

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

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LON-CAPA

MICHIGAN STATE
UNIVERSITY



LON-CAPA

What is
LON-CAPA?

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LON-CAPA

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



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LearningOnline Network

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



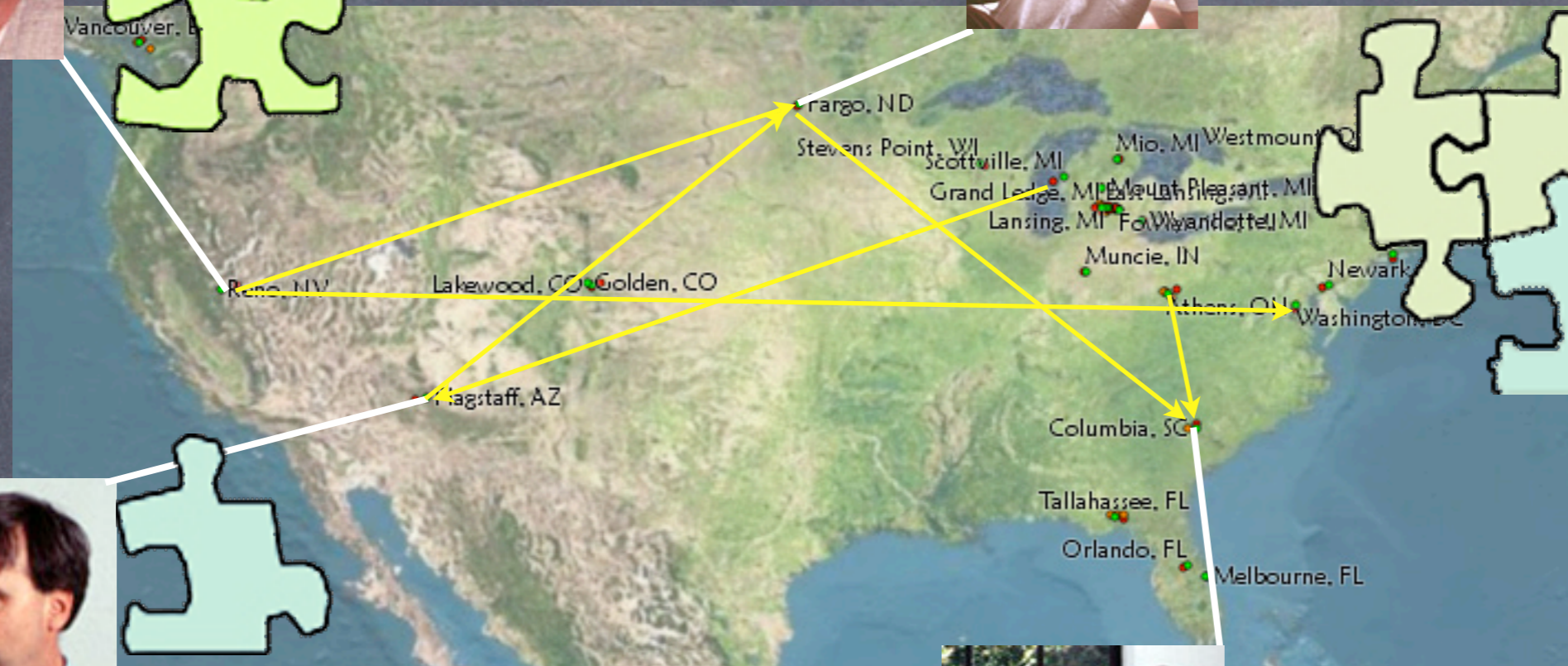
LearningOnline Network



Writes module on statistical averages



Includes the two into her unit on survey analysis



Writes module on statistical errors



Uses that unit in his course



LearningOnline Network



- Currently used at 3 middle schools, 18 high schools, 2 community colleges, and 21 universities



LearningOnline Network

Impedance

The addition of the three currents (through the resistor, the inductance, and the capacitance), each of which is 90° out of phase with each other, in quadrature yields:

$$\begin{aligned}
 V &= \sqrt{V_R^2 + (V_C - V_L)^2} \\
 &= \sqrt{(IR)^2 + (IX_C - IX_L)^2} \\
 &= I\sqrt{R^2 + (X_C - X_L)^2} \\
 &= IZ
 \end{aligned}$$

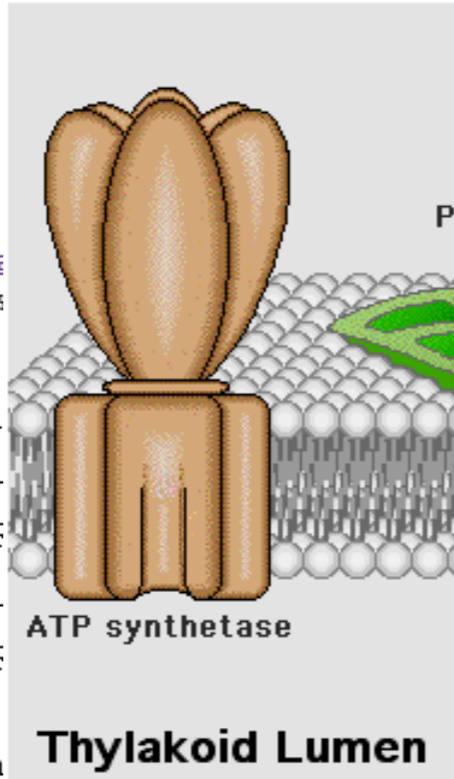
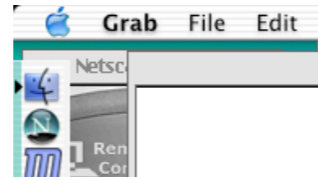
where I is the current, X_C and X_L are the capacitive and inductive reactances, respectively, and Z is obtain for Z:

$$\begin{aligned}
 Z &= \frac{V}{I} \\
 &= \sqrt{R^2 + (X_C - X_L)^2} \\
 &= \sqrt{R^2 + (X_C - X_L)^2}
 \end{aligned}$$

Z is dependent on the frequency and has its m

the frequency of oscillation of the pure LC circ
frequency dependence of the impedance and o

In summary, reactances in series have to be ad
impedance, which is the AC equivalent of the



Animation speed:

- faster
- medium
- slower

Play animation number:

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9



LearningOnline Network

- 20,900 content pages
- 18,600 homework and exam problems
- 12,500 images
- 2,100 content assemblies
- 1,100 simulations and animations
- 500 movies
- Publisher libraries, “back of the chapter problems”



Interface internationalized, multilingual content enabled

Change Your Language Preferences

The screenshot displays the LON-CAPA interface in German. At the top, a navigation bar includes links for 'メインメニュー', '最後に戻る', 'コンテンツをナビゲートする', 'リモコンパネルを使う', 'LON-CAPA', and 'Welcome Set-Up Page'. The main content area is divided into two columns. The left column, titled 'Importieren eines veröffentlichten Dokumentes', contains buttons for 'Suchen' and 'Importieren'. Below these is a search input field and buttons for 'Wähle Seite/Sequenz' and 'Lade Seite/Sequenz'. The right column, titled 'Spezielle Dokumente', lists various document types: 'Neuer Ordner', 'External Resource', 'Kursüberblick', 'Inhaltsverzeichnis', 'Einfache Seite', 'Einfache Aufgabe', 'Formular zum Hochladen von Noten', 'Schwarzes Brett', and 'Meine persönliche Information'. A sidebar on the left shows a 'メインメニュー' with buttons for 'ROLES', 'DOCS', 'NAV', 'SPRS', 'CHRT', 'STAT', 'ENRL', 'CURS', 'PARM', and 'RES', each with a brief description in German. The bottom of the page features a '10 LON-CAPA' logo on the left and the 'MICHIGAN STATE UNIVERSITY' logo with the NSF logo on the right.

