

GUIDED INQUIRY AND FRESHMAN CHEMISTRY

OR:

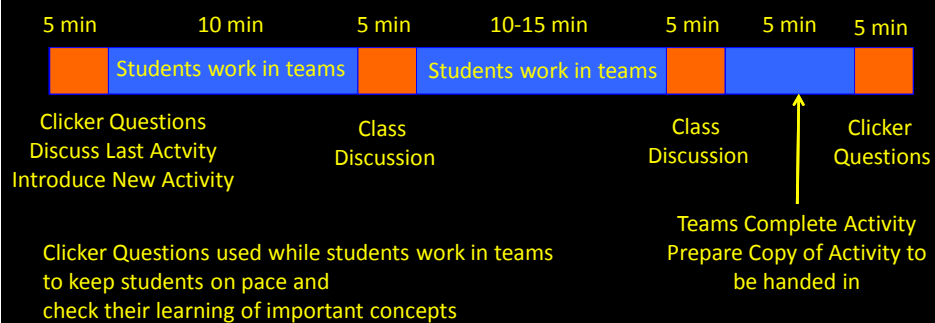
A MISH-MASHY HODGE-PODGE LOOK AT SOME OF THE FACTORS THAT DETERMINE SUCCESS IN FRESHMAN CHEMISTRY

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POGIL IN CHM 110

- **POGIL = *Process Oriented Guided Inquiry Learning***
- **Intended to teach content and important process skills (Information processing, critical thinking, time management, teamwork)**
- **Whatever else it might be, it isn't lecture**

TYPICAL CHM 110 CLASS



FORMAT OF A POGIL ACTIVITY

- Learning Objectives
- Success Criteria
- Reading
- Prerequisites

FORMAT OF A POGIL ACTIVITY

• EXPLORATION OF A MODEL

MODEL 1 EXAMPLES OF ACIDS

Name of Acid	Formula	Reaction in water
hydrochloric acid	HCl	$\text{HCl} \xrightarrow{\text{H}_2\text{O}} \text{H}^+(\text{aq}) + \text{Cl}^-(\text{aq})$
hydrobromic acid	HBr	$\text{HBr} \xrightarrow{\text{H}_2\text{O}} \text{H}^+(\text{aq}) + \text{Br}^-(\text{aq})$
sulfuric acid	H_2SO_4	$\text{H}_2\text{SO}_4 \xrightarrow{\text{H}_2\text{O}} \text{H}^+(\text{aq}) + \text{HSO}_4^-(\text{aq})$
nitric acid	HNO_3	

FORMAT OF POGIL ACTIVITY

• CRITICAL THINKING QUESTIONS RELATED TO MODEL

CRITICAL THINKING QUESTIONS

(1) ♦ When HCl dissolves in water, what two ions are formed?

(2) ♦ When HBr dissolves in water, what two ions are formed?

(3) From the examples in Model 1, what do all acids have in common?

(4) As a group, in one *complete, grammatically correct* sentence, write a definition for an acid.

(5) Complete the table in Model 1 by writing the chemical equation for the reaction that takes place when nitric acid dissolves in water.

FORMAT OF A POGIL ACTIVITY

- **ROUTINE EXERCISES TO REINFORCE BASICS**
- **QUESTIONS THAT REQUIRE DEEPER THINKING**
- **PROBLEMS THAT REQUIRE THINKING BEYOND EXERCISES**

IMPROVEMENTS IN STUDENT PERFORMANCE

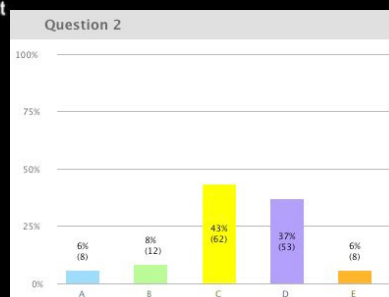
- **Higher percentage of students answer conceptual questions correctly on exams**
- **Students have more confidence in their ability to solve problems**
- **Higher percentage of students correctly answer problems correctly on exams**
- **Class average higher on every exam**
- **Noticeable reduction in D/F rate**

INCREASED CONFIDENCE IN SOLVING PROBLEMS

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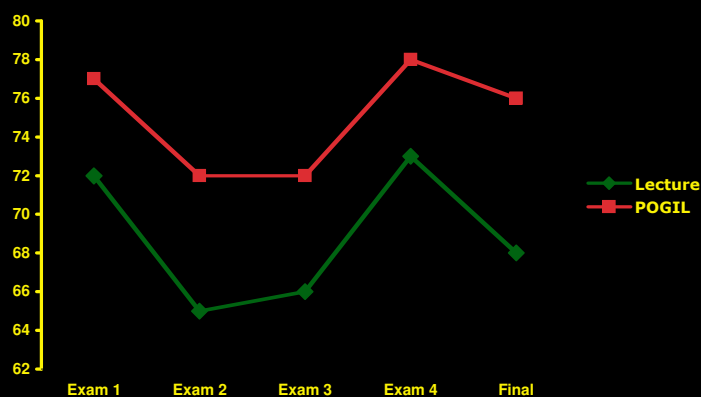
As you look at problem 10, which of the following best describes your ability to solve the problem?

