How do we balance science & practice in pharmacy curricula?

Physical sciences

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Professional competencies

A selection from Curtin B. Pharm course

- Compound pharmaceutical products
- Participate in therapeutic decision making
- Evaluate prescribed medicines
- Evaluate and synthesise information
- Apply communication skills and participate in negotiations
- Prepare cytotoxic drug products
- Explore problems/potential problems

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Process skills

When do students develop these?

Process skills

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Or more specifically

When **do we give students opportunities** to develop these process skills?

Active Learning in University Science

Pedagogy

Process Oriented

An exploration of a concept, application of a theory or experimental data is presented in a model or series of models

Guided Inquiry Learning

The student is guided through the model by a set of questions allowing them to construct their own knowledge and test the knowledge in applications of the theory or concept

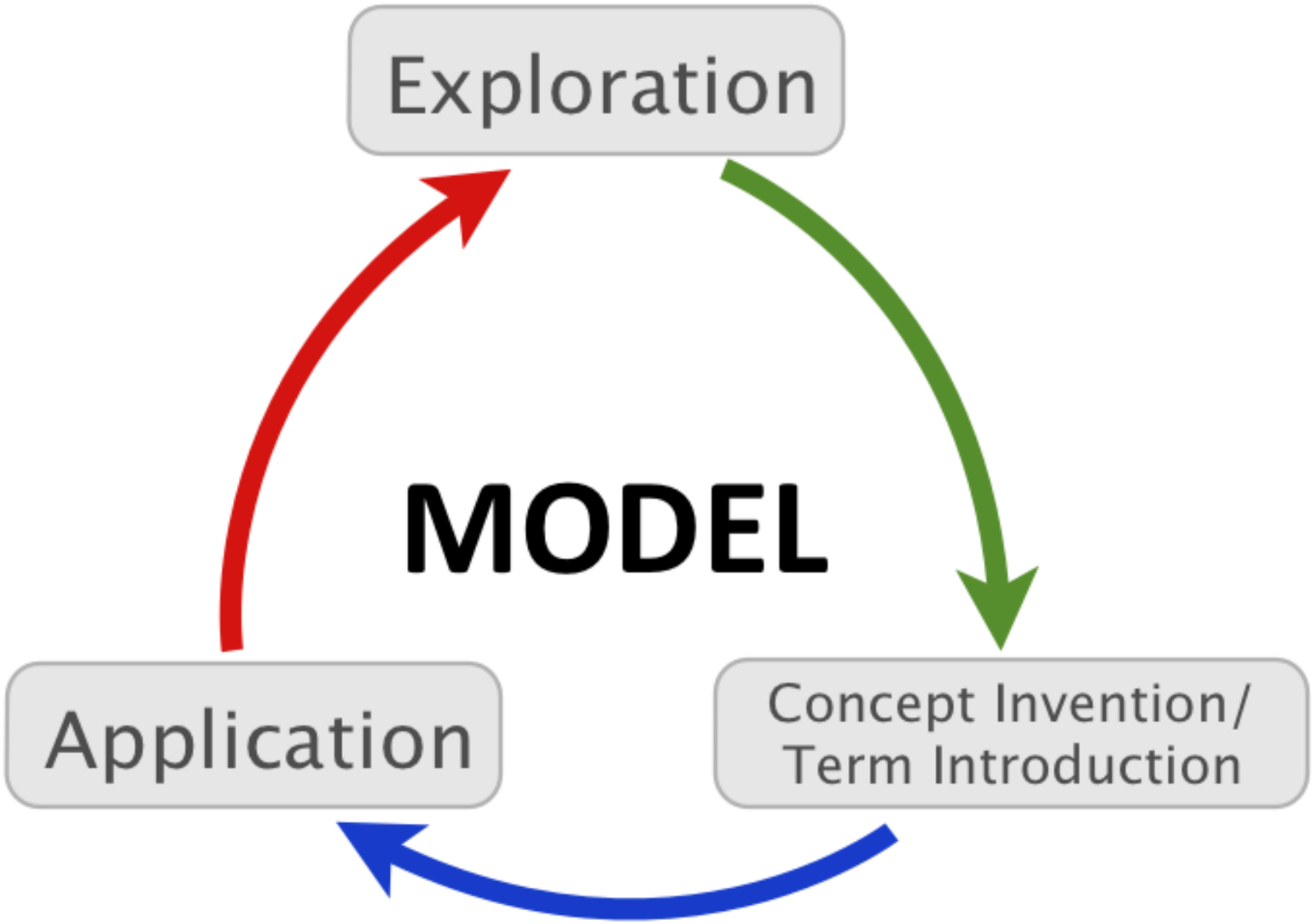
POGIL http://www.pogil.org/

Thinking About Process Skills

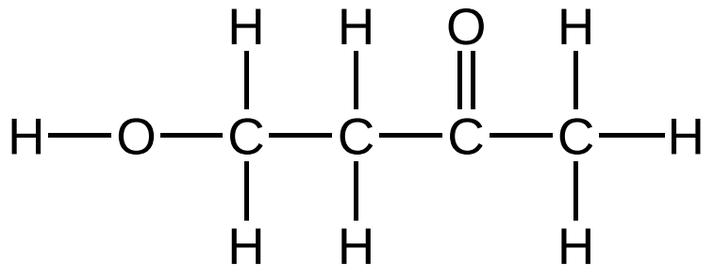
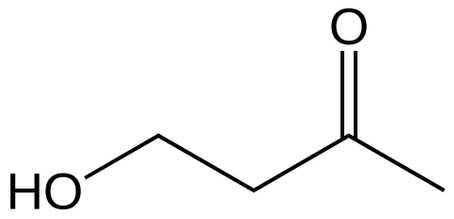
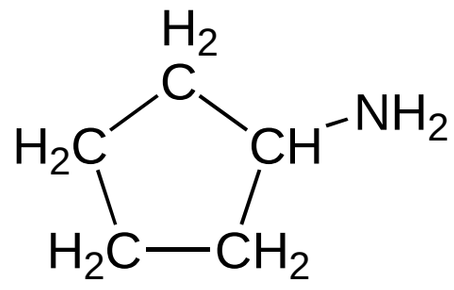
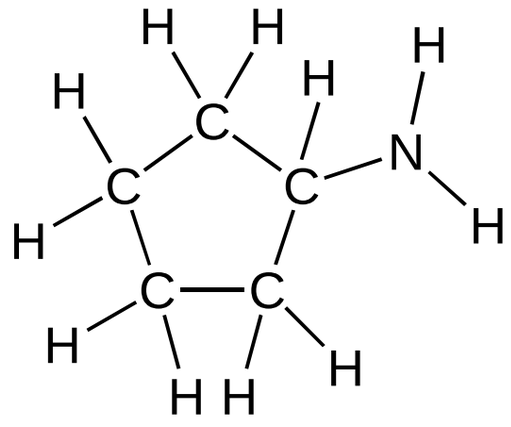
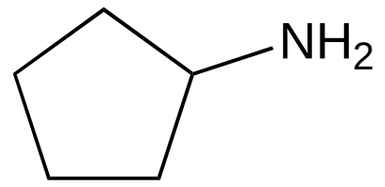
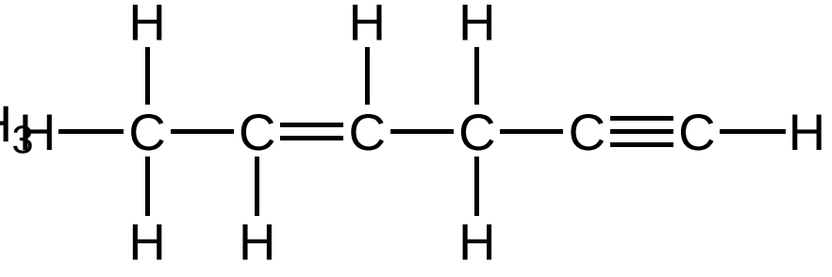
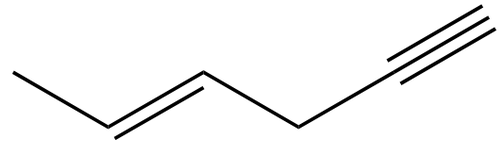
POGIL's targeted process skills