LON-CAPA

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



Knowing what 400
students know

... before it's too late

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400 students knowing
what they don't know

... before it's too late

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The Setting

- One of the 10 biggest universities in the US (“Big10”)
- Research University (“R1”)
- Diverse student population
- Intro science courses
- Between 200 and 3,000 students/course
- Instructors rotating between semesters
- No or few Teaching Assistants



The Problem(s)

- Large lecture halls, no personal interaction with majority of students
- Often no resources to grade homework
- If homework is offered:
 - little personalized feedback
 - students blindly copying each other's answers
 - few conceptual discussions between students when collaborating, no peer-teaching outside class



The Surprise

Most instructors
DO care



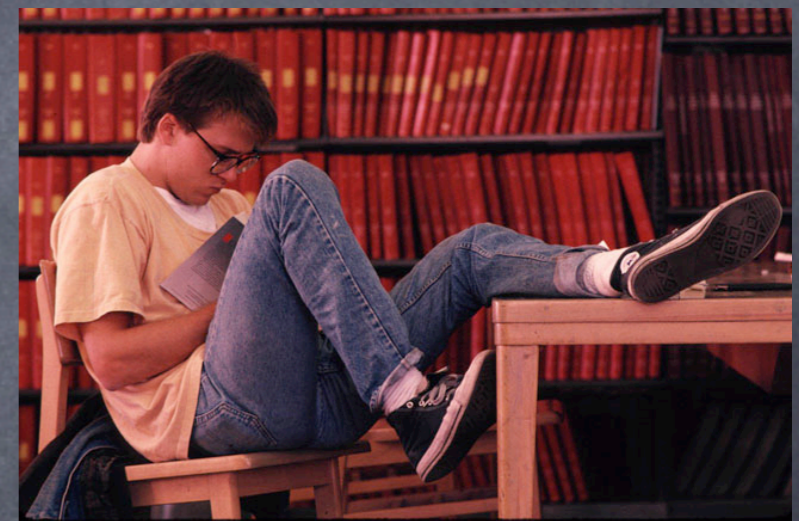
The Challenge

- Provide meaningful formative assessment to students
- Provide timely feedback to both students and instructors
- Reduce blind copying of answers to
 - foster conceptual-level collaboration
 - give a true picture of learner progress
- Provide a scalable solution within the realities and budgets and available resources



