Open Learning *Initiative*

Reforming Electric Energy Systems Curriculum

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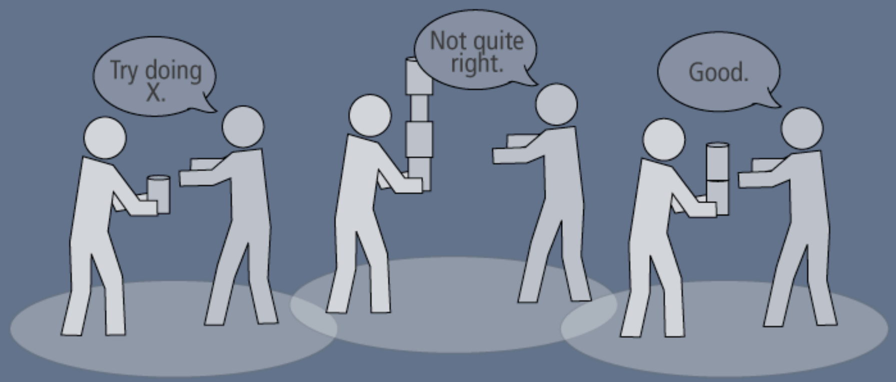
"Improvement in Post Secondary Education will require converting teaching from a 'solo sport' to a community based research activity."

—Herbert Simon

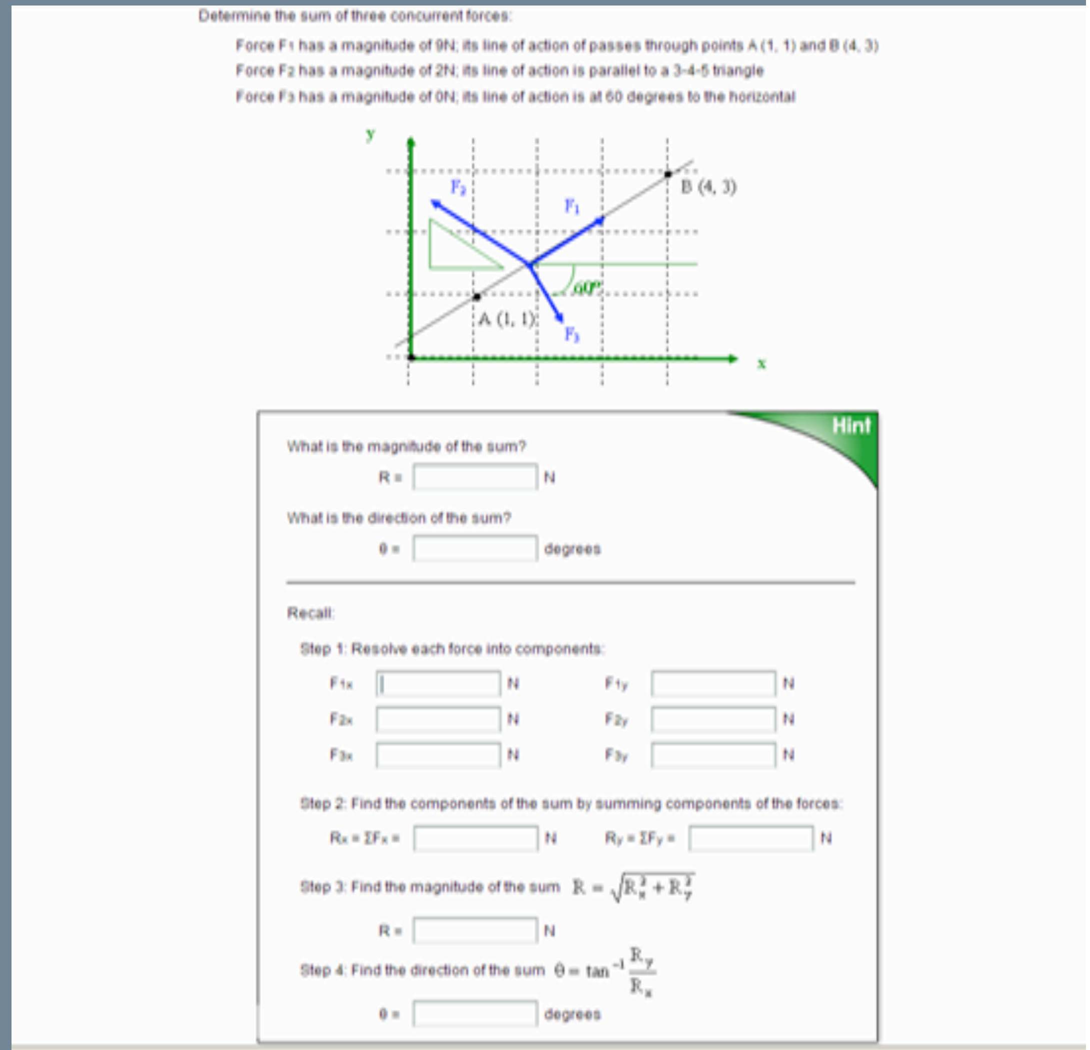
OLI Goals

- Produce exemplars of scientifically based online courses and course materials that *enact instruction* and support instructors
- Provide open access to these courses and materials
- Develop a community of use, research & development that contributes to the evaluation, continuous improvement, and ongoing growth of the courses and materials.



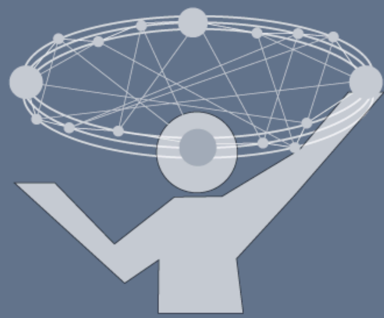
Goal-directed practice and targeted feedback are critical to learning.