1. Oral & written communication
2. Teamwork
3. Problem solving
4. Critical & analytical thinking
5. Team & self-management
6. Information processing
7. Assessment & self-assessment

Learning cycle paradigm



Sample activity

Molecular formula	Condensed structure	"Lewis" Structure	Line structure
$C_4H_8O_2$	$HOCH_2CH_2COCH_3$		
$C_5H_{11}N$			
C_6H_8	$CH_3CHCHCH_2CCCH_3$		

Sample activity

- Provide a table showing common representation styles for organic molecules
- Ask student questions to explore the styles
- Have students develop their own rules for using the line structure style
- Have them apply their rules in some questions

Folders

- Each student is assigned a team
- Each team is given a folder
  - Names of the elements
- Folders are distributed at the start of the class and returned at the end of the class
- A copy of the day's activity is provided (on coloured paper)
- Teams are also given communication tools via Blackboard

Teams

Manager
Keeps the group on-track, delegates tasks to other team members

Recorder
Keeps the record of the group activity on the copy provided

Presenter
Asks questions of the lecturer and enters clicker answers

Teams of three

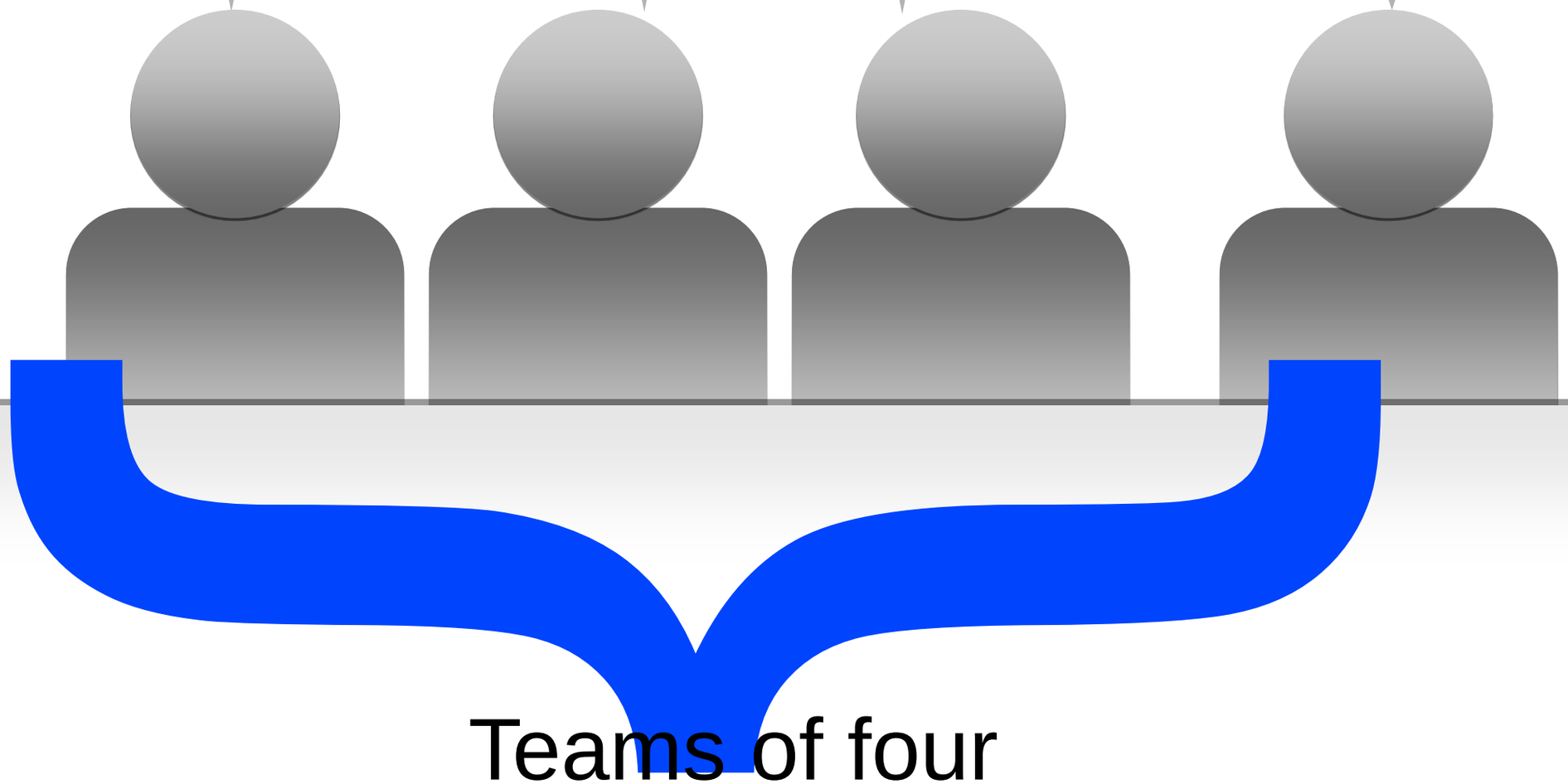
Teams

Manage

Recorder

Presenter

Reflector
Keeps a reflection on the groups progress and performance



Teams of four

Sample Lecture slide

Class Activity: Reactions of alkanes

Group Roles:

Manager: Responsible for keeping group on task and ensuring all members have an input

Recorder: Responsible for recording the **groups** answers on the coloured activity sheets (should sit in the middle of the group)

Presenter: Responsible for asking and answering questions for the group (including clicker questions)

Today's allocation:

Recorder - the person who has their birthday earliest in the year.

Manager- the person to the right of the recorder

Presenter - the person to the left of the recorder

Clicker question in 5 minutes

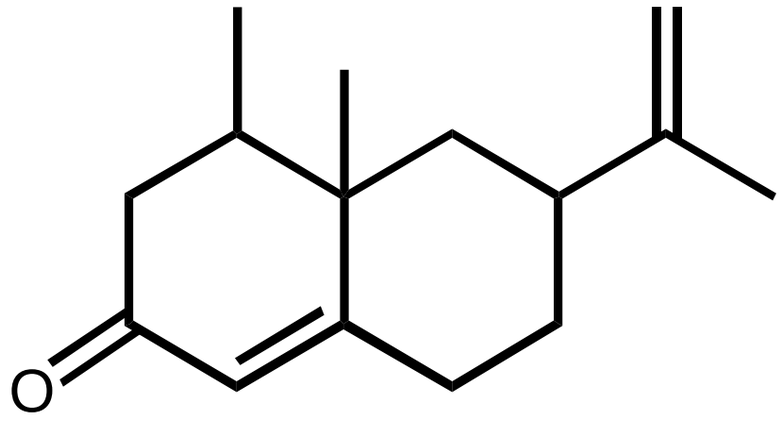
Clickers

- Audience response system
  - Allows immediate feedback
  - Revision of previous lecture's concepts
  - Can easily monitor progress
  - Useful teaching tool
  - Can be used for assessment

Sample clicker question

Highlights of last lecture

What is the number of stereocentres in nootkatone (grapefruit oil) shown below?

