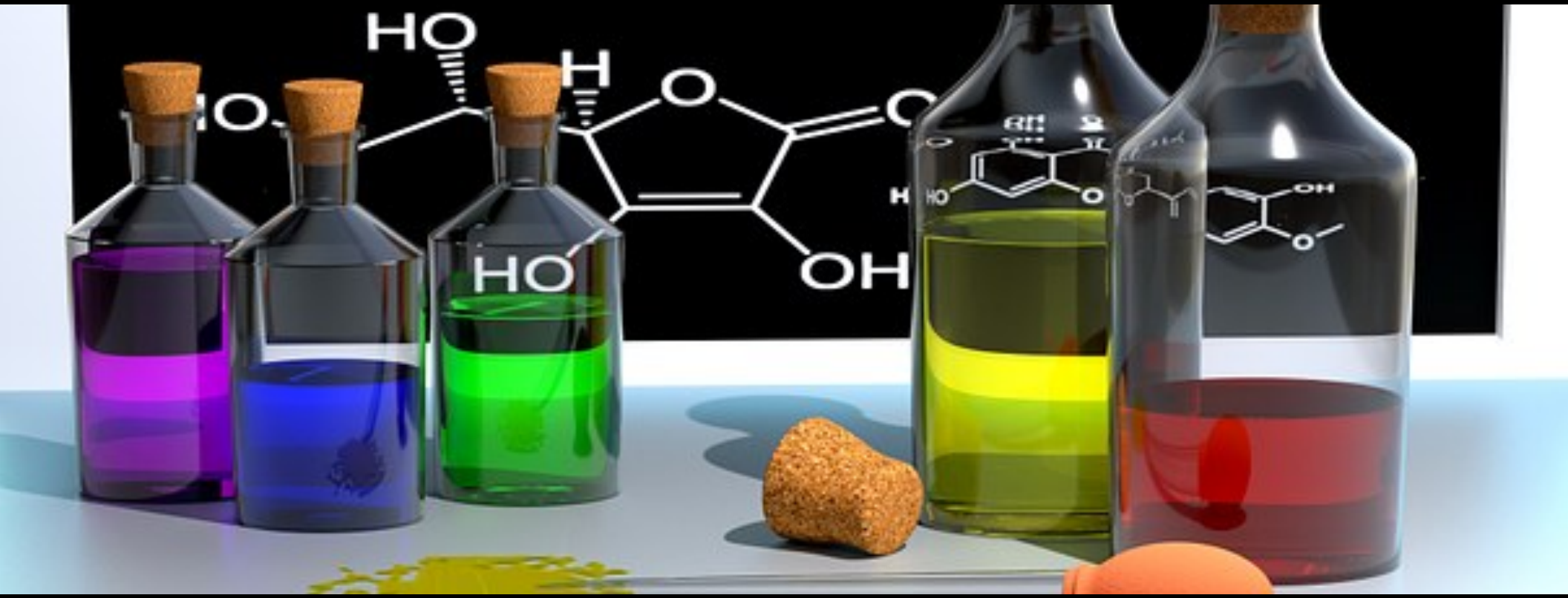

Universal Design in Chemistry for Neurodivergent Learners

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Neurodivergent students come in many forms …..

Neurodivergent Learners in College

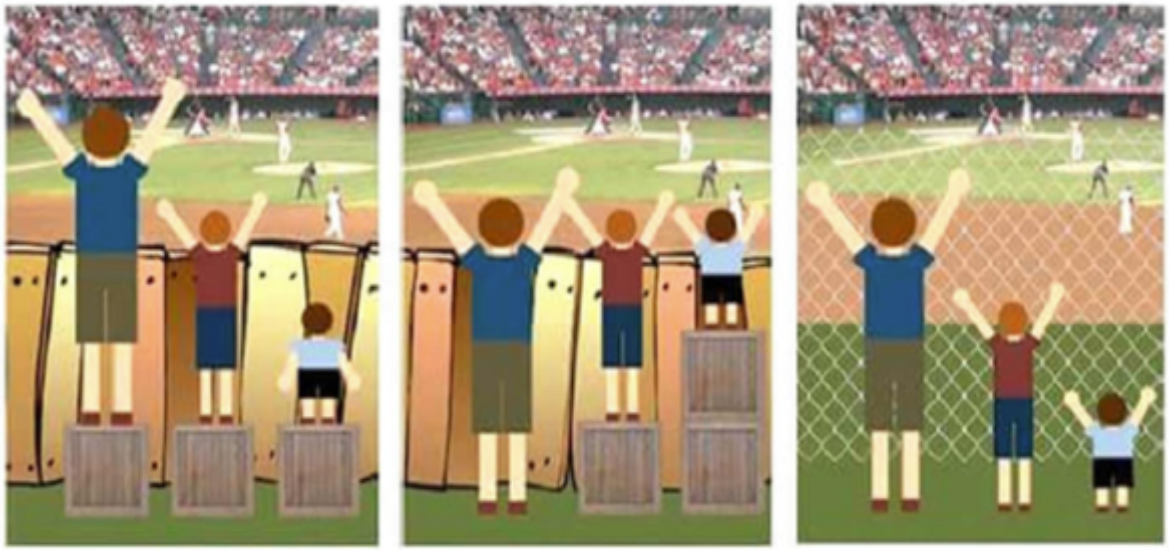
Number of undergraduate **students with disabilities is 11.1 percent** (NCES, 2011-12)