Learners receive support in the problem-solving context

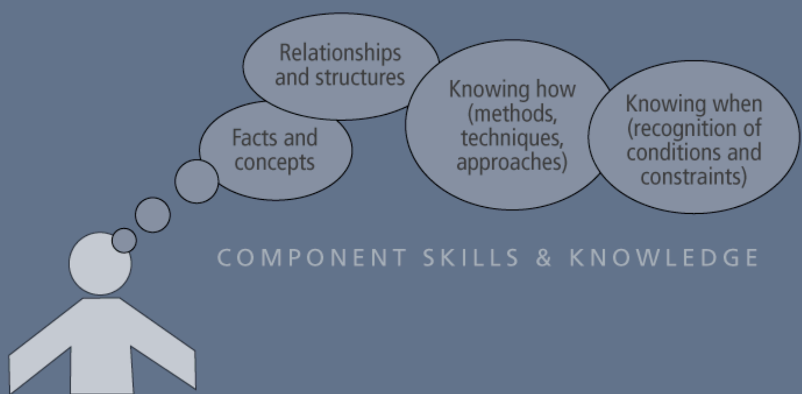


What is a Cognitive Tutor?

- A computerized learning environment whose design is based on cognitive principles and whose interaction with students is based on that of a (human) tutor—i.e., making comments when the student errs, answering questions about what to do next, and maintaining a low profile when the student is performing well.

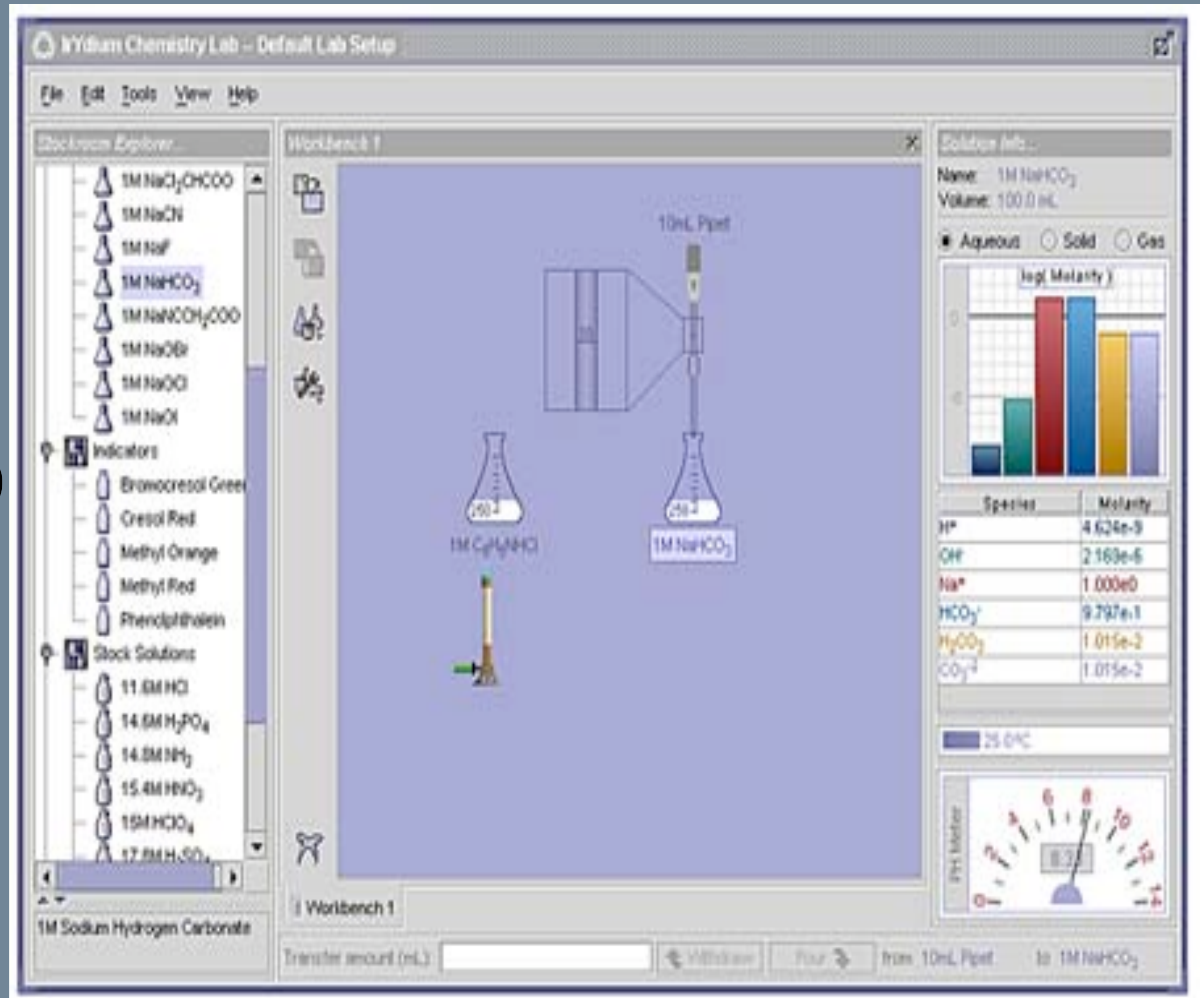


Meaningful engagement is necessary for deeper learning.

