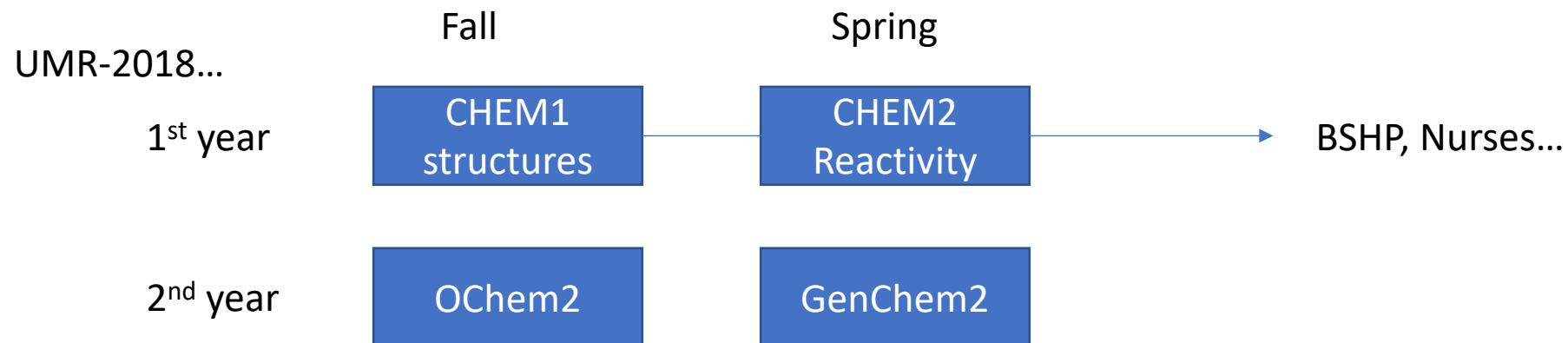
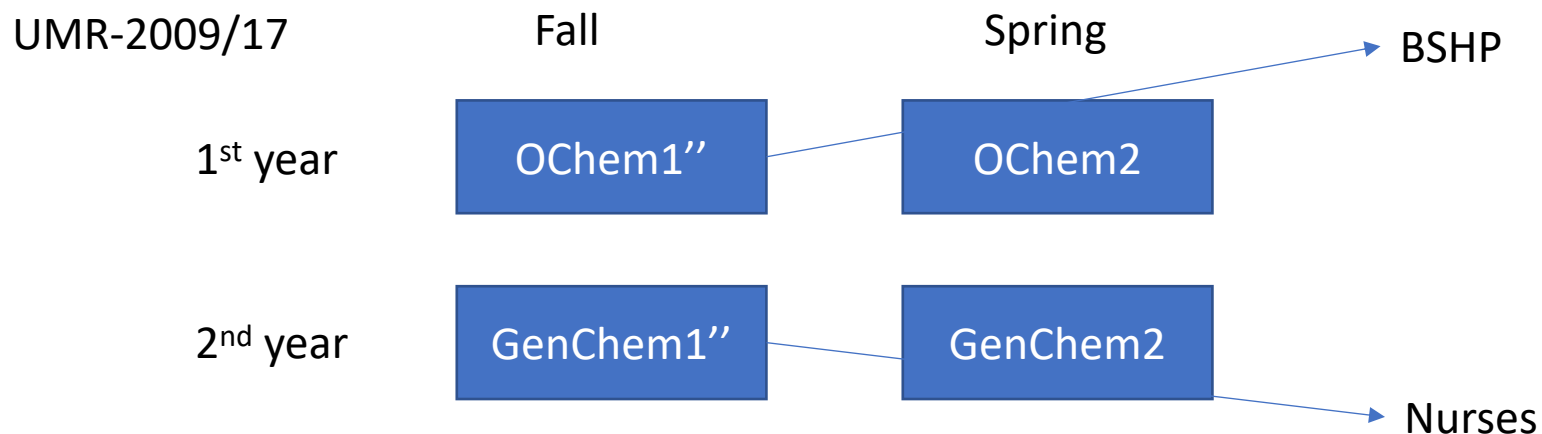
