The LearningOnline Network with Computer-Assisted Personalized Approach (LON-CAPA)

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Outline

- What is LON-CAPA?
  - Learning Content Management
    - Content Repository
    - Content Assembly
    - Course Management
  - Assessment
  - Open Source and Free
- Does it work?
- What's Next?

LON-CAPA

What is LON-CAPA?

LON-CAPA

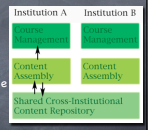
- Learning Content Management System
- Assessment System
- Open-Source and Free

LON-CAPA

- Learning Content Management System
- Assessment System
- Open-Source and Free

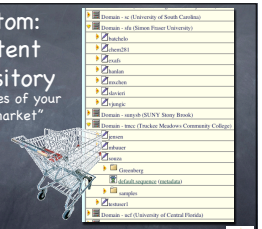
LearningOnline Network

- LON-CAPA learning content management is:
  - a cross-institutional cross-disciplinary content repository
  - a tool to seamlessly assemble this content
  - a complete course management system to readily deploy this content

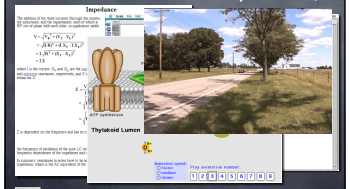


Bottom: Content Repository

"The aisles of your supermarket"



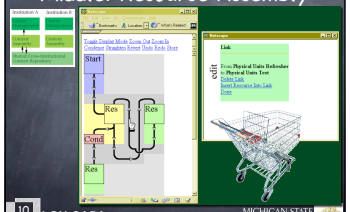
Bottom: Content Repository



Bottom: Content Repository

- Currently links 4 middle schools, 36 high schools, 5 community colleges, and 34 universities
- 38,300 content pages
- 52,600 homework and exam problems
- 49,300 images
- 6,600 content assemblies
- 1,100 simulations and animations
- 500 movies
- Publisher libraries, "back of the chapter problems"

Middle: Resource Assembly



Middle: Resource Assembly

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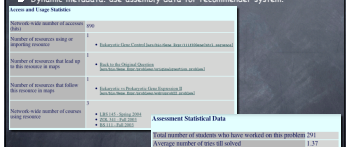
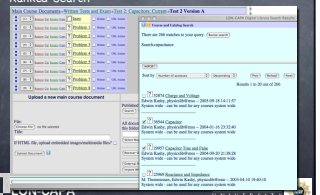
- Static metadata: Dublin Core, cross-walk to IMS
- Dynamic metadata: use assembly data for recommender system:



Middle: Resource Assembly

- Ranked Search



Top: Complete Course Management System

- Course Navigation Tools
- Communication features (discussion, thread)
- Announcements
- Portfolio space
- Homework
- Exams (online/offline)

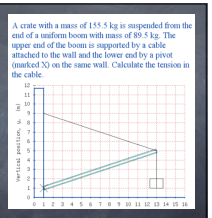
LON-CAPA

- Learning Content Management System
- Assessment System
- Open-Source and Free

LON-CAPA's Approach

- Online assessment with immediate adaptive feedback and multiple tries
- Different students get different versions of the same problem
  - different options
  - different graphs or images
  - different numbers or formulas