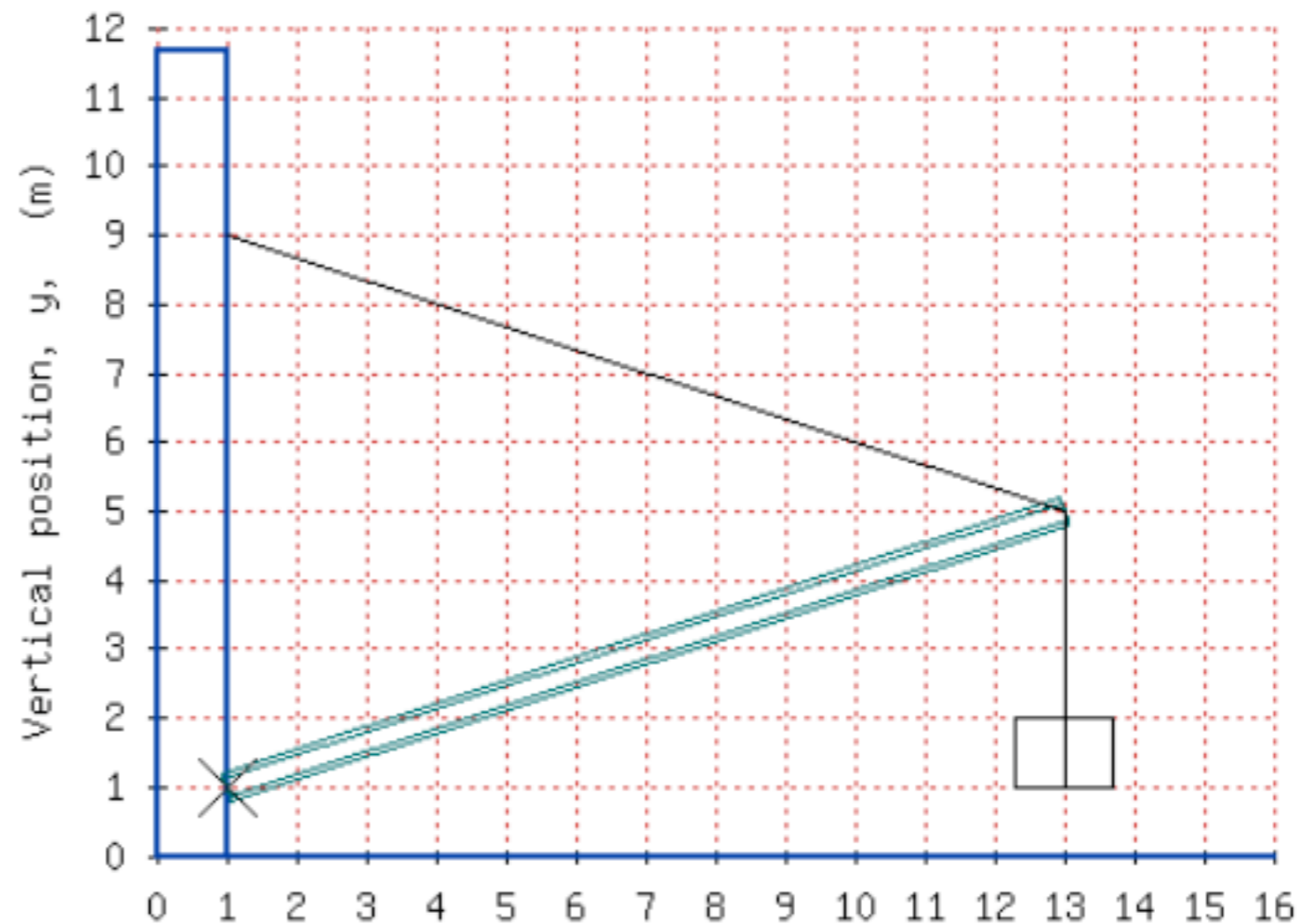
LON-CAPA's Approach

- 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



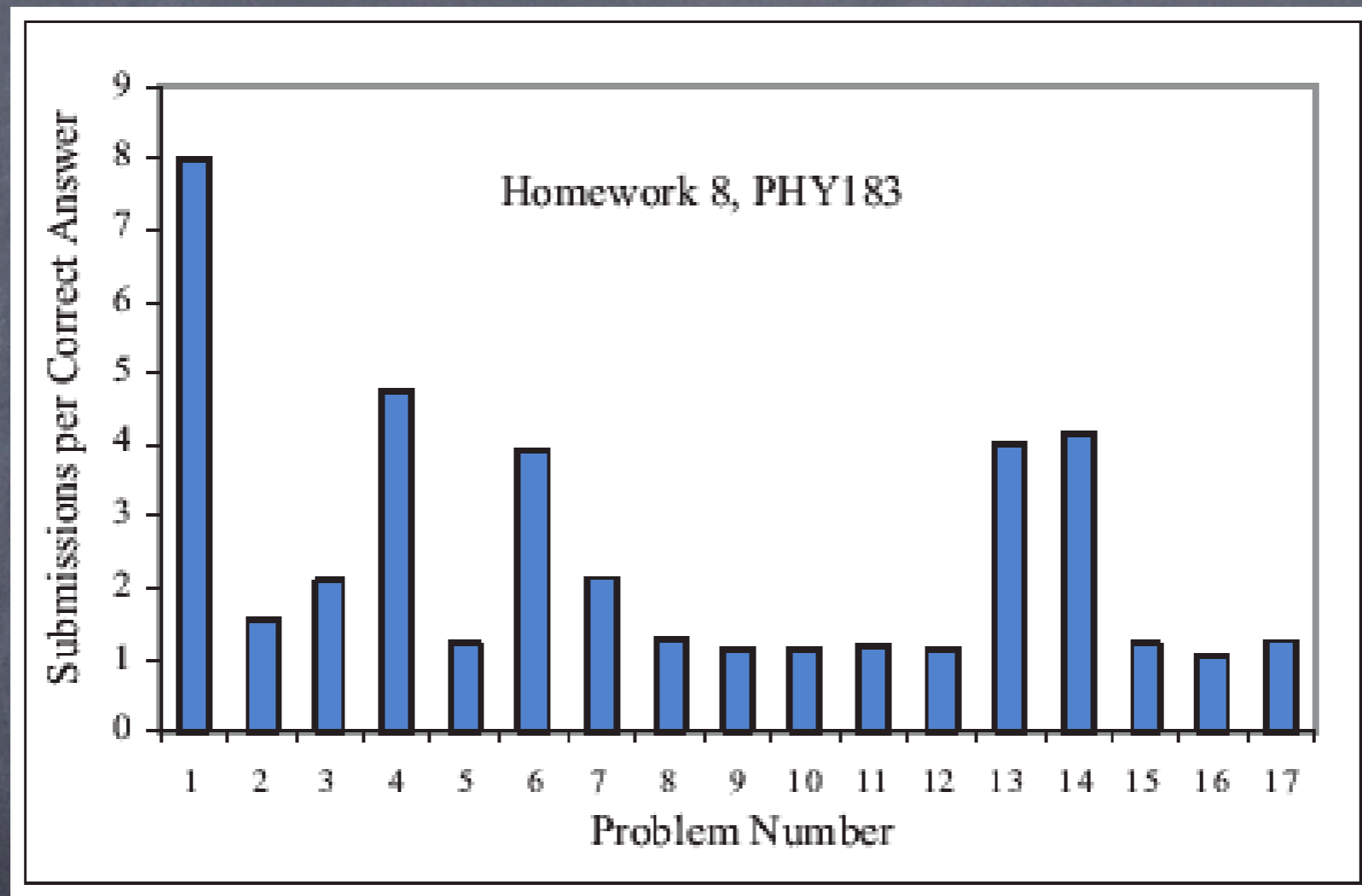
Same
problem,
two
students

A crate with a mass of 155.5 kg is suspended from the end of a uniform boom with mass of 89.5 kg. The upper end of the boom is supported by a cable attached to the wall and the lower end by a pivot (marked X) on the same wall. Calculate the tension in the cable.



Feedback to Instructor

One Homework Set



Feedback to Instructor

Resource: Two Charges

View of the problem - [Agony, Steven Haller](#)

Two opposite charges are placed some distance apart in a vacuum.

What will happen if ...?

- One forth the force: The distance between the charges is doubled.
- Double the force: The magnitude of one of the two charges is doubled.
- Four times the force: The magnitude of both charges is doubled.
- Four times the force: The distance between the two charges is cut in half.
- Half the force: The charges are placed in a medium with a factor two higher permittivity.

You are correct.
Your receipt is 498-1666 ?

Correct answer:

Answer for Part:0 One forth the force Double the force Four times the force Four times the force Half the force