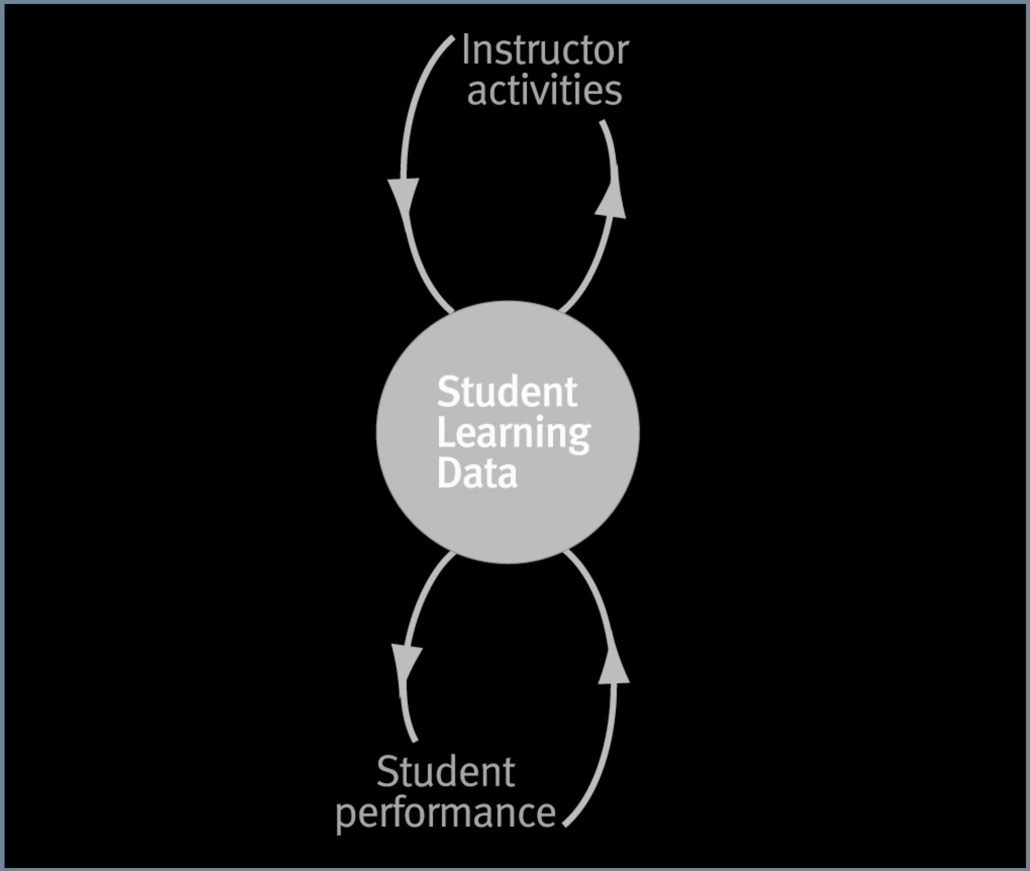


Mastery involves developing component skills and knowledge, and synthesizing and applying them appropriately.

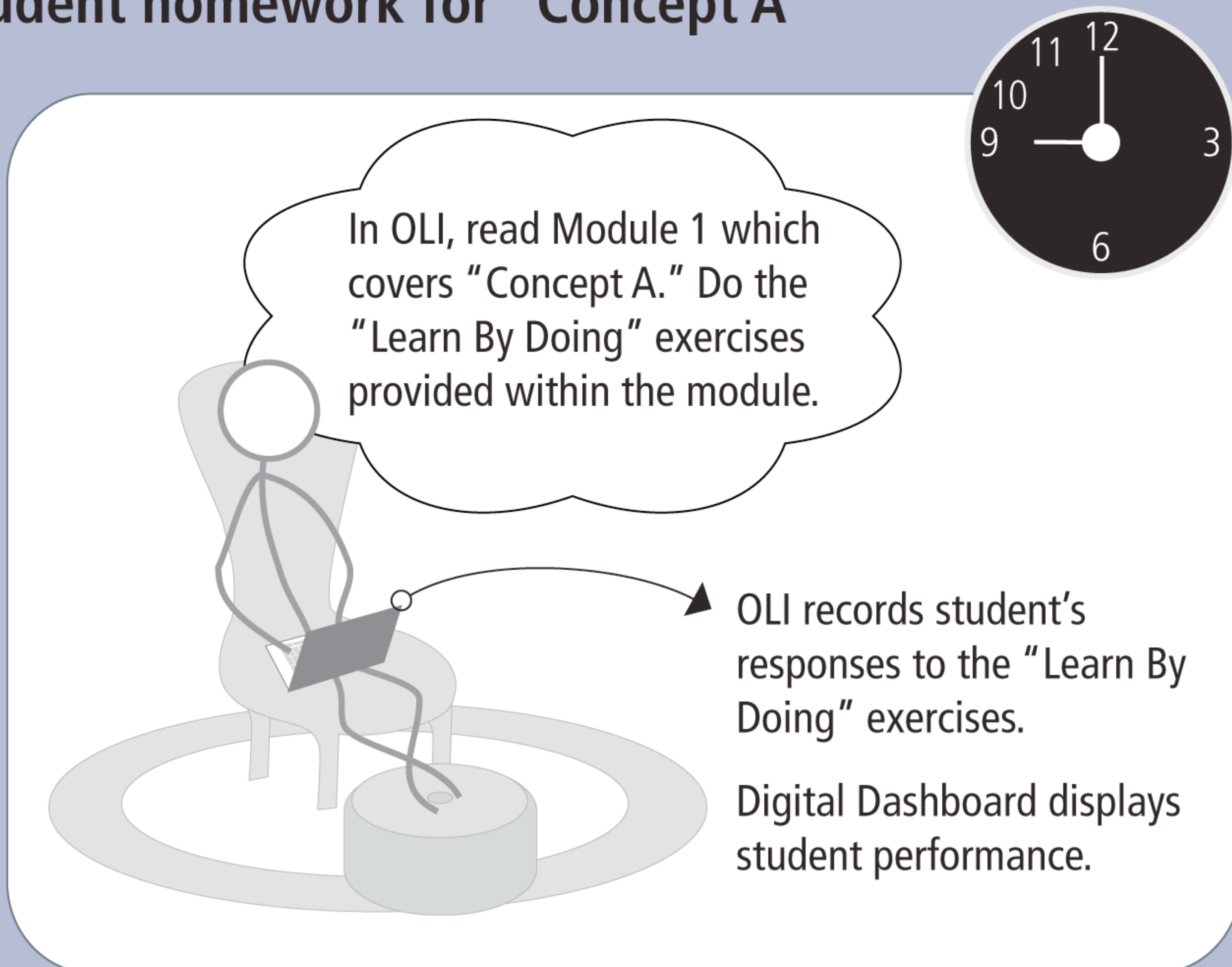
Learners apply skills and concepts to solve authentic problems