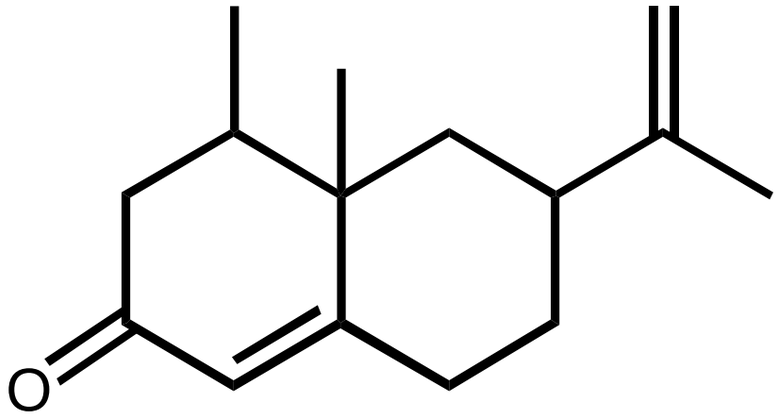


1. none
2. one
3. two
4. three
5. four
6. five

Feedback clicker question

Highlights of last lecture

What is the number of stereocentres in nootkatone (grapefruit oil) shown below?



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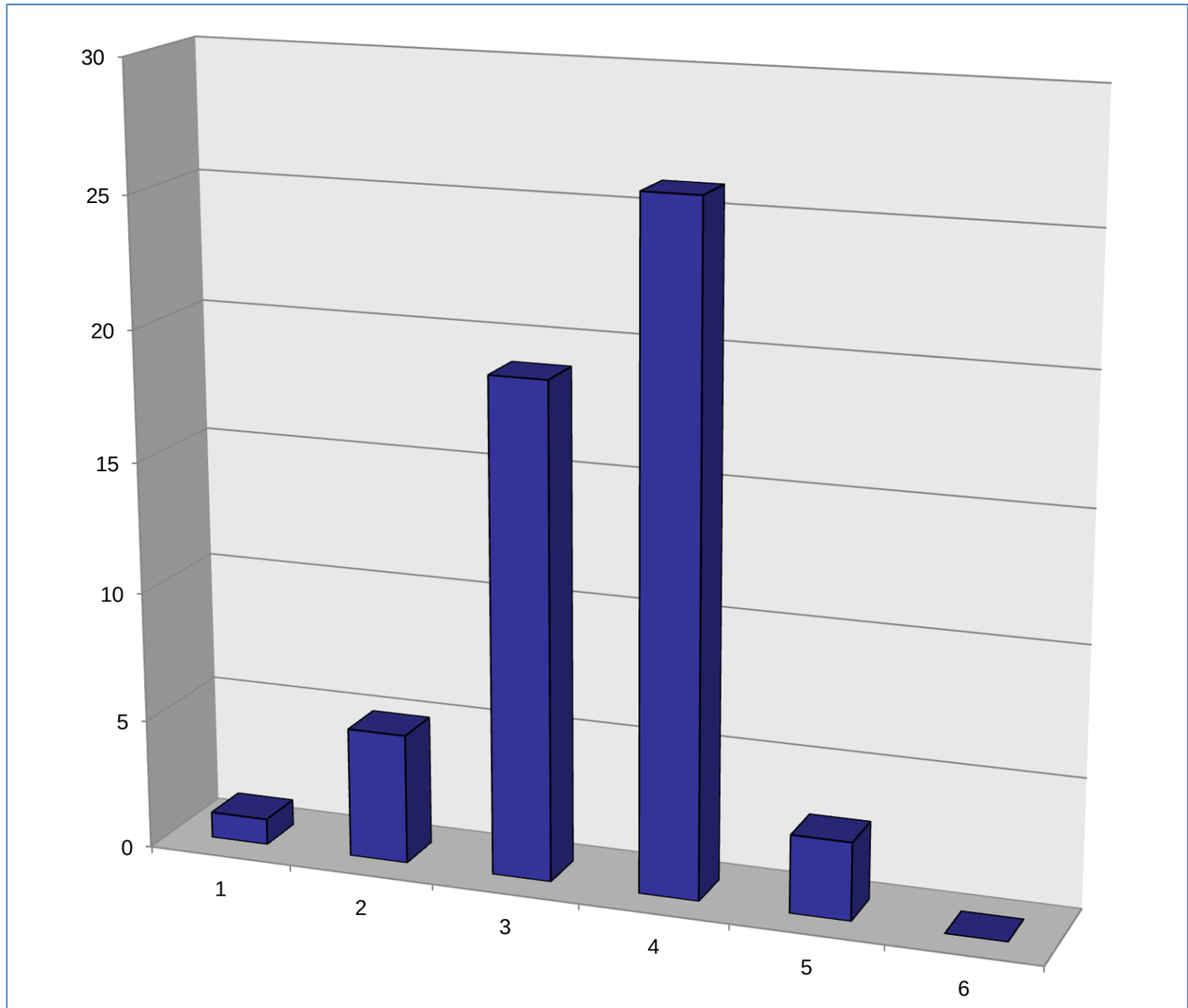