- A) I could solve it and explain it well to others
- B) I could solve it, but not explain it.
- C) With the help of my group, I am confident we can solve it.
- D) With the help of my group, we might be able to solve it
- E) I don't think we could solve the problem



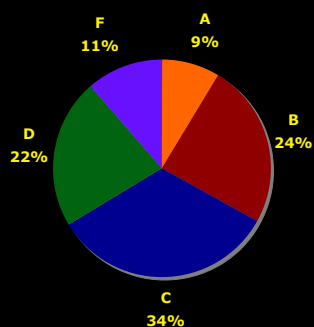
IMPROVED EXAM PERFORMANCE

Exam Averages, Lecture vs POGIL

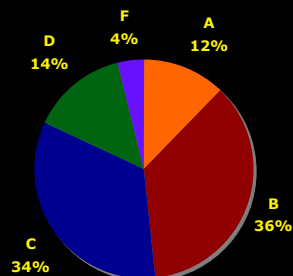


REDUCED D/F RATE

LECTURE

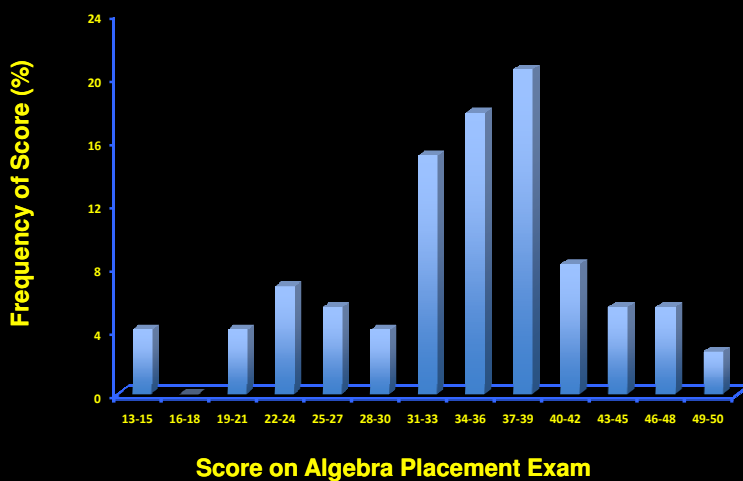


POGIL



NO INFORMATION ON WITHDRAW RATES

MATHEMATICAL PREPAREDNESS OF FRESHMAN IN CHM 110



PREDICTING SUCCESS (OR FAILURE) IN CHM 110

EXAM 1: Median 76, Std Dev 16

260 students took exam

92 students below 70% (D or F in course)

39 students more than 1.5 std dev below median

STUDENTS WHO DID EARN A SATISFACTORY PASS ON EXAM 1

92 student below C

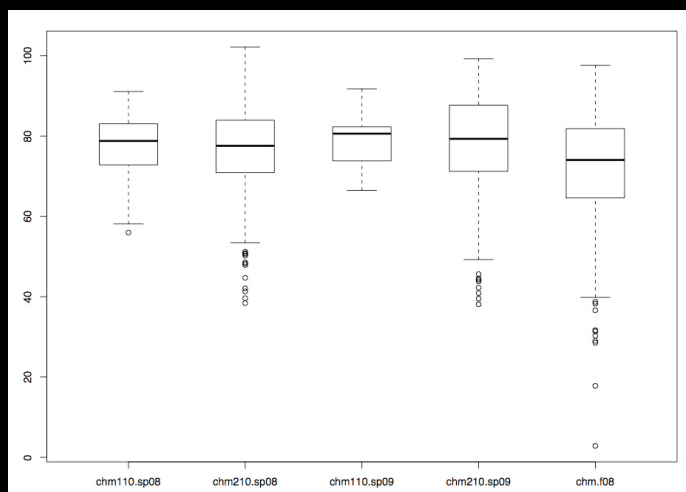
**31 freshman (106 Freshman on Current Roster)
(29% of freshman)**

**61 upper classmen (154 on Current Roster)
(40% of upperclassmen)**

**Is there reason to be worried about how performance
in CHM 110 affects freshman retention?**

CHM 110 AND CHM 210

Grades in 210 (Comparison of 110 students vs the rest of class)