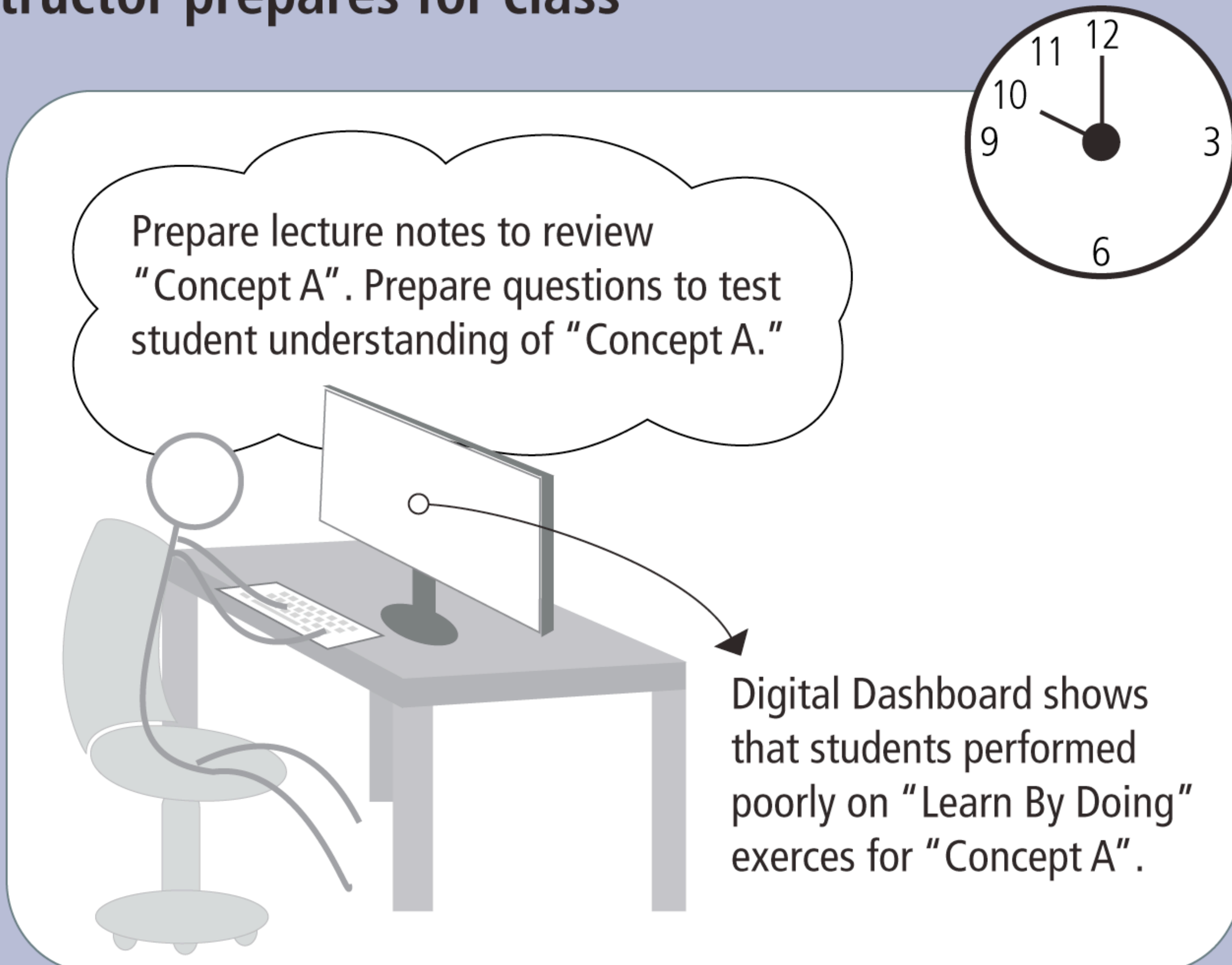
Feedback: Changing the Effectiveness of Learners and Faculty



