

Stealth Assessment



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The Plan

- ∅ Overview the ideas and models in evidence-centered design
- ∅ Define stealth assessment, and illustrate the approach in a worked example



Evidence-Centered Design



(e.g., Mislevy, Steinberg, & Almond, 2003)

Assessment Design & Diagnosis

Competency Model

What do you want to say about the person?

Evidence Model

What observations would provide best evidence for what you want to say?

Task/Action Model

What kinds of tasks let you make the necessary observations?

Design

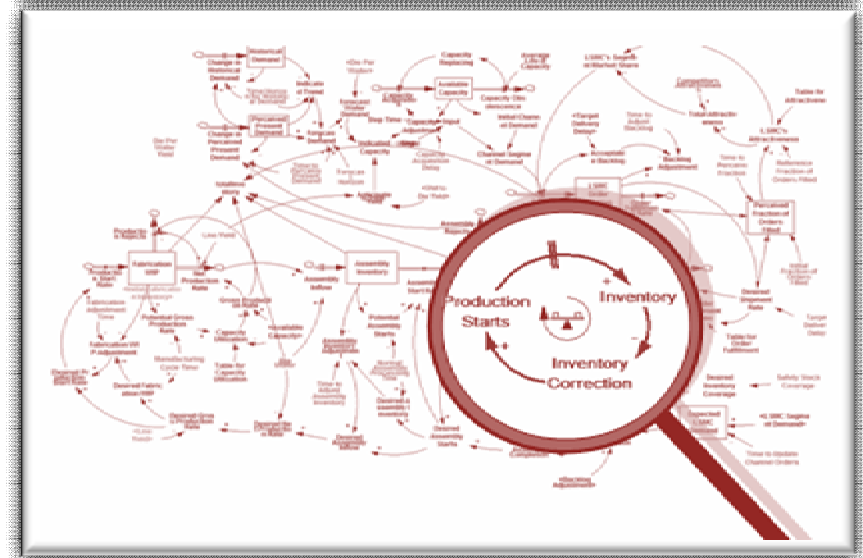
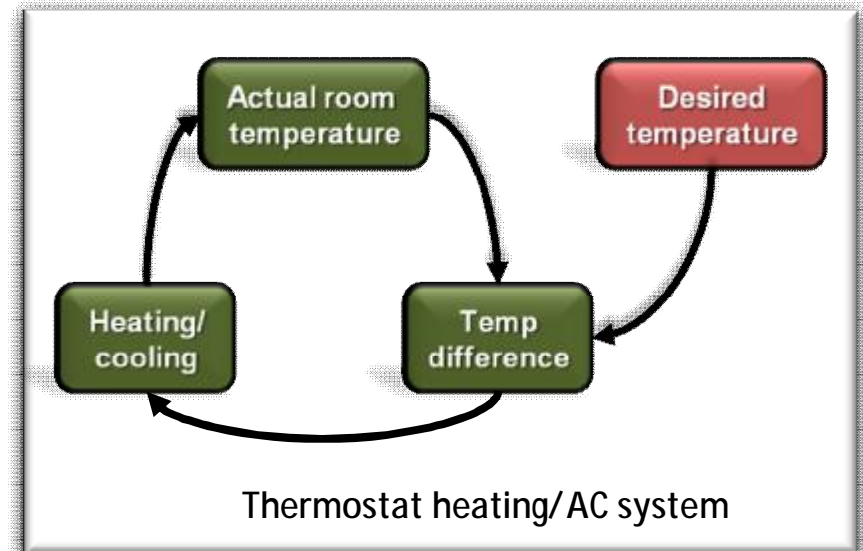
Diagnosis