While 94 % of high school students with LD get help in school, only **17% do so in college** (Hechinger Report, 2014; State of LD, 2017)

Fastest growing population of neurodivergent students is **Autism** and those with **Psychiatric disorders**

Universal Design for Learning (UDL)

- **Maximum usability for the largest number** (Ron Mace)
- **Environment is engineered to be inclusive from the start, of diverse learner needs**



Equal, static instruction. (c.f. "Traditional Instruction")

Equitable, support based on student need. (c.f. "accommodations and modifications")

Flexible learning experiences, such that variable learners have access. (c.f. UDL)

Embracing Universal Design

Principles of UDL (www.cast.org)

- Multiple Means of **Representation**
- Multiple Means of **Action and Engagement**
- Multiple Means of **Expression**

User as Designer

Adopting the UD mindset

"UDL in the Classroom"

examples of each of the 3 principles

Presentation:

- PowerPoint presentations with audio, video, notes, etc.
- Teacher created blogs
- Electronic text with text to speech (to read aloud)
- Podcasts Graphic Organizers multimedia books

Engagement:

- Guided notes skits models concept maps
- Podcast series online discussions

Expression:

- Rubrics online quizzes/ activities
- graphic organizer programs tiered assessments
- Podcast series blog entries web sites
- PowerPoint presentations portfolios

- **Can you think of any more possibilities?**

Universal Design in the Classroom

UDL and Students with Learning and Attention Issues

- Avoid extensive text-based information
- Too many visuals can be distracting for ADHD
- Videos are not the best medium for many students with LD *(Schnepps, 2015)*
- ADA accommodations are about access, not academic success

Research suggests that teaching to someone's "learning style" does not necessarily improve performance

(Cuevas, J; 2015)

Example of a non-UDL Syllabus

- **University and Course Title & Instructor Information**
- **Required Text:** Science of Cooking. Understanding the Biology and Chemistry Behind Food and Cooking. **ISBN**: 978-1-118-67420-8
- **Overview:** The Science of Cooking: Understanding the Biology and Chemistry Behind Food and Cooking aims to serve science instructors and students through a topic that is approachable and relevant to everyone. Through the topic of food and cooking, fundamental principles of biology and chemistry can be taught to and learned by a broad population of undergraduate students. While this textbook is targeted for nonscience majors, it can also serve as a resource for a topics course for majors in biology, biochemistry or chemistry programs.
- **Course Learning Objectives:** The overall course learning objective for The Science of Cooking: Understanding the Biology and Chemistry Behind Food and Cooking is to enhance student understanding of fundamental scientific principles of biology and chemistry as well as the science of food and cooking. Students will learn and use methods of scientific discovery / inquiry, as well as disciplinary methods of chemistry, biology, and physics, to better understand the molecular basis of and importance of science in food, nutrition and cooking. Students will collect data from their laboratory problems to interpret and report their hypothesis and observations. As students do this, they will understand major scientific theories of biochemistry, chemistry and biology.

Suggestion: Reduce text; use bullets; white space, but not color

Universal Design for Science Labs

- Provide both written and verbal instructions. Give verbal and visual descriptions of demonstrations.
- Use plastic instead of glass. Provide surgical gloves for handling wet or slippery items.
- Allow extra time for set up and completion of lab work.
- Address safety procedures for students with a variety of sensory and mobility abilities, including the provision of visual lab warning signals.
- Make laboratory signs and equipment labels in large print, with high c
- Ensure that field sites are wheelchair accessible.
- Incorporate an adjustable-height work surface for at least one workstation.
- Use lever controls instead of knobs.
- Ensure that utility and equipment controls are within easy reach from a standing or seated position.