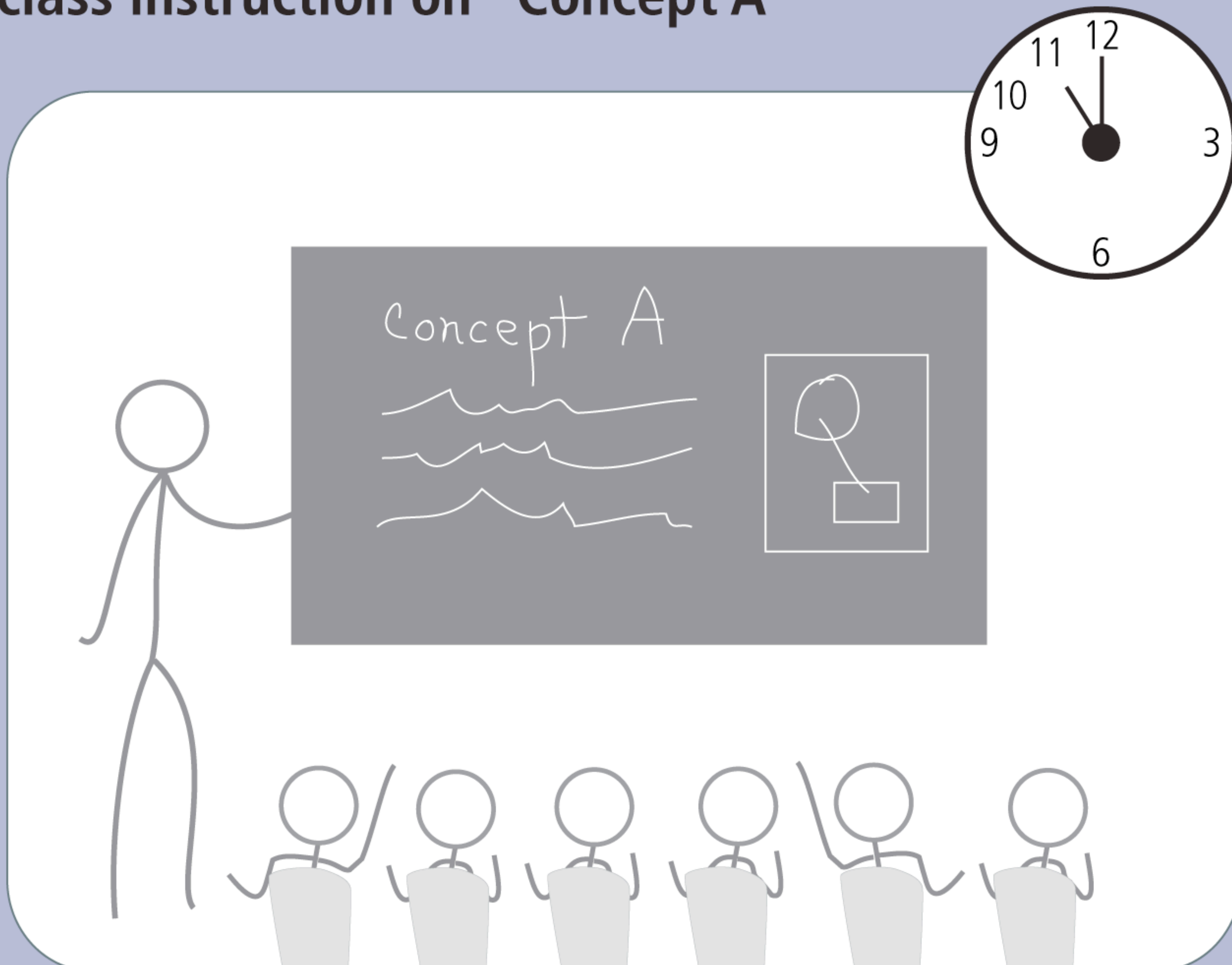
Student homework for “Concept A”