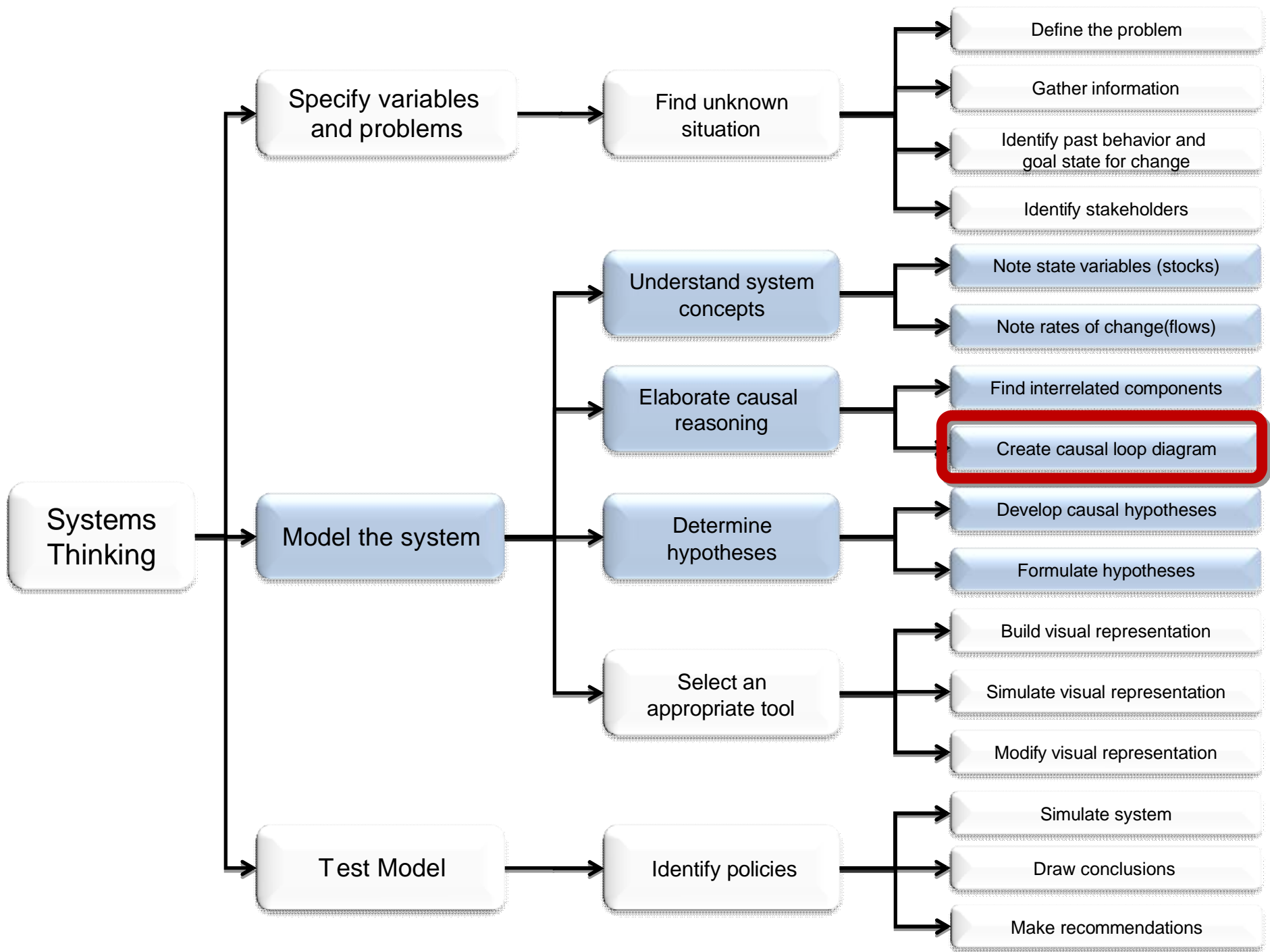
Stealth Assessment

- ∅ Advances in measurement let us administer evidence-based assessments during learning to:
 - § Extract *ongoing, multifaceted* info from a learner
 - § Make *accurate inferences* of competencies
 - § React in *immediate* and helpful ways.
- ∅ Accomplished via automated scoring and machine-based reasoning techniques.
- ∅ When assessment is so seamlessly woven into the fabric of the learning environment that it's invisible, this is ***stealth assessment***.

What is *Systems Thinking*?

- Ø Know and reason about complex systems' **elements & relationships**.
- Ø Understand how systems function as a whole through **dynamic interaction** of interdependent parts, and effects of feedback loops.
- Ø Identified as an **essential skill** for the 21st century (Federation of Scientists, 2006; National Science Education Standards).