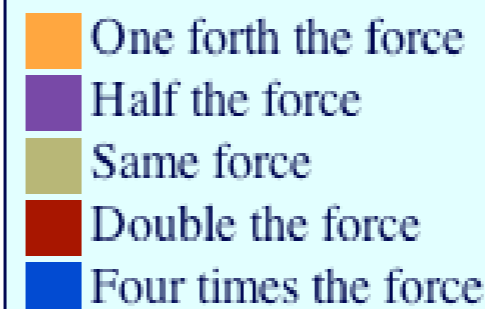
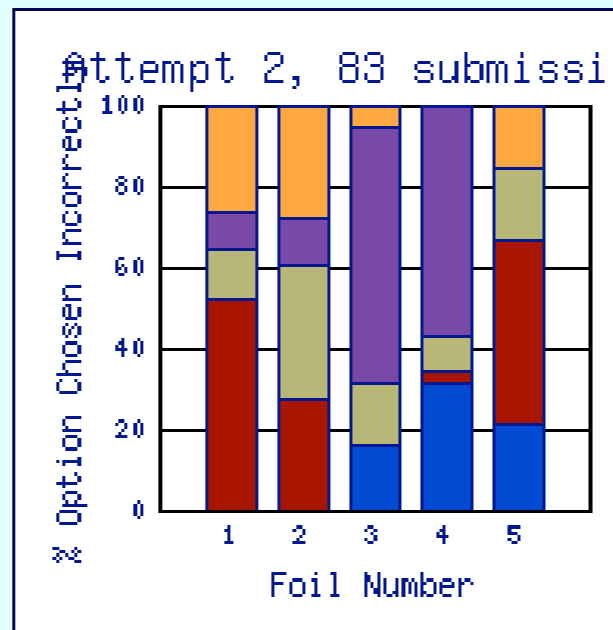
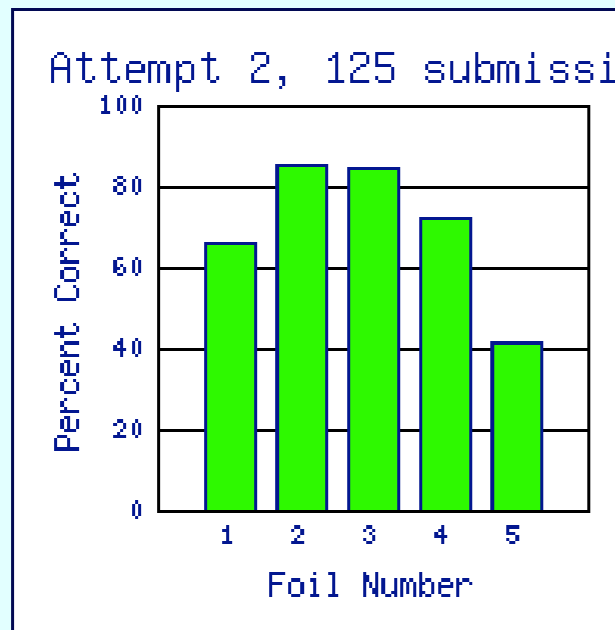
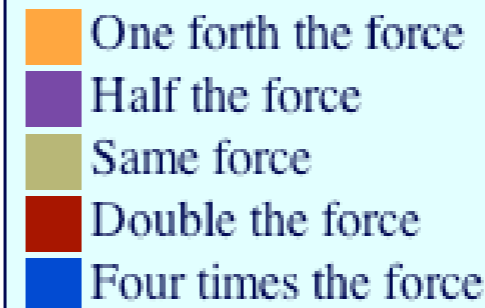
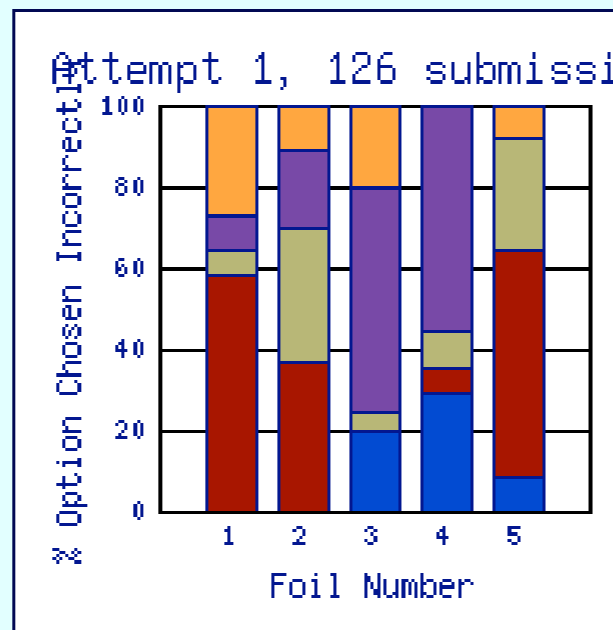
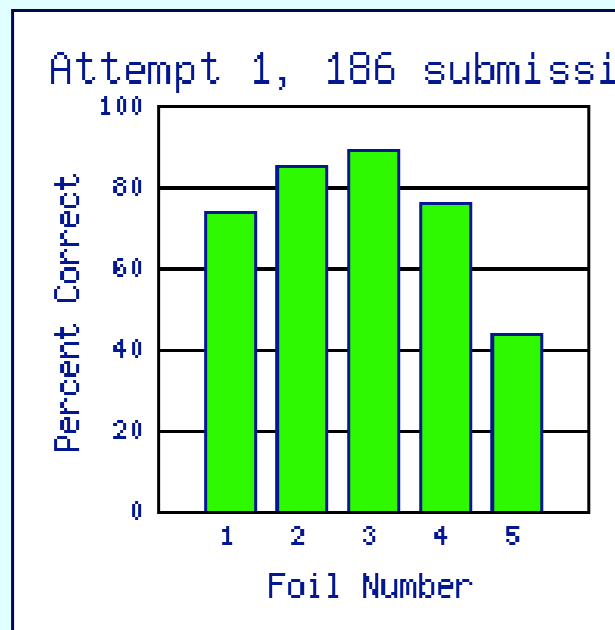
Fullname: [Agony, Steven Haller](#)

Date/Time	Submission	Status												
Mon Jan 19 20:15:19 2004	Part 0 (ID 11) Trial 1 <table border="1" style="margin-top: 10px;"> <tr> <td>Answer</td> <td>One forth the force</td> <td>Double the force</td> <td>Four times the force</td> <td>Four times the force</td> <td>Double the force</td> </tr> <tr> <td>Option ID</td> <td>1_6_1_4_2</td> <td>1_6_1_3_2</td> <td>1_6_1_2_2</td> <td>1_6_1_1_2</td> <td>1_6_1_5_2</td> </tr> </table>	Answer	One forth the force	Double the force	Four times the force	Four times the force	Double the force	Option ID	1_6_1_4_2	1_6_1_3_2	1_6_1_2_2	1_6_1_1_2	1_6_1_5_2	Part 0 incor
Answer	One forth the force	Double the force	Four times the force	Four times the force	Double the force									
Option ID	1_6_1_4_2	1_6_1_3_2	1_6_1_2_2	1_6_1_1_2	1_6_1_5_2									
Mon Jan 19 20:15:29 2004	Part 0 (ID 11) Trial 2 <table border="1" style="margin-top: 10px;"> <tr> <td>Answer</td> <td>One forth the force</td> <td>Double the force</td> <td>Four times the force</td> <td>Four times the force</td> <td>Four times the force</td> </tr> </table>	Answer	One forth the force	Double the force	Four times the force	Four times the force	Four times the force	Part 0 incor						
Answer	One forth the force	Double the force	Four times the force	Four times the force	Four times the force									



Problem Analysis

Foil Number	Foil Name	Foil Text	Correct Value
1	1_6_1_1_2	The distance between the two charges is cut in half.	Four times the force
2	1_6_1_2_2	The magnitude of both charges is doubled.	Four times the force
3	1_6_1_3_2	The magnitude of one of the two charges is doubled.	Double the force
4	1_6_1_4_2	The distance between the charges is doubled.	One forth the force
5	1_6_1_5_2	The charges are placed in a medium with a factor two higher permittivity.	Half the force




Problem Selection

- Static metadata: Dublin Core, cross-walk to IMS
- Dynamic metadata: usage information

Access and Usage Statistics	
Network-wide number of accesses (hits)	890
Number of resources using or importing resource	1 <ul style="list-style-type: none"> • Eukaryotic Gene Control [msu/bio/Gene_Expr/111f03GeneCntrl.sequence]
Number of resources that lead up to this resource in maps	1 <ul style="list-style-type: none"> • Back to the Original Question [msu/bio/Gene_Expr/problems/originalquestion.problem]
Number of resources that follow this resource in maps	1 <ul style="list-style-type: none"> • Eukaryotic vs Prokaryotic Gene Expression II [msu/bio/Gene_Expr/problems/eukvsprokII.problem]
Network-wide number of courses using resource	3 <ul style="list-style-type: none"> • LBS 145 - Spring 2004 • ZOL 341 - Fall 2003 • BS 111 - Fall 2003

