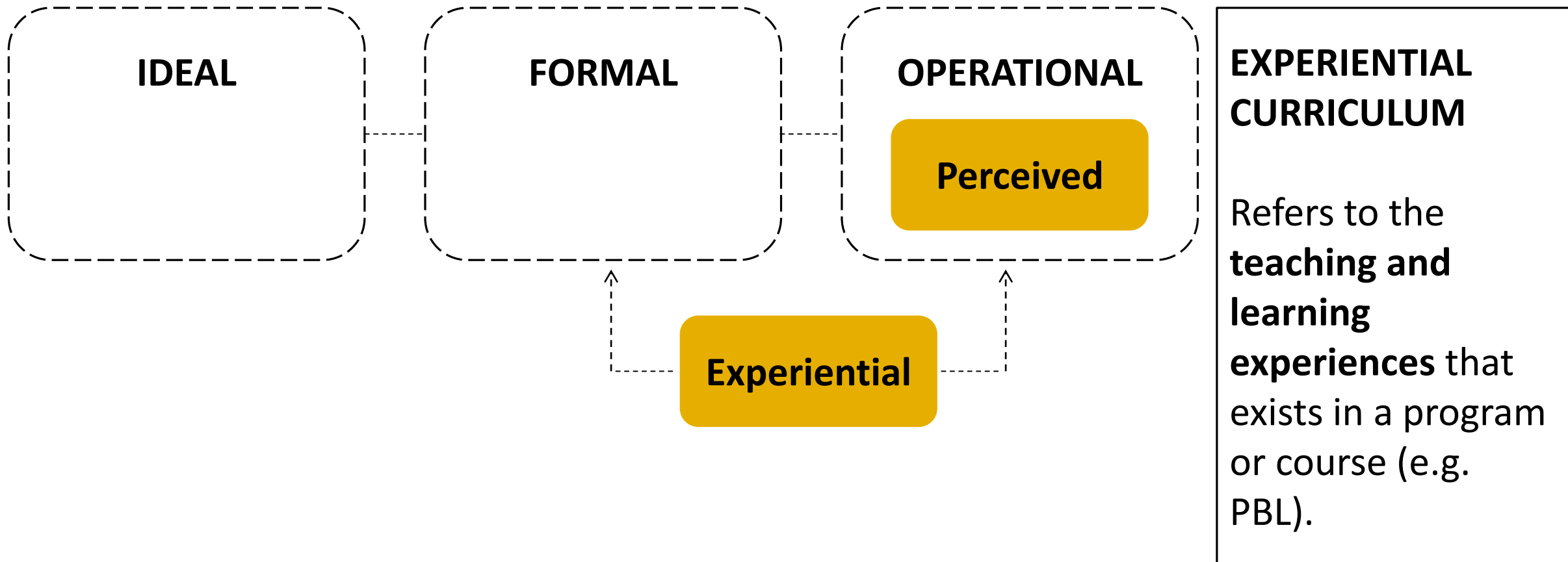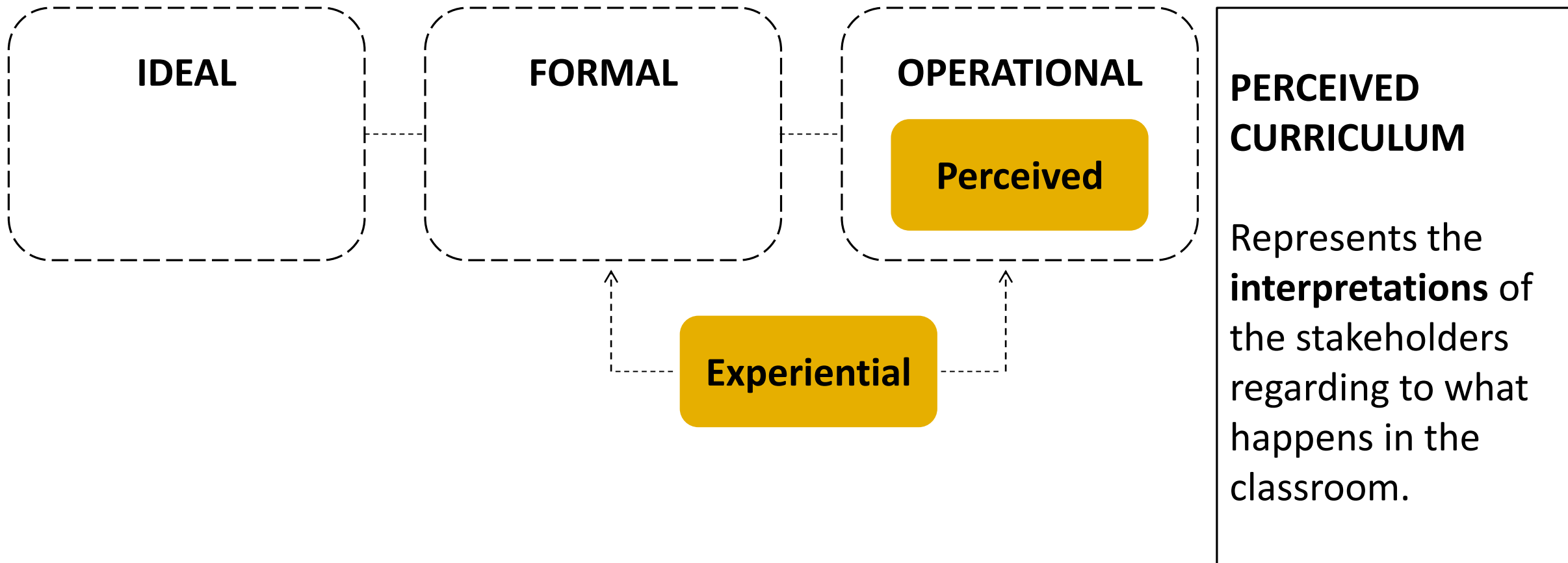| IDEAL	FORMAL	OPERATIONAL

OPERATIONAL CURRICULUM
refers to what actually happens in the classroom. Are related to the **teaching and learning practices** and the interaction between teachers, students and, in some occasions, other stakeholders (e.g. companies representatives).

Curriculum Levels

IDEAL

FORMAL

OPERATIONAL

Perceived

Experiential

EXPERIENTIAL CURRICULUM

Refers to the **teaching and learning experiences** that exists in a program or course (e.g. PBL).

Curriculum Levels

IDEAL

FORMAL

OPERATIONAL

Perceived

Experiential

PERCEIVED CURRICULUM

Represents the **interpretations** of the stakeholders regarding to what happens in the classroom.

Voices - teachers, students and professionals

"The projects open us the horizons to see things as they really are and how they work ... The project then becomes not only by what we learn with teachers and companies and classes, but also what we have learned with the team, or better, as a team. For example, to me helped me to manage stress, to relativize things and prepare for times of stress." (4th year student)

"The project helped us even to see it: what is the relevance! Because we often think: - oh where is this going to help me, I'll never need it for nothing. And we came to the project and we had to use everything, everything, really all" (1st year student)

"(...) With the projects it was possible to apply some things in reality, not by trial and error, but by pressing need; it was possible to see this happening. There was a context and previous knowledge that allowed us to analyse and apply tools and other theories, in a more immediate way. We were not waiting two years to see what it serves for. We see it right there directly." (Professional – UMinho graduate)

"Because what I liked most of the project was precisely the fact of being puled by students, they put me to think, to go searching and sharing. There were times it was even a sharing of me for students and other it was from students to me. I never thought I would have such an experience as a teacher!" (Teacher)