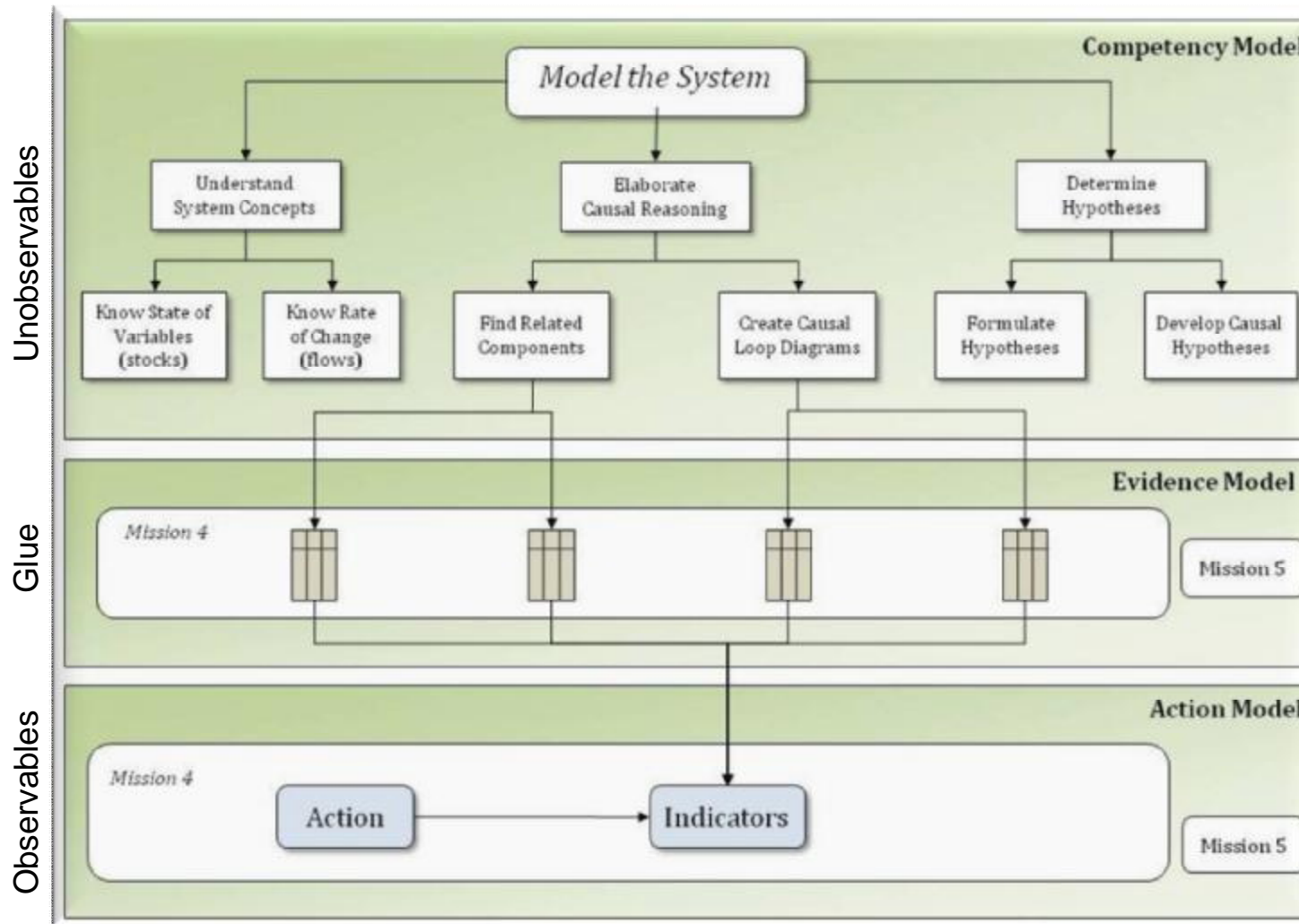
Quest Atlantis—Taiga Park

- An immersive, RPG set in a modern 3D world (Barab et al., 2007).
- *The fish in the Taiga River are dying.* You must solve the problem to save the park!
- Taiga Park's populated by 3 main groups who use or depend on the river in some capacity.
- The groups are quite different, but their lives are entwined, showing several levels of systems within the world (ecological & socio-economical).



