

# A Comprehensive Reaction Map For Undergraduate Organic Chemistry

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Online information available at <http://caknudtson.weebly.com/org-chem-lecture.html>

- Hydrocarbons
- Aromatics
- Halides
- Oxygen
- Nitrogen
- Sulfur
- Carbonyls
- Enolates

## Abstract

Concept maps are excellent tools in science education. They provide a visual guide of how organize information and emphasize interconnections between concepts. Reaction maps can be considered an analogous tool in their use as graphical examples for organizing synthetic transformations. A comprehensive reaction map for teaching reactions in an undergraduate organic chemistry course is described.

This teaching device incorporated a comprehensive list of reactions from an undergraduate course into a single resource, diagramming the transformations between functional groups across multiple chapters of the class. Individual units of the course were differentiated on the map by color-coding the functional groups. The reaction map was displayed in an area accessible to students and utilized as a component of a multi-modal education strategy. The reaction map provided both a visual and physical learning experience for students; their interactions with it included taking pictures, copying individual sections for study, and tracing pathways in order to solve multi-step synthesis problems. Students expressed that using the reaction map as a study aid was useful in improving understanding and recollection of course material.

## Learning via a Reaction Map

- Deriving chapter based maps
  - Identify chapter-relevant sections of reaction map
  - Copy and reorganize information
    - Both from comprehensive map and memory
    - Add attentional linkages, concepts, and qualifiers
- A tool for solving syntheses
  - Direct functional groups transformations
  - Trace from starting material to product
  - Multiple functional groups transformations
  - Find relevant functional group transformations
- Developing pattern recognition
  - Learn through sequential levels of complexity
  - Recognition of theme and variation

## Student Response

- Students' interactions with map as a learning tool
  - Taking photos
  - Copying reaction map
    - Directly from map
    - From memory
  - Tracing map during problem solving
- Students' reaction towards map
  - Enthusiastic attitude to reaction map as learning tool
  - "It re-wires my brain"
    - Indication of conceptual framework development
  - Tracing answers during exam
    - Indication of visual-tactile learning