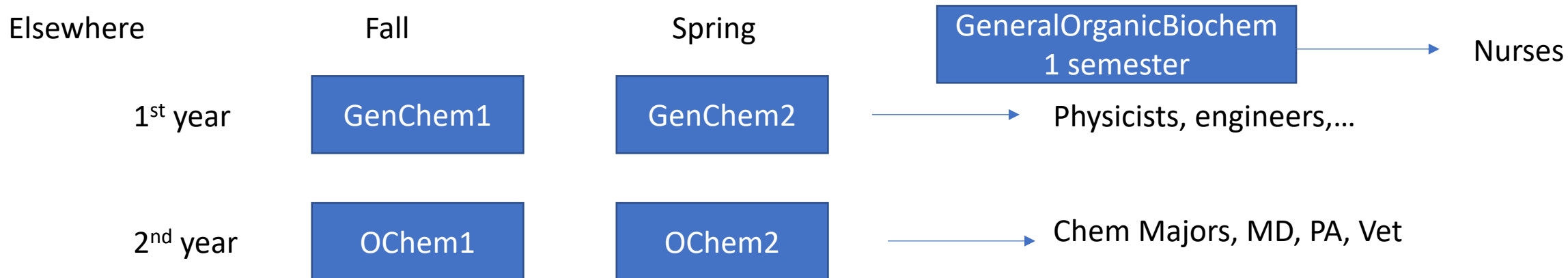
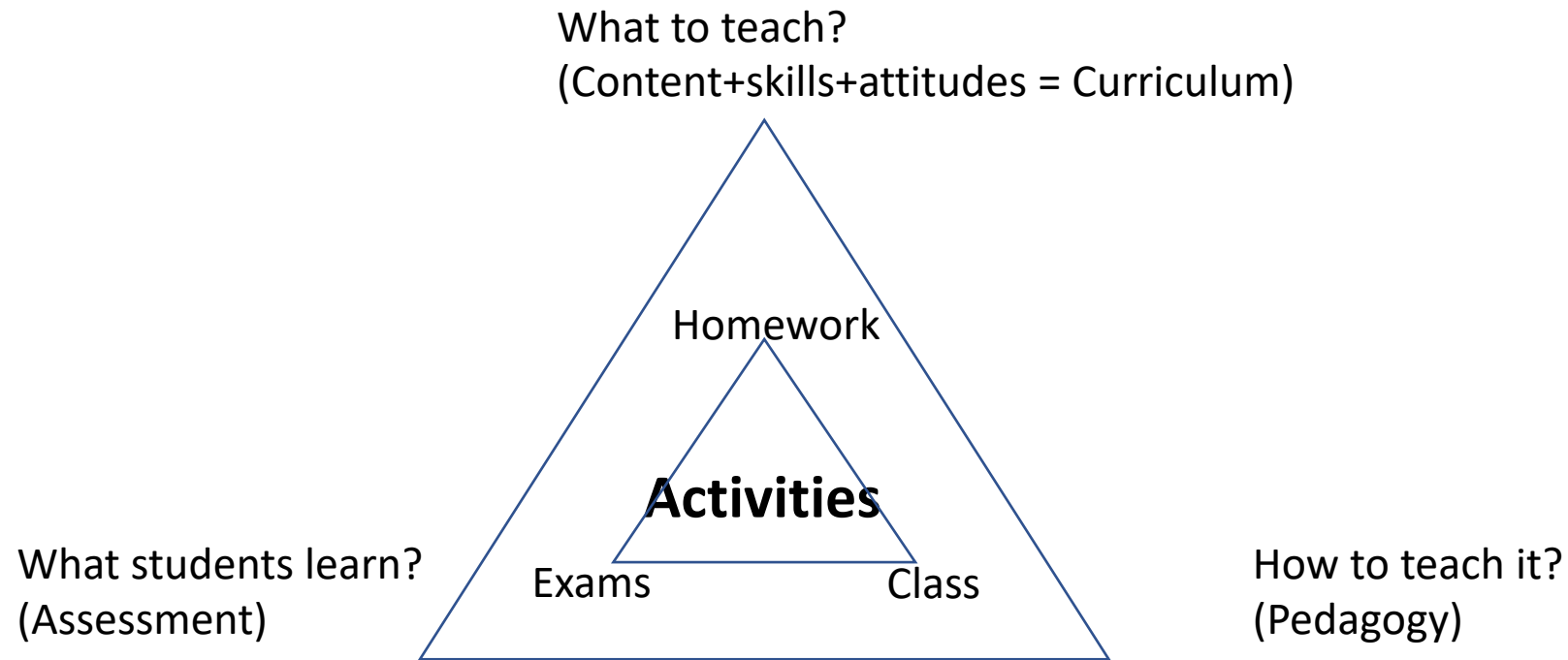


