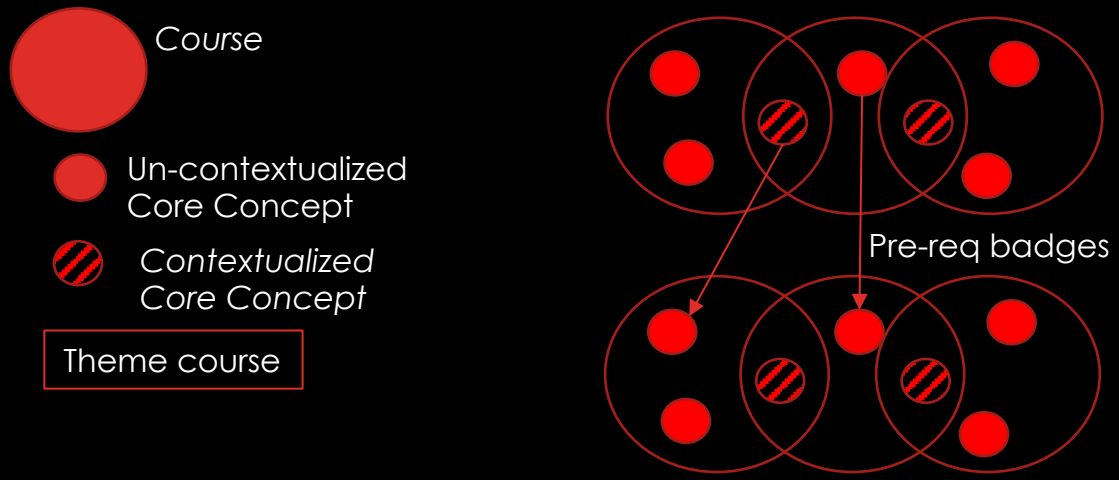
PRINCIPLES FOR ACADEMIC INNOVATION AT UMR

Using evidence-based methods to align pedagogical practices, curriculum design and assessment of learning.

Xavier, on a sunny day of June

1 SLIDE



1st year

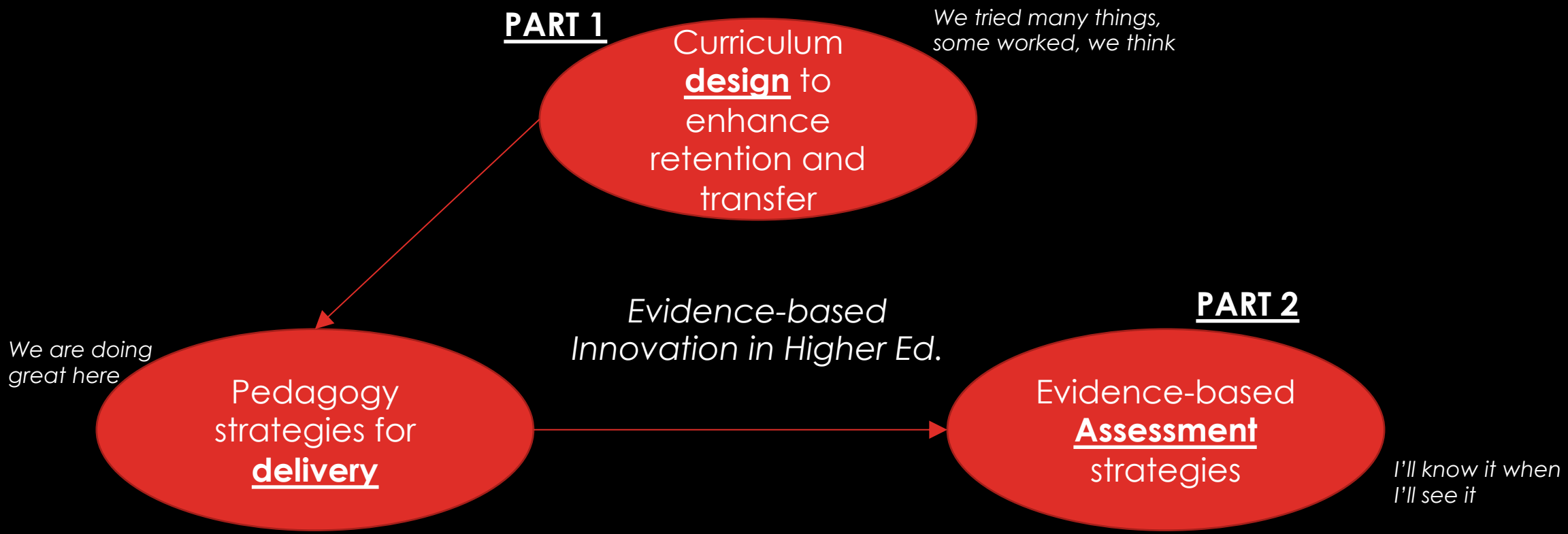
2nd year

A rigid first two years. With transferable single courses. Keeping track of badges for concept and skill mastery, as evidence of learning

3rd and 4th year students pick semester-long themes course (+capstone)

- Natural Sciences
- Public Health and environment
- Psychology and human behavior
- History and literature of health

CURRENT STATUS OF LEARNING INNOVATION AT UMR



The three components of learning innovation (design, delivery, and assessment) must be aligned and supported by evidence.