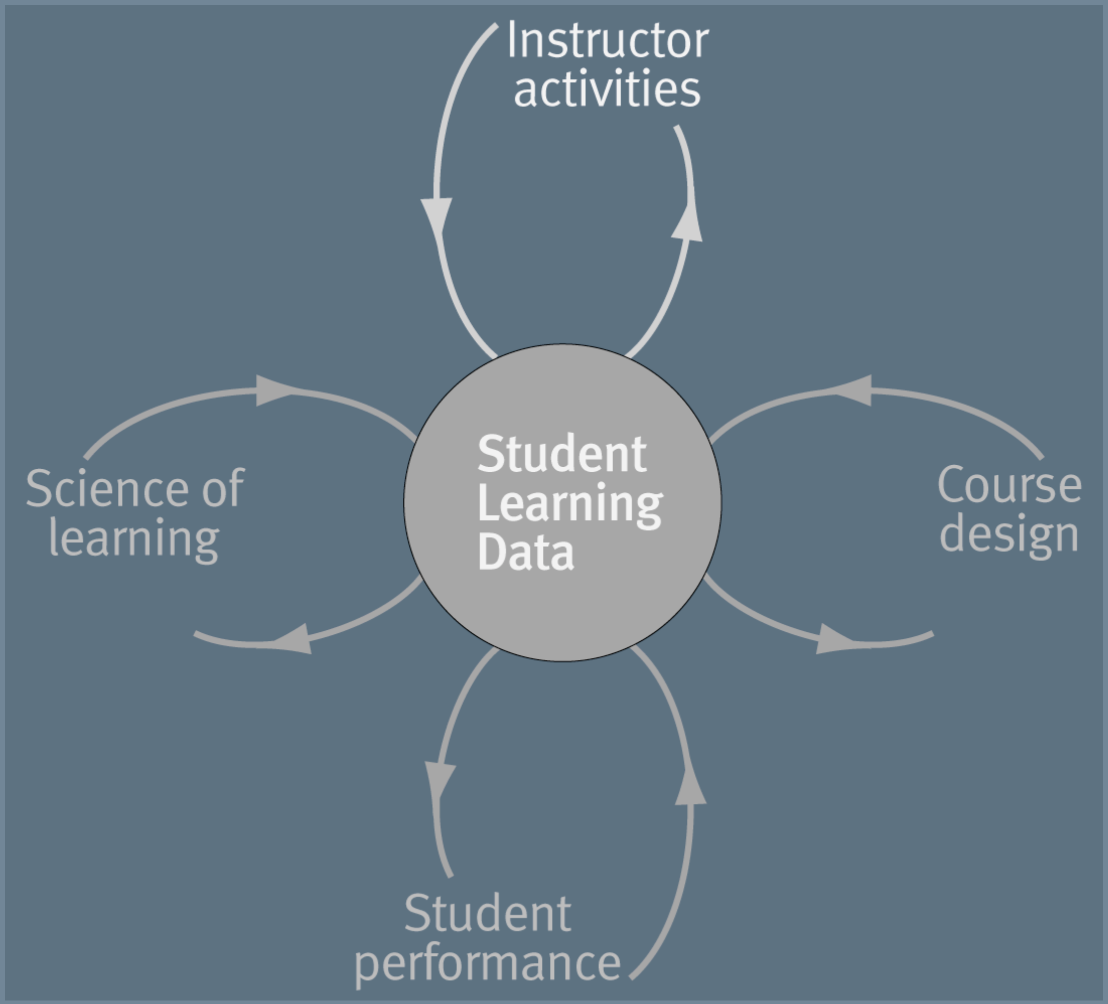
Instructor prepares for class



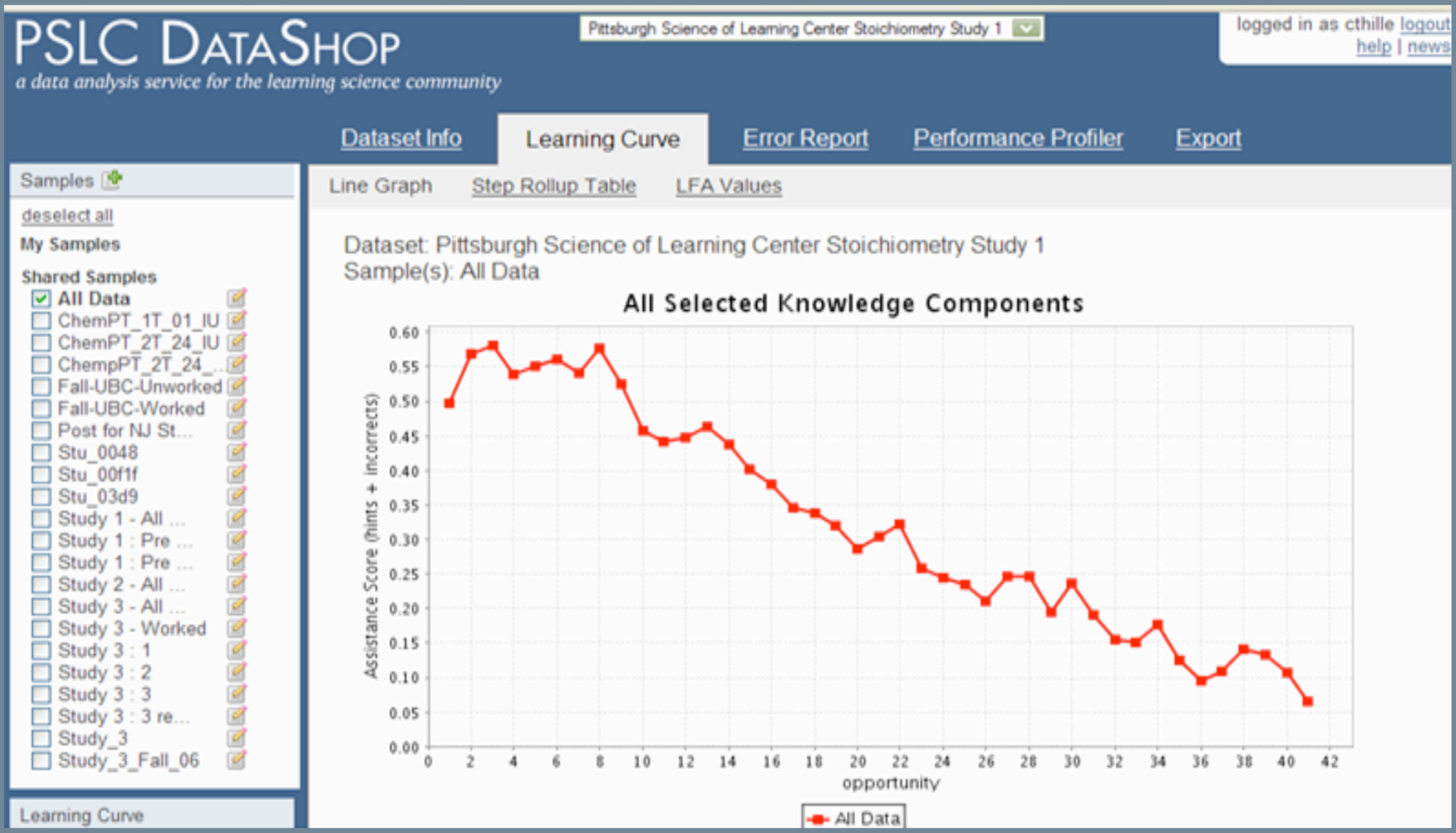
In-class instruction on “Concept A”



“The Killer App” feedback loops for continuous improvement



Learning Curve Analysis on Stoichiometry Data



OLI Review:

- Apply learning science research and scientific method to course development, implementation and evaluation
- Environments are developed by teams of content experts (and novices), learning scientists, HCI, software engineers
- Feedback loops for continuous improvement

What Difference Does This Make?

Accelerated Learning Results

- OLI students completed course in half the time with half the number of in-person course meeting
- OLI students showed significantly greater learning gains (on the national standard “CAOS” test for statistics knowledge) and similar exam scores
- No significant difference between OLI and traditional students in follow-up measures given 1+ semesters later

Other Class Results

- Community College accelerated learning study in Statistics: ~ 33% more content, learning gain in standardized test 13% OLI vs 2% in traditional face-to-face class.
- Large State University: OLI Online vs. traditional. OLI 99% completion rate vs 41% completion rate traditional.
- Community College accelerated learning study in Logic: An instructor with minimal experience in logic. Students obtained high levels of performance on more advanced content (~33%) not covered in traditional instruction.