Implementation of the New Chemistry Curriculum

...looking for ways to identify interventions that “work”



The triangles of curriculum design



The big changes: The sequence

- <https://sites.google.com/r.umn.edu/chemistry-at-umr>

General Chemistry 1

SI units
Dimensional analysis
Atoms, Moles and Mass
Stoichiometry Calculations
Ideal Gases
Theory of light and electronic structure
Periodic Table
Chemical bond: Lewis structures
Molecular orbital theory
Intermolecular forces and phase change
Solutions: properties and preparation

General Chemistry 2

Chem. Kinetics: Descriptive concepts
Chem. Kinetics: Integrated rate laws and Arrhenius
Thermodynamics: Descriptive concepts
Thermodynamics: Hess law and quantitative equil.
Quantitative Equilibrium
Electrochemistry
Acid/Base: Reactions, K_a , K_b and approximate pH.
Acid/Base: Titrations, buffers and ICE tables.
Precipitation Equilibria
Metallic Complexes: Bonding and Equilibria

CHEM1	Atoms and Moles	Mass spectrometry
	Theory of light and electronic structure	
	Periodic Table	
	Chemical bond: Lewis structures. Hybridization	
	Functional groups. Overview of conformation.	
	Introduction to IR and NMR spectroscopy	
	Intermolecular forces and phase change	
	Solutions: properties and preparation	
CHEM2	Chem. Kinetics: Descriptive concepts	
	Conformational analysis	
	Thermodynamics: Descriptive concepts	
	Acid/Base: Reactions, K_a , K_b and approximate pH.	
	Stereochemistry	
	Nucleophilic Substitutions	
	Addition to alkenes	
CHEM3	Conjugation and Ultraviolet spectroscopy	
	Aromaticity and Aromatic substitution	
	Alcohols and Ethers	
	Carbonyl Reactivity	
	Carboxylic and acyl derivatives	
	Amines and Heterocycles	
CHEM4	Kinetics theory of gases. Ideal gas models.	
	Chem. Kinetics: Integrated rate laws and Arrhenius	
	Quantitative Thermodynamics	
	Stoichiometry and quantitative equilibrium	
	Electrochemistry	
	Acid/Base: Titrations, buffers and ICE tables.	
	Metallic Complexes: Bonding and Equilibria	

Data Visualization

Algebra

Calculus

Organic Chemistry 1

Bonding: Hybrid orbitals.
Resonance.
Acid/Base and polarity
Functional groups. Overview
Alkanes
Conformation of alkyl chains
Cycloalkanes
Alkenes and alkynes: structure
Alkenes and Alkynes reactivity.
Stereochemistry
Nucleophilic substitution.

Organic Chemistry 2

Mass spectrometry
Infrared spectroscopy (IR)
Nuclear magnetic resonance (NMR)
Conjugation and Ultraviolet spectroscopy
Aromaticity and Aromatic substitution
Alcohols and Ethers
Carbonyl reactivity
Carboxylic acid and acyl derivatives
Amines and Heterocycles

Implemented Interventions

- High Impact Practices (active learning et al)
 - Preclass:
 - Homemade videos
 - Submit a picture of preclass answers as attendance – write them on paper (emphasis on paper)
 - Analytics on watching videos – who's engaged?
 - During class: accountability vs comfortable environment
 - They are not assessed during class. (Low stakes)
 - But I give them a paper copy of activities so that it is easier to be engaged
 - We solve them together / some accountability - Table lottery
 - After class:
 - Weekly homework. The same questions as in the milestone
- The Grading: Specifications grading – The A/C/F scale
 - Laboratory
 - Preclass + Attendance
 - Milestones
- Splitting examinations between Milestones (low-level, memorize questions) and Science practices (high-level, open ended problems)
- Curriculum Sequence – The content
 - Postponing the quantitative thinking and focusing on the Drawing-Representing-Explaining

Assessment?

- Are students learning the same as elsewhere?
 - ACS exams: nation wide accepted tool for majoring in chemistry.
It would tell us that at least we are not damaging and
- Identifying what works
 - Will the new sequence help make connections?
 - Will milestones help them retain basic topics?
 - Is watching videos related to performance?

How is grade calculated

- Written exams: 3 semester (20%) + 1 final exam (10%)
 - Drop the lowest score during the semester
- Milestones 30% graded on A/C/F scale
 - Three attempts
- Attendance 10% graded on A/C/F scale
- Laboratory 20%
- Online Homework – every Thursday
 - 5 attempts – Drop the lowest score