Assessment Statistical Data

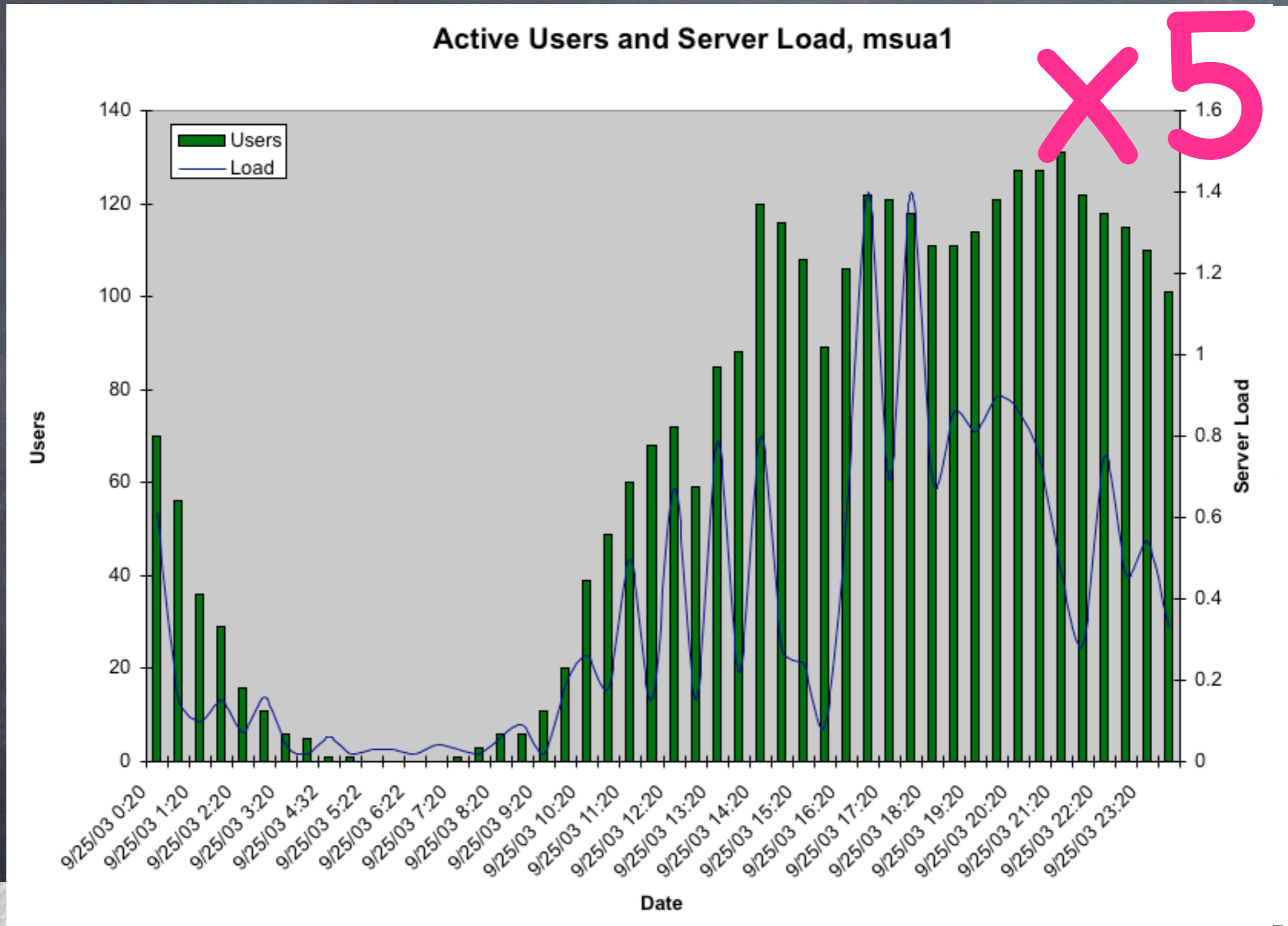
Total number of students who have worked on this problem	291
Average number of tries till solved	1.37
Degree of difficulty	 (0.36)

Effectiveness

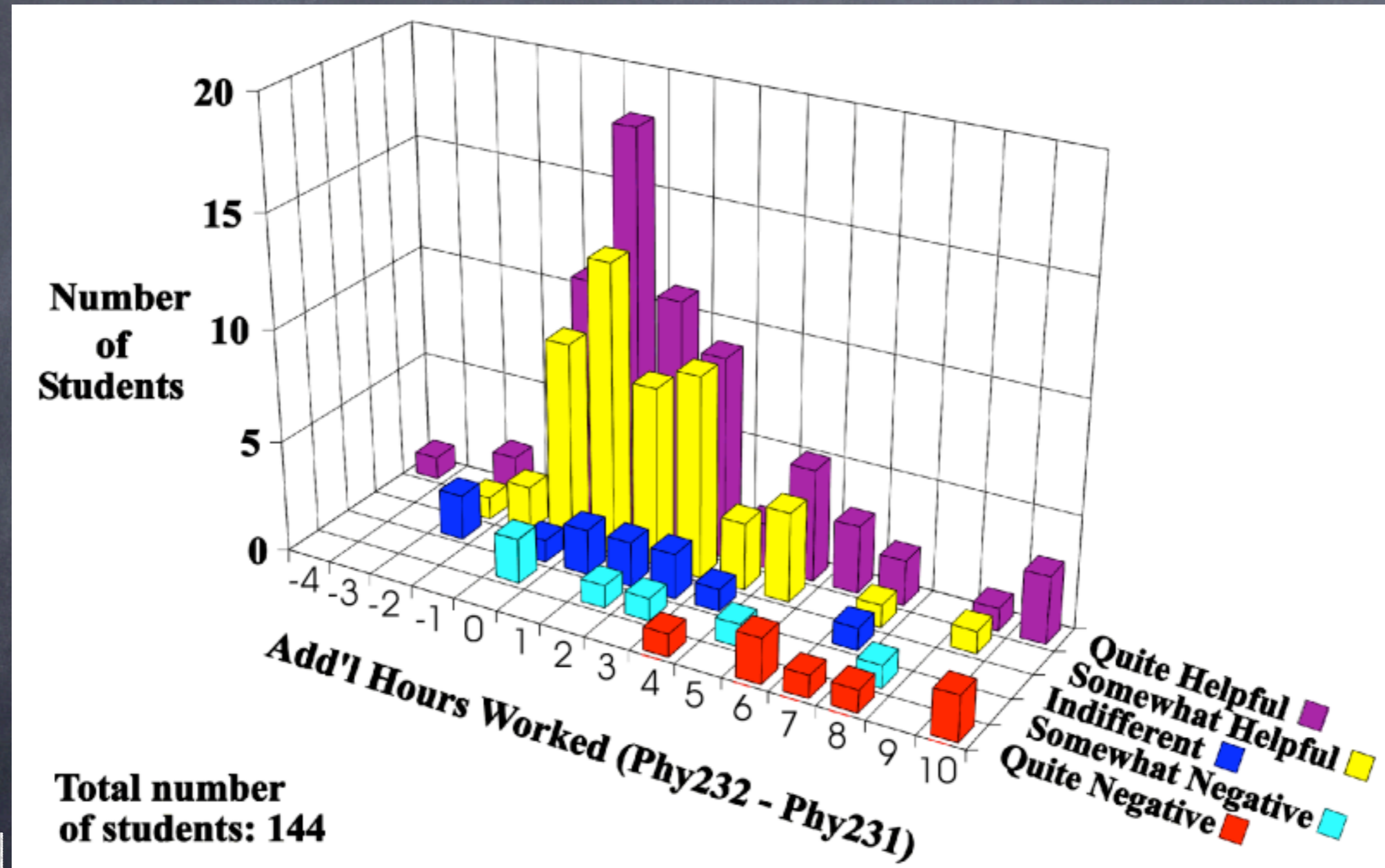
LON-CAPA is a tool, not a curriculum.
Effectiveness depends on how it is used.