Data Log Analysis Results

- Statistics and Biology "Dose Response" data log analysis: positive and significant correlation between student use of OLI learning activities and quiz scores on target topic – no correlation with unrelated topics
- A study conducted on the OLI stoichiometry course revealed that the number of engaged actions with the virtual lab explained about 48% of the variation observed in the post test scores. The number of interactions with the virtual lab outweighed ALL other factors including gender and SAT score as the predictor of positive learning outcome.

End of Course Student survey for accelerated online:

- 85% Definitely Recommend
- 15% Probably Recommend
- 0% Probably not Recommend
- 0% Definitely not Recommend

Quotes

- Student Quote: "This is so much better than reading a textbook or listening to a lecture! My mind didn’t wander, and I was not bored while doing the lessons. I actually learned something.“

- Instructor Quote: “The format [of the accelerated learning study] was among the best teaching experiences I’ve had in my 15 years of teaching statistics.”

Pasteur's Quadrant

- Stokes argues basic/applied goals need not trade off

	Low Emphasis on Applied Work	High Emphasis on Applied Work
High Emphasis on Basic Science	How to translate to the real world?	☺
Low Emphasis on Basic Science	X	What principle can be derived?

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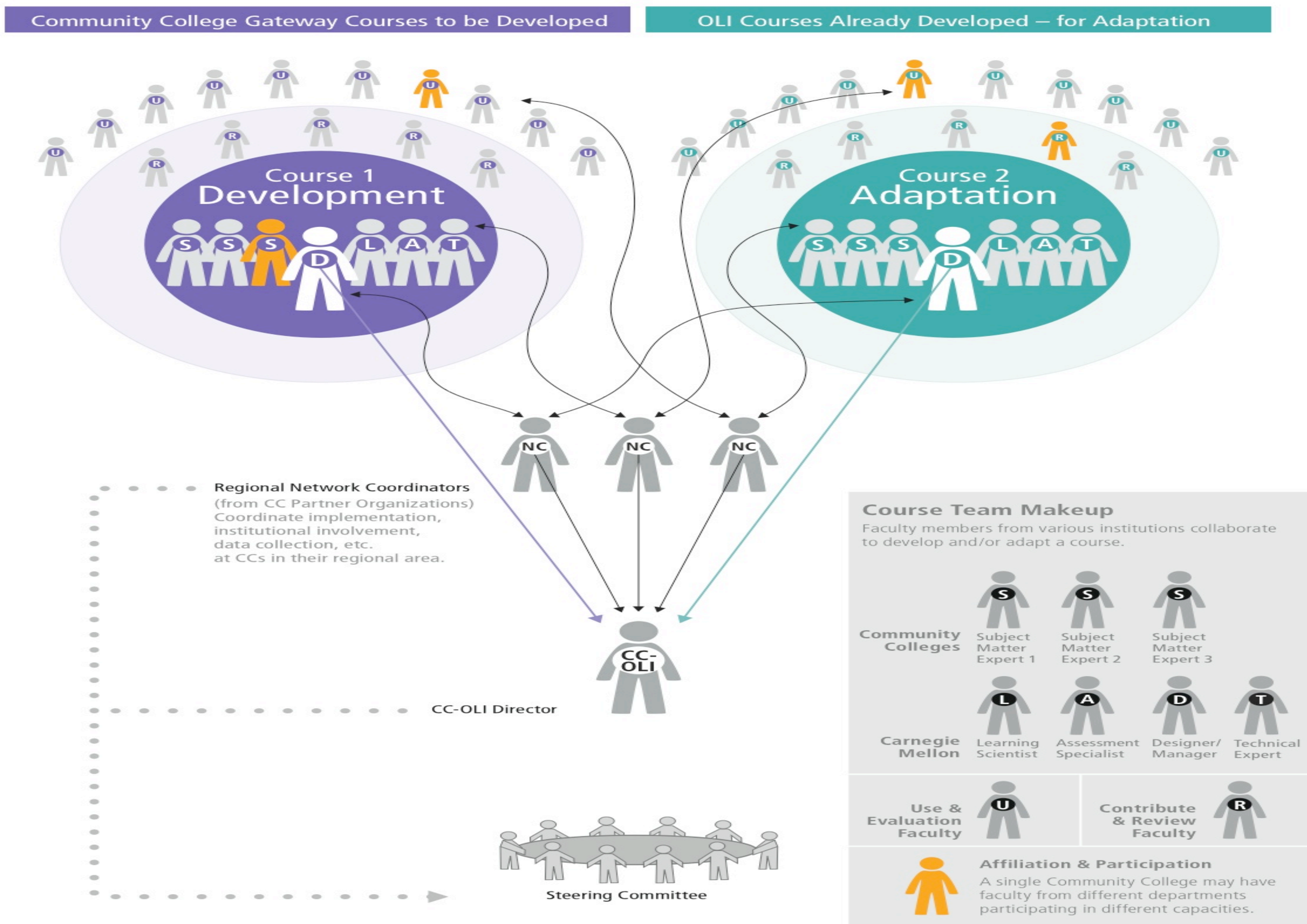
CC-OLI Outcomes

- 25% jump in successful course completion rates in 4 CCOLI gate-keeper courses at participating colleges
- 40 colleges participating in CCOLI course development, adaptation, evaluation
- An established model, platform & tools for testing and scaling innovation



Community College Gateway Courses to be Developed
OLI Courses Already Developed – for Adaptation
Course 1
Development
Course 2
Adaptation
NC
NC
NC
CC-OLI
Regional Network Coordinators
(from CC Partner Organizations)
Coordinate implementation,
institutional involvement,
data collection, etc.
at CCs in their regional area.
CC-OLI Director
Steering Committee
Course Team Makeup
Faculty members from various institutions collaborate
to develop and/or adapt a course.
Community Colleges
Subject Matter Expert 1
Subject Matter Expert 2
Subject Matter Expert 3
Carnegie Mellon
Learning Scientist
Assessment Specialist
Designer/ Manager
Technical Expert
Use & Evaluation Faculty
Contribute & Review Faculty
Affiliation & Participation
A single Community College may have
faculty from different departments
participating in different capacities.