- Same problem, two students



Focus on Science and Math

Combined HTML/LaTeX Source

```
<html>
<head>
<title>A Math Equation</title>
</head>
<body bgcolor="#FFFFFF">
The function is
<m>\[f(T)=\frac{1}{\omega}\int_{0}^{T}dt\frac{1}{t^2}\]</m>
where <m>$\omega$</m> is the frequency, and <m>$T$</m> is the period.
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```

Configurable online rendering:

As HTML	As Image	Using Mathtype fonts
Compatible	Compatible	Requires browser config
Low bandwidth	High bandwidth	Low bandwidth

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Print: HTML->LaTeX PDF output

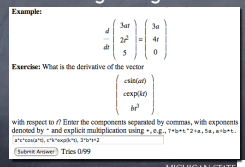
The function is

$$f(T)=\frac{1}{\omega}\int_{0}^{T}dt\frac{1}{t^2}$$

where ω is the frequency, and T is the period.

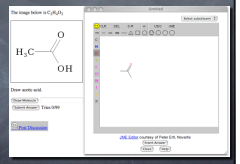
Focus on Science and Math

- Symbolic math grading



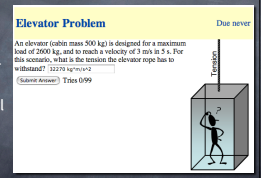
Focus on Science and Math

- Chemical formulas and structures



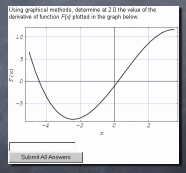
Focus on Science and Math

- Full support of physical units



Focus on Science and Math

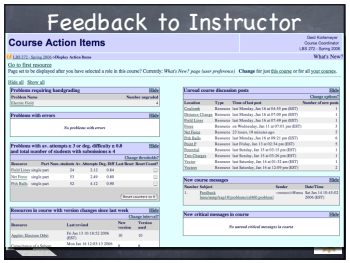
- Dynamic Graphing



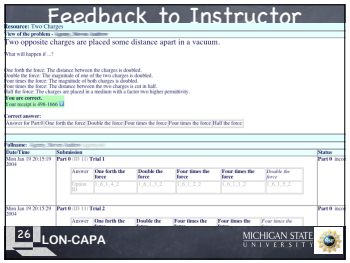
Formative Assessment

- Feedback to the student
  - "how am I doing?"
  - "what is expected?"
- Feedback to the instructor
  - "how is my class doing?"
  - "what do I need to deal with, and what not?"
  - Just-In-Time Teaching (reading and problems due before class)

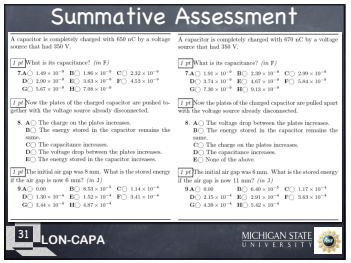
Feedback to Instructor



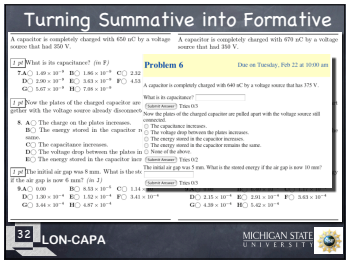
Feedback to Instructor



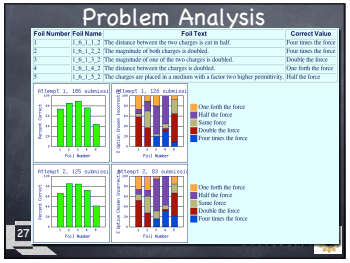
Summative Assessment



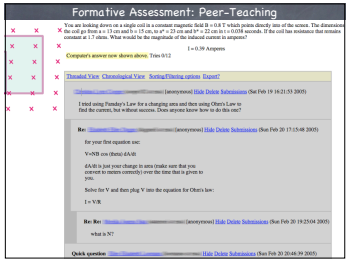
Turning Summative into Formative



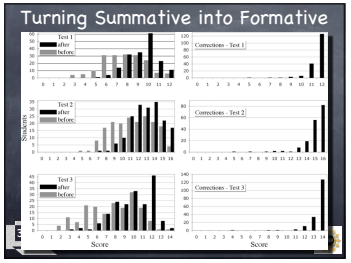
Problem Analysis



Formative Assessment: Peer-Teaching

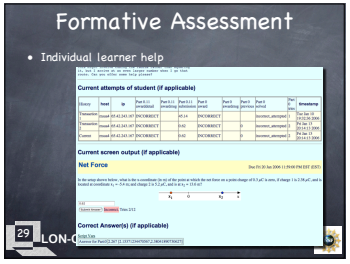


Turning Summative into Formative

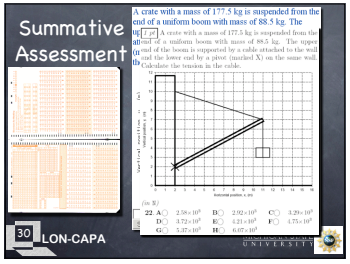


LON-CAPA

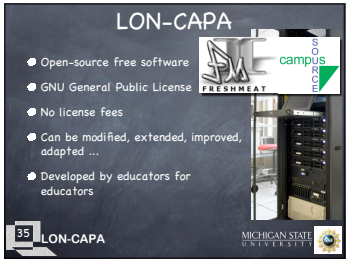
Formative Assessment



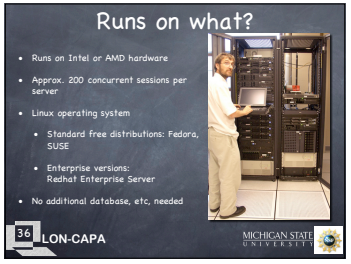
Summative Assessment



LON-CAPA



Runs on what?