PART 1: CURRICULUM DESIGN

Main Thesis: Not all introductory courses can be blended into a single topic-based course. Pre-requisites are necessary and would take too long to cover in one topic-based course.
I advocate for a system of pre-requisite concepts and skills (instead of courses) leading to a system of badges (parallel to a regular transcript) that at the same time are acquired by showing evidence of learning.

A continuum of blendedness

Independent courses as usual

Easier Course Transfer

Easier Integration

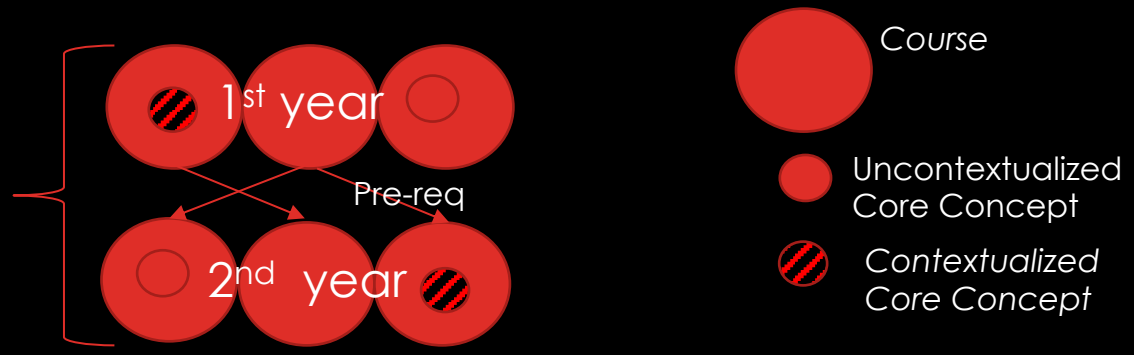
Un-blend-able "concept" as pre-requisite

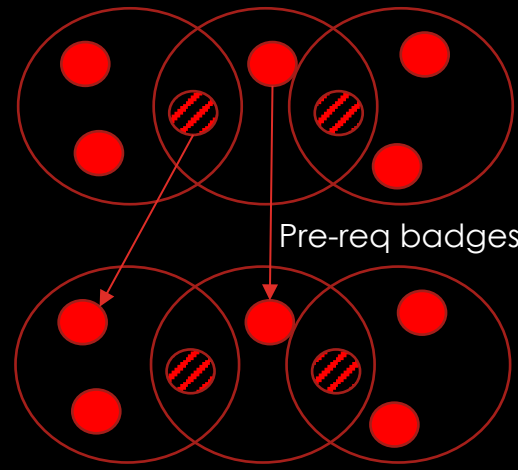
Disciplines with threshold or core concepts that must be learned without context