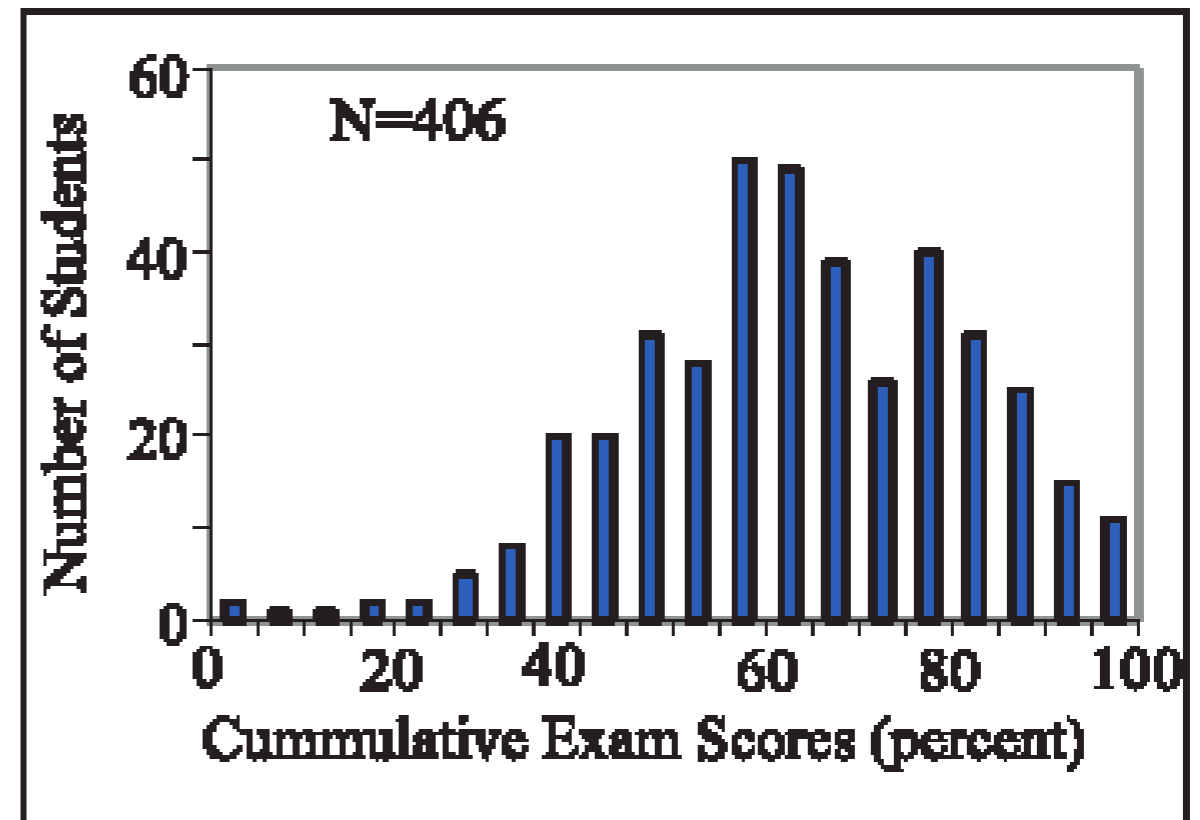
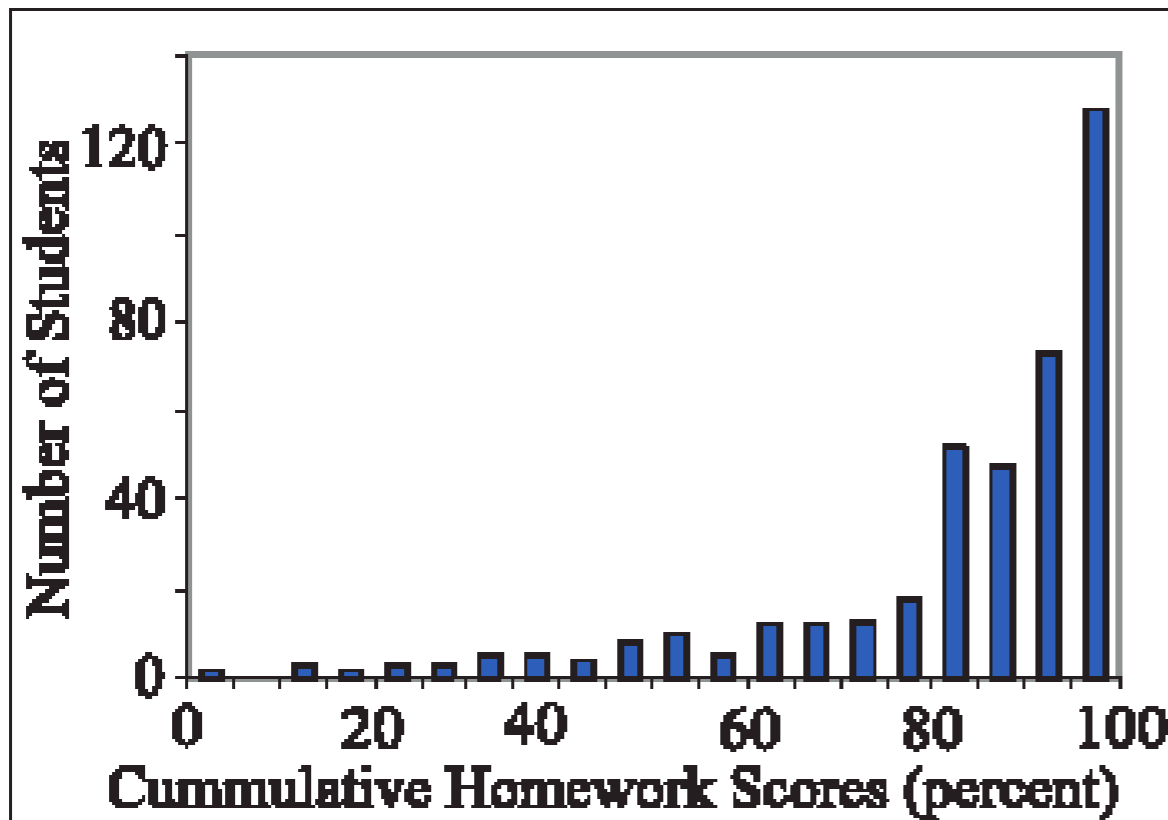
Time on Task: 10,000 students