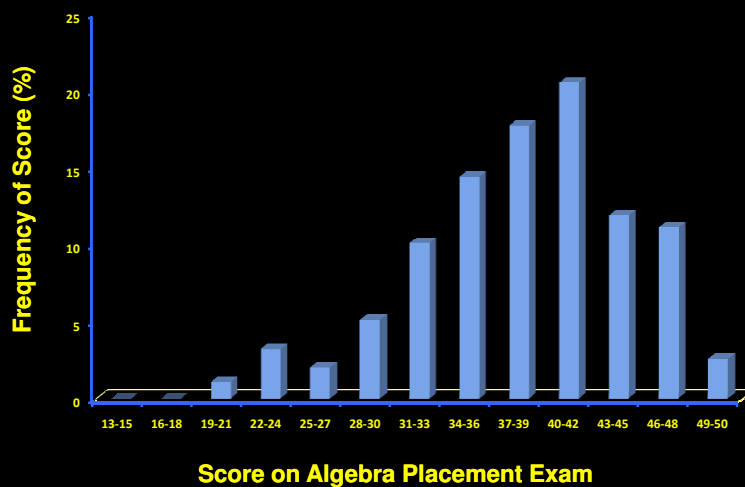
WHAT WE KNOW ABOUT CHM 110

- D/F Rate down using POGIL and clickers
- Students who successfully complete CHM 110 are usually successful in CHM 210

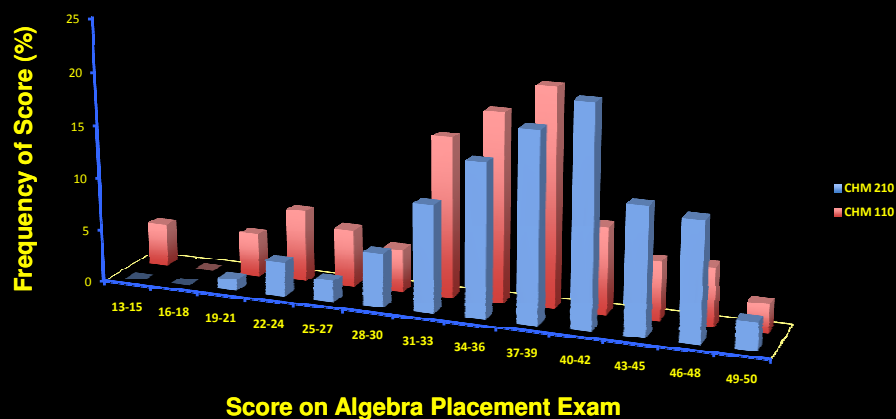
FUTURE PLANS

- Continue to track students from 110 to 210
- Analyze 110 students more thoroughly on 210 exam questions

PREDICTING SUCCESS (OR FAILURE) IN CHM 210



MATH SCORES (110 AND 210)



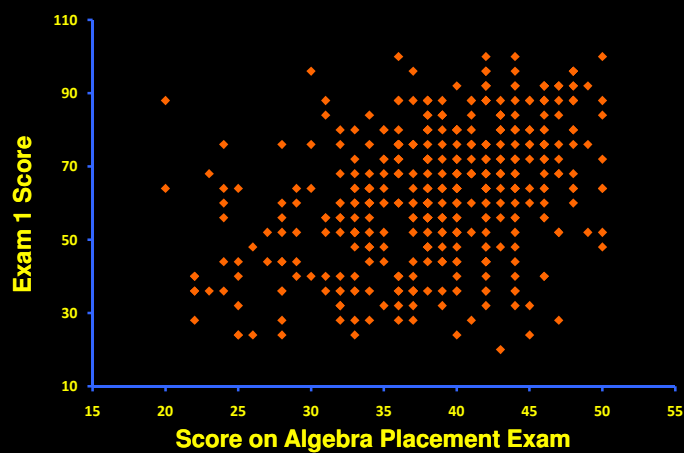
CHEMISTRY READINESS EXAM

A CHEMISTRY READINESS TEST AS A
PREDICTOR OF PERFORMANCE ON EXAM 1

SCORE ON CRE	N	MEDIAN	STD DEV
0-5	73	52	18
6-10	322	56	17
11-15	262	68	17
16-20	107	78	14

MATH PLACEMENT SCORES

A CHEMISTRY READINESS TEST AS A
PREDICTOR OF PERFORMANCE ON EXAM 1



MATH PLACEMENT SCORES

THE ALGEBRA PLACEMENT TEST AS A
PREDICTOR OF PERFORMANCE ON EXAM 1

ALGEBRA SCORE	N	MEDIAN	STD DEV
20-25	22	40	18
26-30	24	48	17
31-35	69	56	16
36-40	144	64	17
41-45	114	72	18
46-50	65	76	16

WHAT WE KNOW ABOUT CHM 210

- **Higher score on Chem Readiness Test usually means better performance on Exam 1**
- **Higher score on Algebra Placement Test usually means better performance on Exam 1**

FUTURE PLANS FOR CHM 210

- **More detailed analysis of Chem Readiness Test to improve it's usefulness as a predictor of success**
- **Study combination of Chem Readiness Test and Algebra scores**
- **Can we find students in 210 who should be placed in 110?**

ACKNOWLEDGEMENTS

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