CC-OLI: Next Stage

- Instructional Intelligence Platform
  - Seamless gathering of effectiveness data on material created/adapted by faculty
  - Data to support course level performance improvement as the norm
  - This remains an area for extensive R&D

OLnet: Open Learning network

From *producing* open resources to *use* of open resources

- Build capacity
- Find evidence
- Refine the issues

Network

Research

Fellowships

The Open University

Carnegie Mellon

THE WILLIAM AND FLORA HEWLETT FOUNDATION

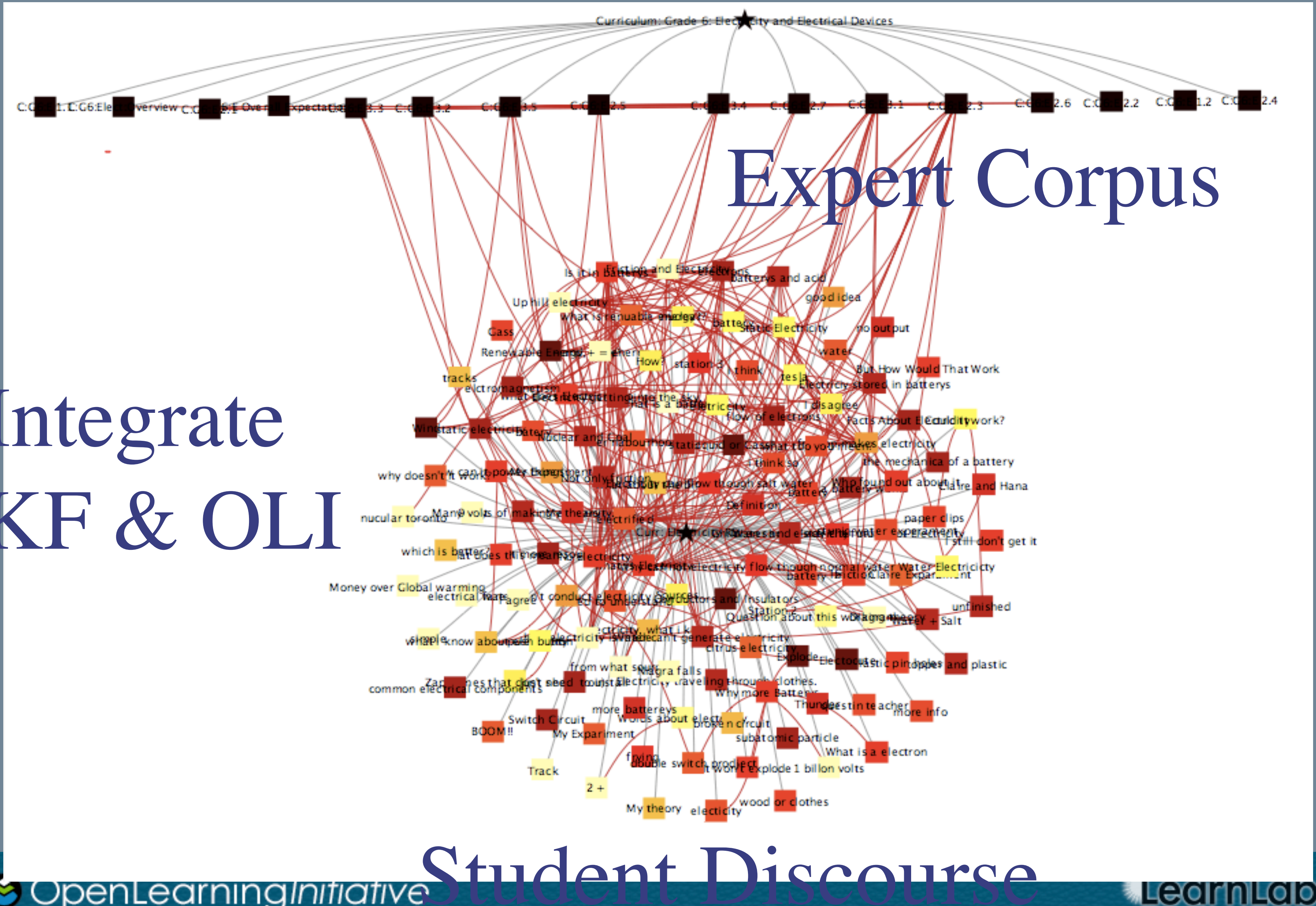
OLnet Research Questions

- How can we build a robust evidence base to support and enhance the design, evaluation and use of Open Educational Resources (OER)?
  - How do we improve the process of OER design/ reuse, delivery, evaluation and data analysis?
  - How do we make the associated design processes and products more easily shared and debated?
  - How do we build a socio-technical infrastructure to serve as a collective evolving intelligence for the community?

Participate in OER Effectiveness Cycle

- Collaborators: OER Developers/Users.
- Productive use of an OER depends on
  - Features of the resource itself
  - How the resource is incorporated into a course
  - How students' work with the resource is monitored and evaluated
  - How human interactions change in ways enabled by the OER.

Group Knowledge Building



Integrate KF & OLI