Burgstahler, S., 2012; https://www.washington.edu/doit/making-science-labs-accessible-students-disabilities – DO IT

“User As Designer” in Universal Design

You, as the faculty member decide how and how much scaffolding to include in your course.

In designing your course materials, lab projects, assignments, quizzes and tests, consider design that:

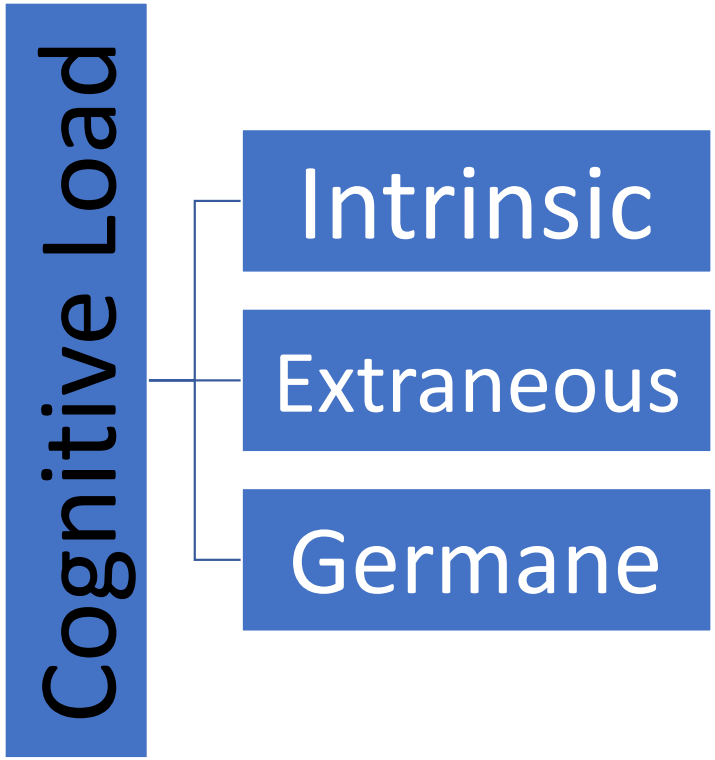
- Reduces **cognitive load**
- Facilitates **recall and memory**
- Activates **prior knowledge**
- Includes **accessible technologies**

Reducing Cognitive Load

- **Cognitive load** refers to the total amount of mental effort being used in working memory. (Sweller, 2010)
- **Lower order and higher order processes compete for cognitive working space**

Reducing Cognitive Load

Each of the cognitive loads are additive, and instructional design's goal should be to reduce extraneous cognitive load to free up working memory



Cognitive Load, Working Memory, Prior Knowledge

- Advance organizers – KWL
- Repetition
- Clear directions
- Asking for and giving feedback
- Varied definition of success
- Differentiated Instruction
  - *Grading rubrics*
  - *Readability level*
  - *Assignment options*

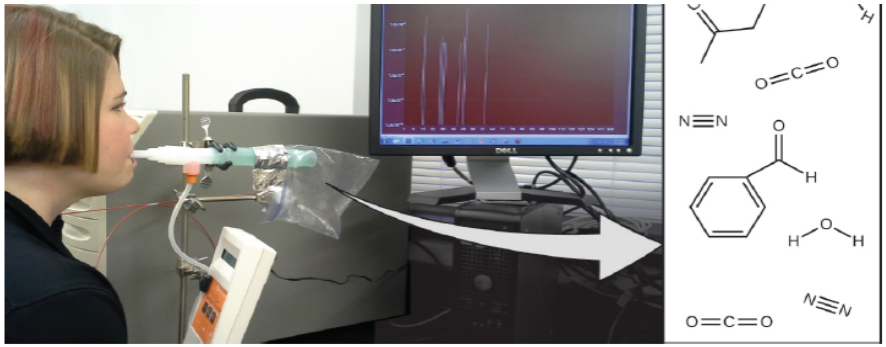


Figure 2.1 Analysis of molecules in an exhaled breath can provide valuable information, leading to early diagnosis of diseases or detection of environmental exposure to harmful substances. (credit: modification of work by Paul Flowers)

Chapter Outline

2.1 Early Ideas in Atomic Theory
2.2 Evolution of Atomic Theory
2.3 Atomic Structure and Symbolism
2.4 Chemical Formulas
2.5 The Periodic Table
2.6 Molecular and Ionic Compounds
2.7 Chemical Nomenclature