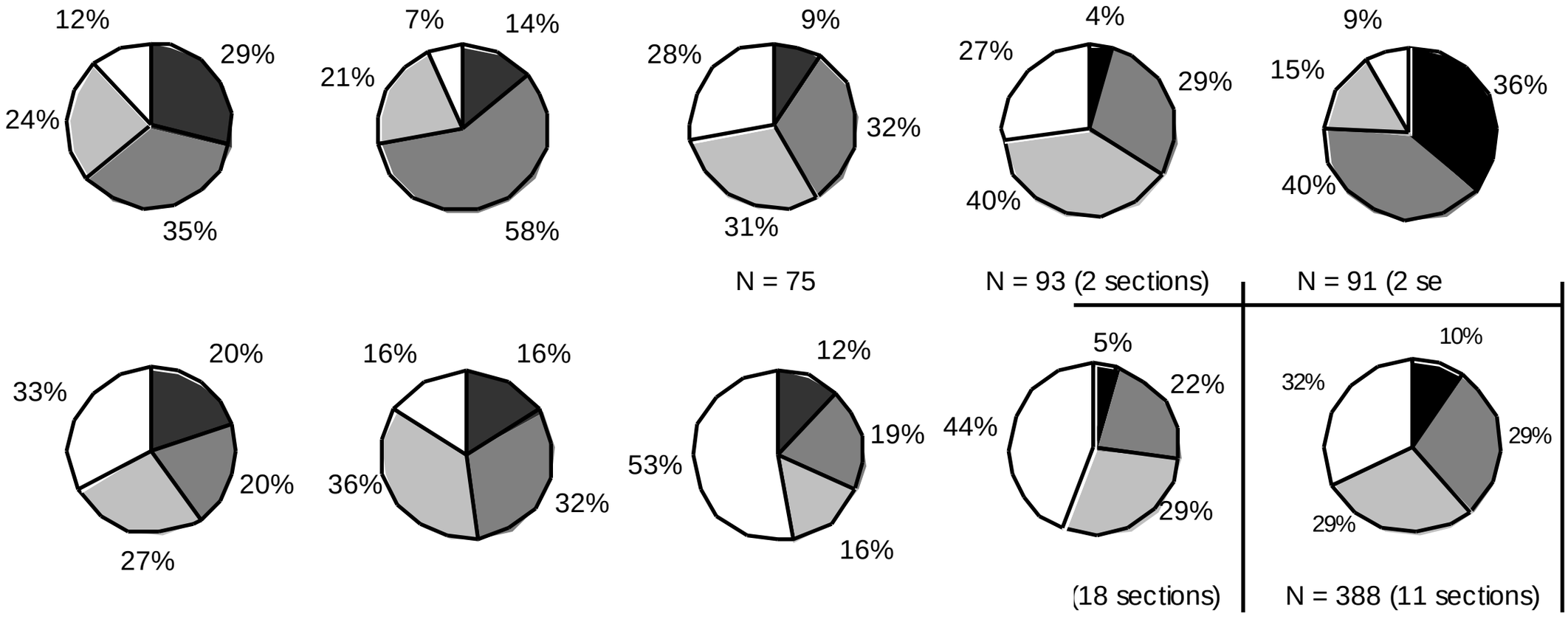


Outcomes C101 & C102

- Class attendance is improved
- Improvement in some traditionally poor areas
  - MO theory
  - Coordination chemistry
  - Mechanisms and use of curved arrows
- Student feedback is very positive

Outcomes - US data

- Common exam data



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