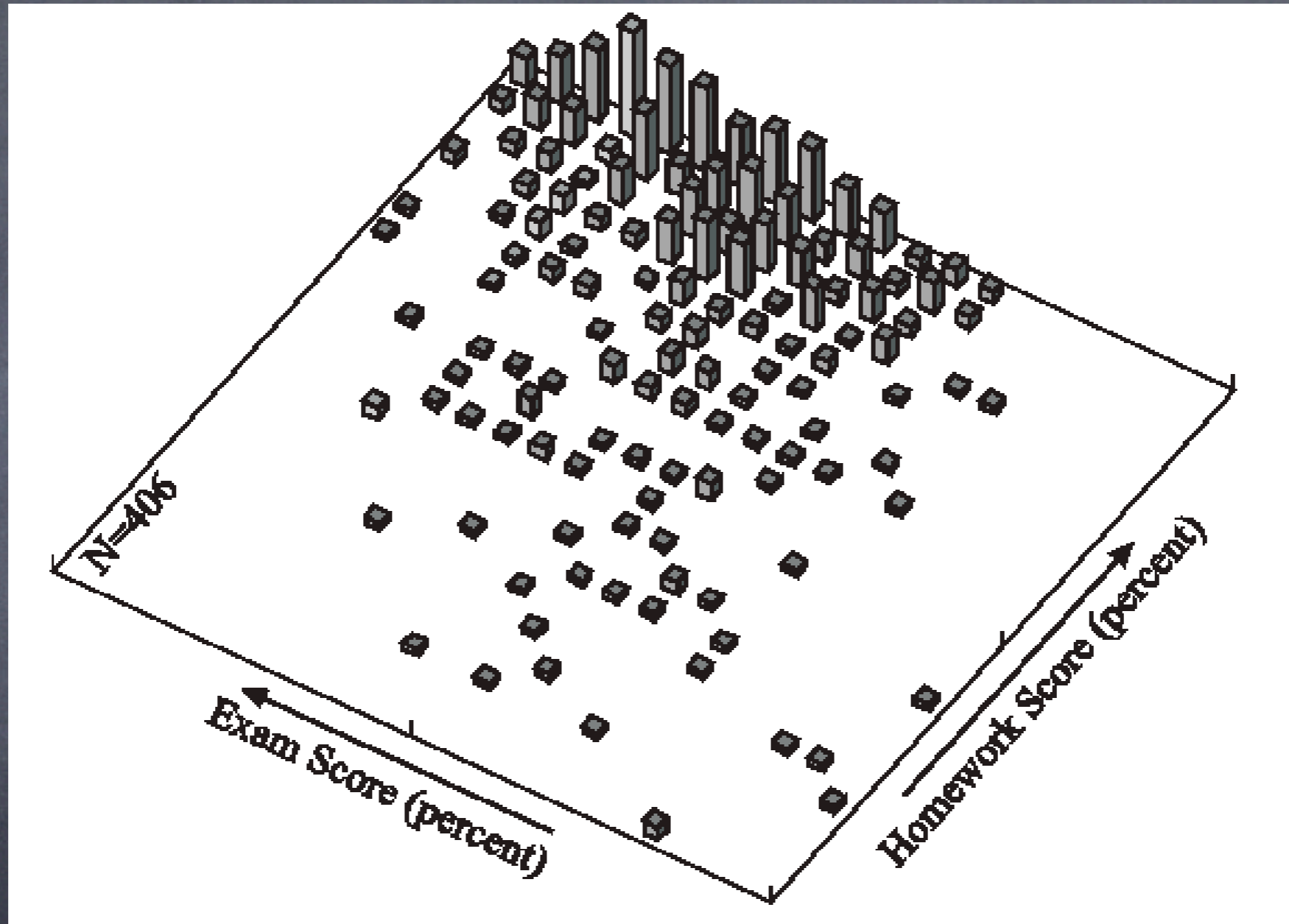
Before/After Time-On-Task vs. Perceived Helpfulness



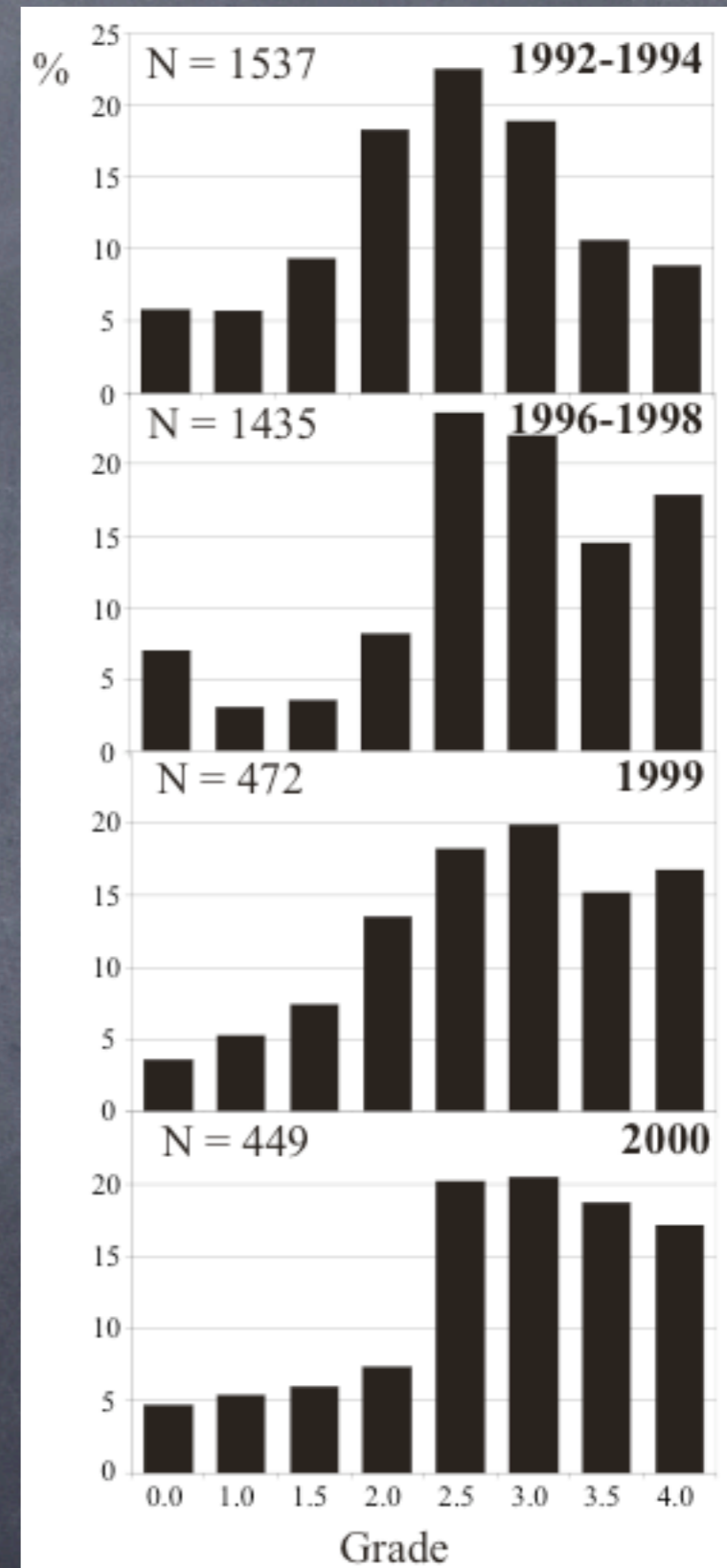
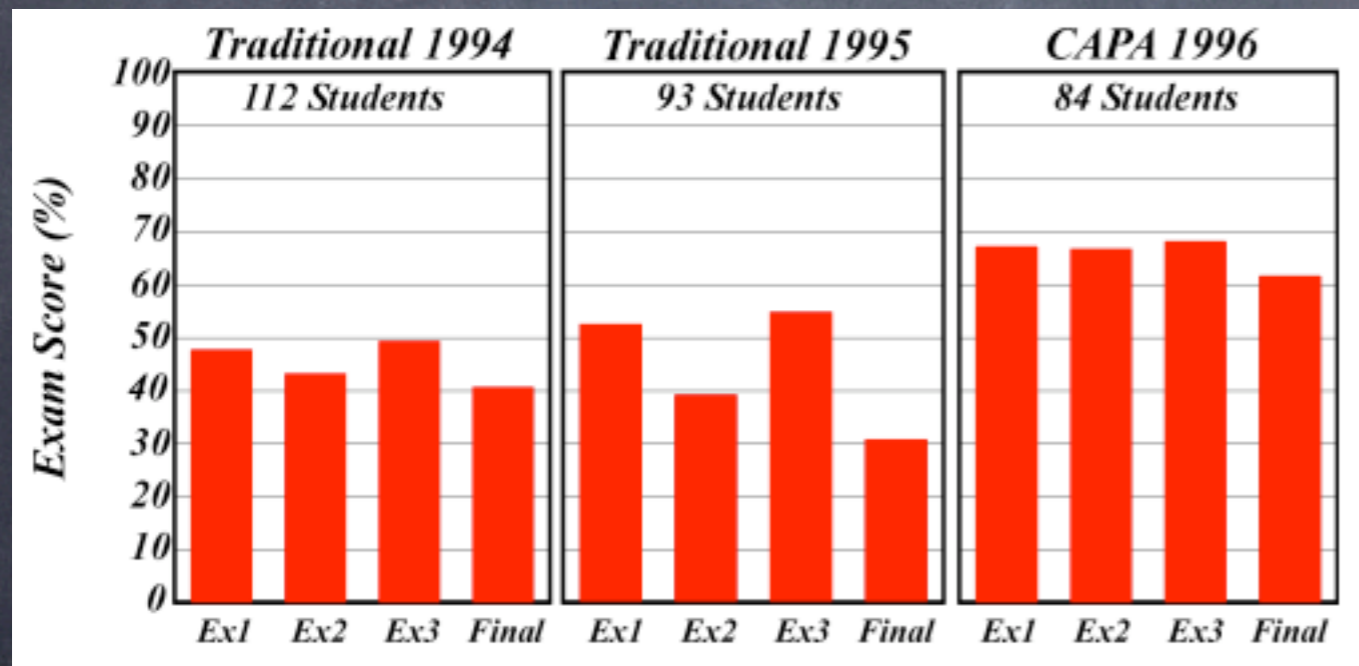
Formative vs. Summative