ECD Models Applied to Taiga Park

“Model the System” fragment of ST competency



CM: What are relevant competencies?
 •E.g., Draw CLD showing factors affecting fish population.

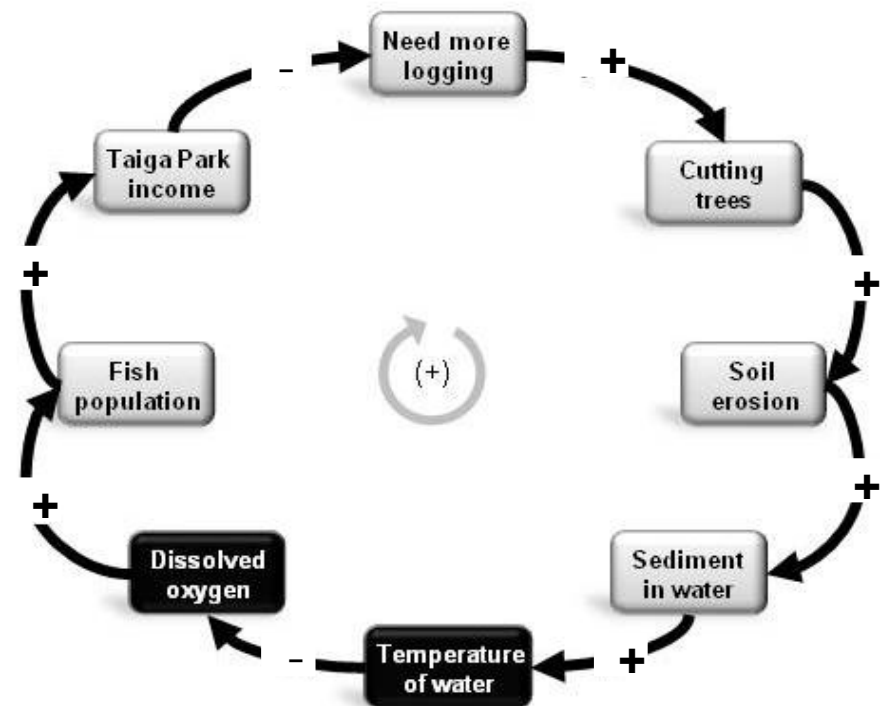
EM: Statistically link unobservable var's (in CM) to observables (in AM) via Bayes nets.

AM: Actions & their indicators (per mission) where an action is something done when solving a problem. Each action's defined in terms of its indicators.

Support for Learning

Verbal FB: Results from this kind of analysis provides for valuable *feedback*; e.g., “Nice job, Clara—but you forgot to include the fact that **sediment** increases **water temperature** which decreases the amount of **dissolved oxygen** in the water. That’s the reason the fish are dying—they don’t have enough oxygen!”

Visual FB: The lab technician (or another character in Taiga) can provide feedback in the form of a CLD that explicitly highlights those variables in the picture. That way, she can see for herself what she’d left out.



Wrapping it Up

∅ Bayes nets can be used in various ways to *improve learning* and performance.

§ Continuously gather evidence for *accurate, real-time estimates of comp's*.

§ Info on comp's used by (a) *teachers* (to adjust instruction & give good feedback), (b) *system* (to select new gaming experiences), and/or (c) *students* (to reflect on how they're doing).

∅ Current estimates of competency levels can be integrated into the game and displayed as *progress indicators*.

∅ ***This elevates valued competencies to the same level as health and weapons!***



Summary

- ∅ To address educational challenges and harness potential of immersive games, I presented an ECD-inspired idea which involved:
 - **Specifying comp's to be acquired from the game**
 - **Defining EMs that link game behaviors to comp's**
 - **Updating the learner model regularly**

- ∅ Using ECD, stealth assessment, and automated data collection & analysis tools can collect valid and valuable evidence of students' emerging competencies (and *reduce teachers' workload* allowing them to focus energies on fostering student learning).

- ∅ Next step—build stealth assessment models it into Taiga Park and test its value added.