Learning objectives for system dynamics competency

**Goal:** to improve the teachability and standardization of system dynamics and thereby foster its wider adoption at education institutions.

**SD competency**

<table>
<thead>
<tr>
<th>Competency Levels</th>
<th>Beginner (e.g., K-12 level courses)</th>
<th>Advanced beginner (e.g., graduate/master)</th>
<th>Practitioner</th>
<th>Expert</th>
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**Who**

<table>
<thead>
<tr>
<th>Institution</th>
<th>Contact</th>
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</thead>
<tbody>
<tr>
<td>Universidad de Talca</td>
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</tbody>
</table>

**What should one know, understand and to be able to do at the end of different levels of training in system dynamics?**

**On-line Delphi process**

**Phase 1: establish learning objectives**

**Phase 2: establish competency levels**

**Validating the simulation model**

- Test model's structural validity: Trace, validate and correct dimensional consistency. Test and validate each variable's correspondence to a real entity. Correct errors in variables' correspondence to a real entity. Judge a model's membership to a model level.
- Test model's behavioral validity: Discover and validate the hypothesis. Test and validate extraneous condition behavior. Test and validate the sensitivity of the model with respect to uncertain parameters.

**Creating models**

- Develop hypotheses in the context of a problem (based upon a S&F model). Hypothesize plausible behavior of variables in generic formulations. Design a qualitative model (CLD or S&F) that may serve as a starting point for subsequent refinement.
- Build hypotheses in the context of a problem (based upon a S&F model). Hypothesize plausible behavior of variables in generic formulations. Design a qualitative model (CLD or S&F) that may serve as a starting point for subsequent refinement.
- Modify the S&F model to achieve validity (Validate the S&F model). The model to test scenarios or candidate policies (Exploits the S&F model). Improves the situation. Knows when to stop the modeling process.

**Evaluating possible modeling projects policies and problems**

- Prepare a modeling project: Define the scope of the project. The purpose of the project. The reference models of the project. The reference models of the project. The purpose of the project. The reference models of the project. The purpose of the project.
- Establish the purpose of the modeling project: Define the scope of the project. The purpose of the project. The reference models of the project. The purpose of the project. The reference models of the project. The purpose of the project.
- Explain the causal structure of a problem or situation. How the modeling is created by this structure. Why one policy has high impact while others fail to do so. How established policies are the underlying cause of the problematic behavior. Argues for better policies.

**Analyzing the steps of the modeling process**

- Interprets feedback loops in CLDs and S&Fs: Compare the loops' polarities. Analyzes CLDs (structure and possible behavior): Proposes a general S&F model for a concrete situation.
- Identifies polarities. Determines the model's organizational behavior. Determines the model's organizational behavior. Determines the model's organizational behavior. Determines the model's organizational behavior.

**Understanding the concepts of SD**

- Defines the purpose of a model, a reference model, a dynamic hypothesis, the types of variables, causality, time horizon, model boundary, polarity, delay, accumulation, flow, policy
- Describes atomic behavior patterns: Proposes a general S&F model for a concrete situation.
- Interprets S&D graphs: Describes a stock's accumulation behavior gives the in- and outflows, a flow's behavior gives the stock's accumulation behavior.

**Remembering the concepts of SD**

- Defines the purpose of a model, a reference model, a dynamic hypothesis, the types of variables, causality, time horizon, model boundary, polarity, delay, accumulation, flow, policy
- Describes atomic behavior patterns: Proposes a general S&F model for a concrete situation.
- Interprets S&D graphs: Describes a stock's accumulation behavior gives the in- and outflows, a flow's behavior gives the stock's accumulation behavior.