Formative vs. Summative

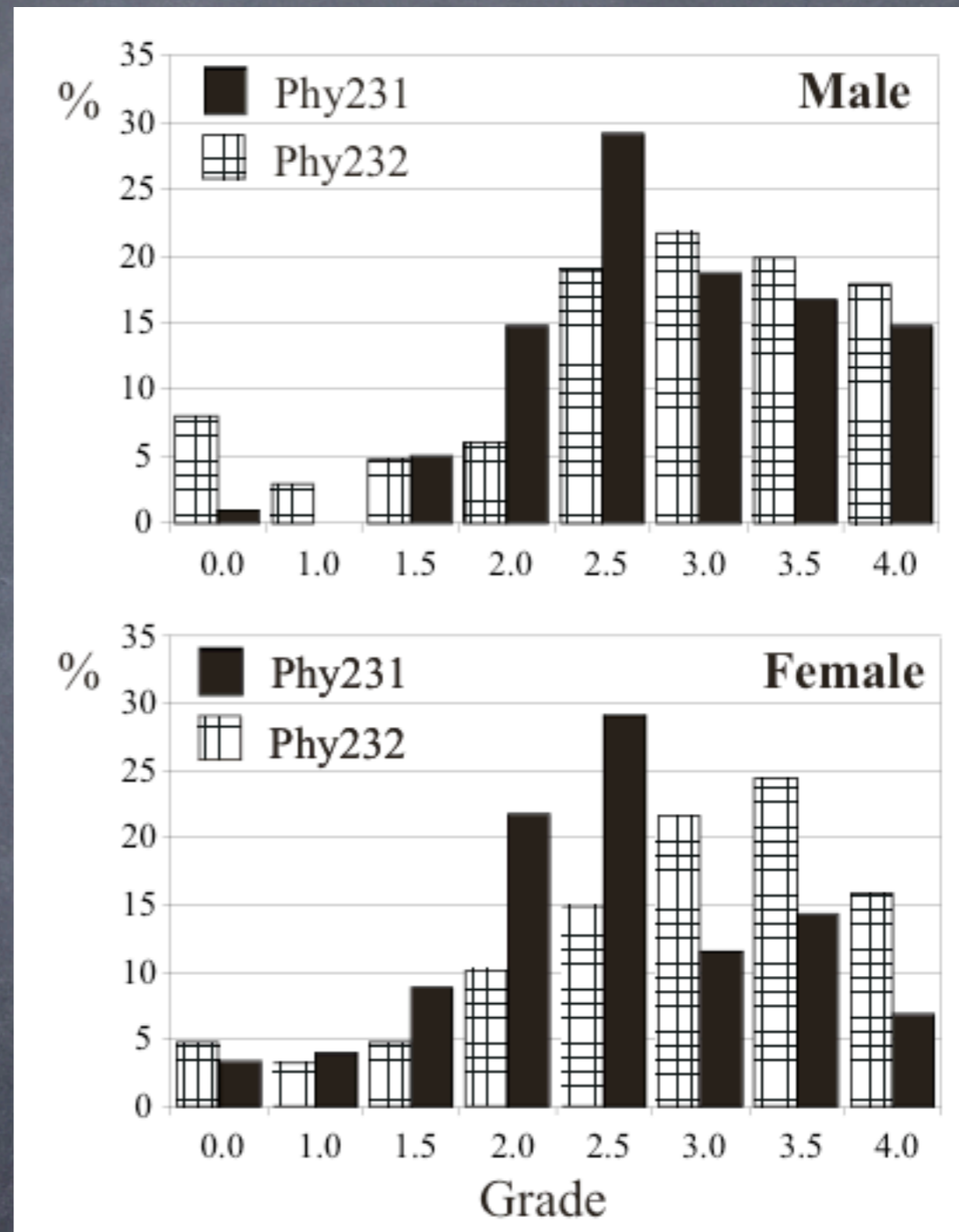


Exam and Course Grades



Gender Differential

- phy231: traditional
- phy232: CAPA



Datamining (WIP): Early Detection of Learners at Risk

Best Predictor	Total Number of Correct Answers
Good Predictor	Total Number of Tries
Predictor	<ul style="list-style-type: none">•Gets Problems Correct on the First Try•Time spent
Minor Predictor	Participation in online Discussions



Funding

- Initially developed at Michigan State University
- Funded by Michigan State University and the National Science Foundation within the ITR and CCLI-ASA programs