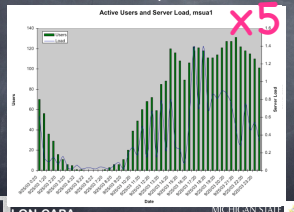
LON-CAPA

Does it work?

Effectiveness

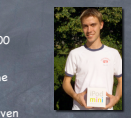
LON-CAPA is a tool, not a curriculum.
Effectiveness depends on how it is used.

Time on Task: 10,000 students

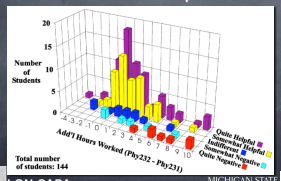


Time-On-Task

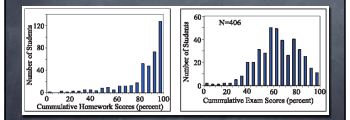
- Academic year 2004/2005
- Approx 12,600 (fall) and 10,800 (spring) MSU students
- 100,000 logins 16 days into the year
- 1,000,000 logins by March, seven months into the year
- Approx 30,000 students systemwide



Before/After Time-On-Task vs. Perceived Helpfulness



Formative vs. Summative



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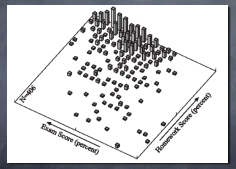
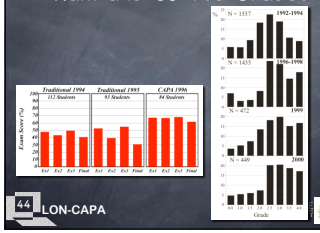
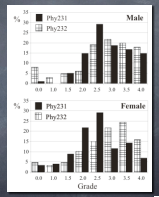


Exam and Course Grades



Gender Differential

- phy231: traditional
- phy232: CAPA

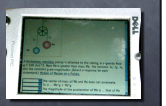


LON-CAPA

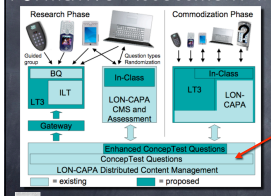
What's Next?

Formative Assessment in Class

- In-Class Use of LON-CAPA
- Partnering with Harvard (Mazur group) and Erskine (Junkin) on next generation "clickers"



Formative Assessment in Class



Integration of Computer Algebra System

- LON-CAPA can already deal with multidimensional symbolic expressions through sampling
- Integration of Computer Algebra System will allow more flexibility
- Working with University of Applied Sciences at Wolfenbüttel, Germany, on integration of Maxima CAS

LON-CAPA Academic Consortium

- Founding partners: Michigan State University and University of Illinois at Urbana-Champaign
- Each institution commits $200k/year of five years toward further development and support

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
MICHIGAN STATE UNIVERSITY

Current Funding

- Initially developed at Michigan State University
- Additional funding of CAPA by Sloan and Mellon Foundations
- Today funded by Michigan State University, partner universities, publisher and service contracts, and the National Science Foundation within the ITR and CCLI-ASA programs

Project Website:
http://www.lon-capa.org/

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