Core concept based integration

Not all courses can be blended

Full blended courses: à la Evergreen





1st year

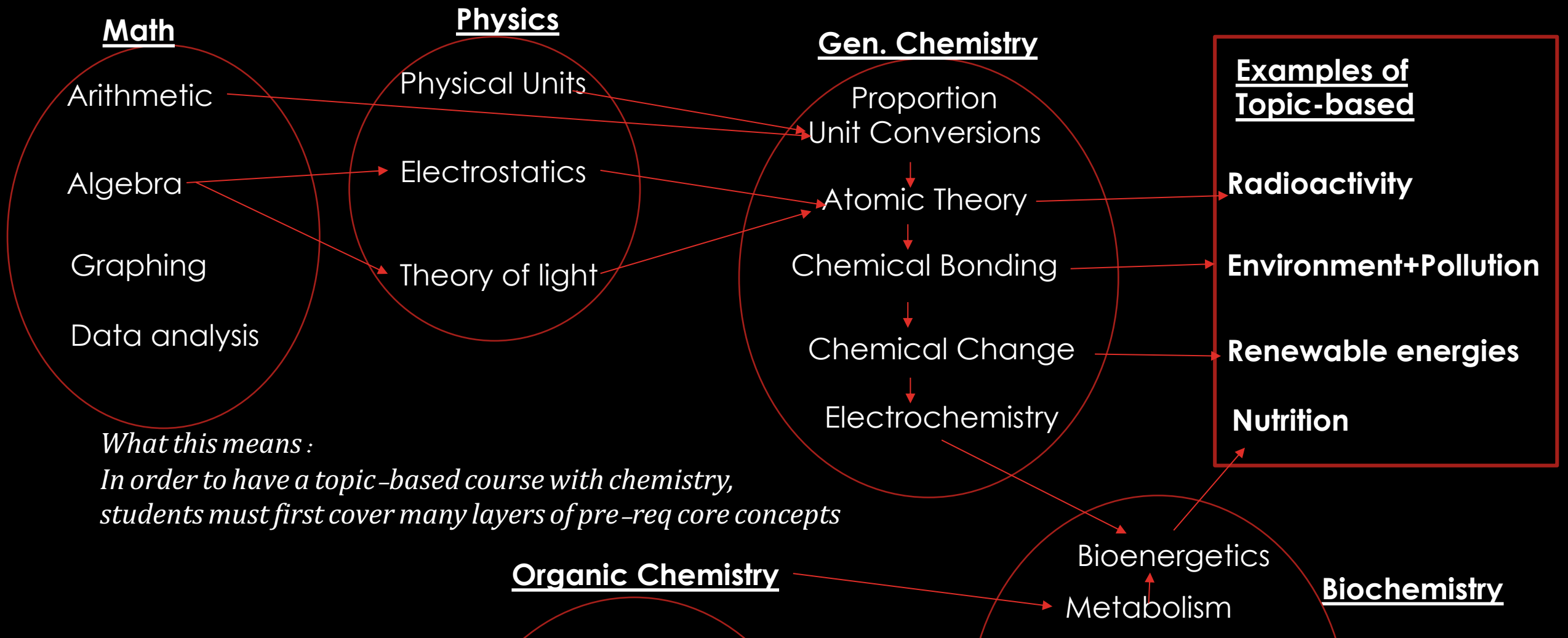
2nd year

3rd year: most core concepts are now covered and courses can now be blended further

I am a topic-based fully integrated untransferable 15 credit monster — 1st year

I am a topic-based fully integrated untransferable 15 credit monster — 2nd year

EXAMPLE OF "TOPIC-BASED COURSE" THAT COVERS CHEMISTRY



What this means :
In order to have a topic-based course with chemistry, students must first cover many layers of pre-req core concepts

PART 2: ASSESSMENT ALIGNED WITH CURRICULUM DESIGN AND PEDAGOGICAL PRACTICES

THE NEXT GENERATION OF SCIENCE STANDARDS (NGSS)

- Building scaffolded curricula around progressions of the following
  - Scientific practices
  - Cross-cutting concepts
  - Disciplinary core concepts

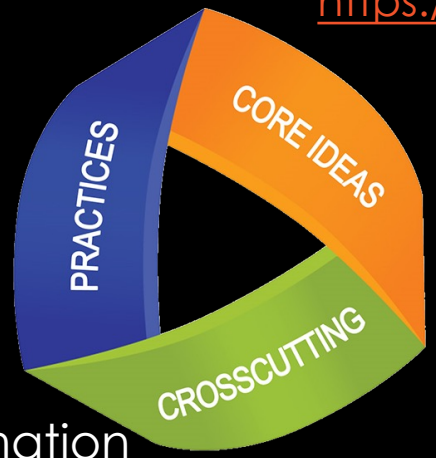
- Basic principle: the three dimensions of learning must be practiced at the same time, as it allows the learner to deepen the knowledge (core concepts) by practicing (science practices) and integrating it with other courses (cross-cutting concepts)

The Framework by National research council (2012): http://nap.edu/catalog/13165
NGSS (2013): https://www.nap.edu/catalog/18290/next-generation-science-standards-for-states-by-states

Biology, Chemistry, Physics and Math core ideas
https://doi.org/10.1371/journal.pone.0162333.s002

Scientific Practices

Asking Questions
Developing and Using Models
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Using Mathematics and Computational Thinking
Constructing Explanations
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information



Crosscutting concepts

Patterns
Cause and Effect: Mechanism and Explanation
Scale
Proportion and Quantity
Systems and System Models
Energy and Matter: Flows, Cycles, and Conservation
Structure and Function
Stability and Change

USING BADGES AND MODULES FOR AN INTEGRATED CURRICULUM

1. Use three-dimensional activities for student summative assessment.
    1. Implementing these kinds of assessment it makes it easier to establish a system of badges
2. Use curriculum gradebook that contains badges (or any other name) for signs of accomplishment and skills
    - Identify crosscutting concepts and science practices, make cumulative badges (intro level, familiar, competent, expert)
    - We need practices for the social sciences and humanities
    - Identify "disciplinary core ideas" or "anchoring concepts" or "threshold concepts", make badges as pre-requisites to modularize our curriculum.
3. Modularize some courses to help establish a more detailed pre-req.
    1. Use J-term for students to catch up with necessary core concepts?