Introduction

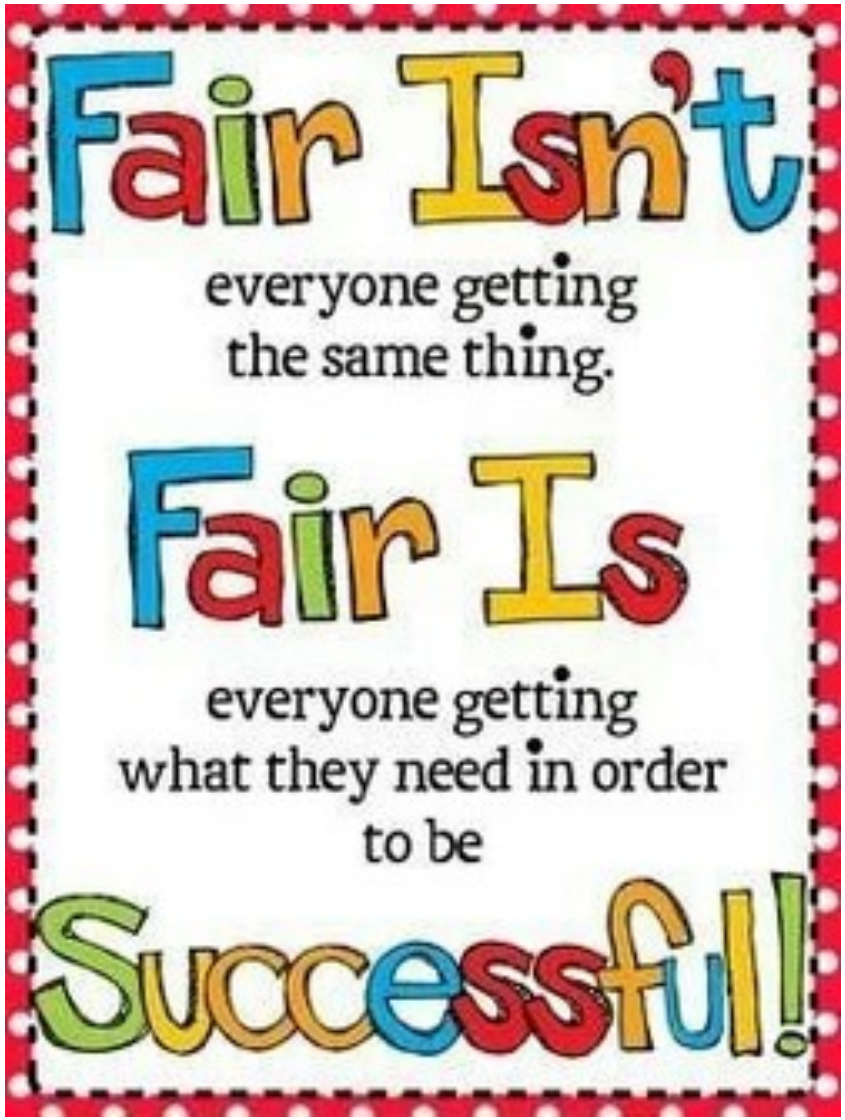
Your overall health and susceptibility to disease depends upon the complex interaction between your genetic makeup and environmental exposure, with the outcome difficult to predict. Early detection of biomarkers, substances that indicate an organism's disease or physiological state, could allow diagnosis and treatment before a condition becomes serious or irreversible. Recent studies have shown that your exhaled breath can contain molecules that may be biomarkers for recent exposure to environmental contaminants or for pathological conditions ranging from asthma to lung cancer. Scientists are working to develop biomarker "fingerprints" that could be used to diagnose a specific disease based on the amounts and identities of certain molecules in a patient's exhaled breath. An essential concept underlying this goal is that of a molecule's identity, which is determined by the numbers and types of atoms it contains, and how they are bonded together. This chapter will describe some of the fundamental chemical principles related to the composition of matter, including those central to the concept of molecular identity.

DEMO

file:///C:/Users/manjubanerjee/OneDrive%20-%20Landmark%20College/Chemistry/Chemistry-OP_XdqVZpQ.pdf

What is the UD Mindset?

- An **inclusive approach** to instruction and instructional pedagogies
- Is anchored in **student success**
- Is **more than** just **accessibility and accommodations**
- Understanding that UD does not mean "**watering down**" the curriculum or learning expectations
- **Not a check-list** of to-do items
- Proactive planning of course **planning, delivery, and assessment**
- Realizing that UD supports neurodivergent learners, but ends up **benefitting ALL students**


Fair Isn't
everyone getting
the same thing.
Fair Is
everyone getting
what they need in order
to be
Successful!