

# Authentic Assessment in STEM courses

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California  
Community  
Colleges

California  
Virtual Campus

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- Creative Commons Certificate Facilitator

# Outcomes

1. Identify confounding variables for fixed assessments.
2. Discuss examples of adaptable assessments.
3. Design assessments that are adaptable, accurate and authentic using the [Designing Adaptable Assessments Worksheet](#)

# Warm-up

What is the purpose of assessment?



# Assessments

Assessments can be used for:

- Measurement
- Learning
- Collaboration

Creating assessments that are:

- Adaptable
- Accurate

# Our goals for this section

- Compare and contrast fixed and authentic assessments
  - Lower-level Outcomes
  - Higher-level Outcomes

# Learning Outcome 1

Define and group  
terms

- Peptide Bond
- Lactose
- Cholesterol
- Wax
- Polysaccharide
- Nucleotide
- Cellulose
- Nitrogenous base
- Monosaccharide
- Triglyceride
- Glucose
- Amino acid
- Disaccharide
- Fatty Acid
- Deoxyribose
- Chitin
- Phospholipid
- Ribose
- Lipid
- Protein

## Tests:

### Traditional Assessment

What are some confounding variables for this assessment?

Which relationship is different?

- A. Phospholipid / Lipid
- B. Amino Acid / Protein
- C. Monosaccharide / Polysaccharide
- D. Monosaccharide / Disaccharide



# The alternative

- Clearly identify the learning outcome
- Provide a clear and detailed rubric
- Let students select the strategy for demonstrating knowledge

# Student Approach: Outlines

**Carbohydrate:** (Sugars, disaccharide, monosaccharide's, polysaccharides) Store energy and maintain cell structure. They are non-polar and are insoluble in water. They are hydrophobic.

**Monosaccharide:** Simple sugar

**Polysaccharide:** When numerous monosaccharide's are joined together.

**Disaccharide:** double sugar, two monosaccharide's connected.

**Glycogen:** starch in plants

**Chitin:** Polysaccharide N- acetylglucosamine

**Starch:** Plant product formed together by bonding together thousand of glucose.

**Cellulose:** produced by plants, it's a polysaccharide of glucose.

**Glucose:** the most abundant monosaccharide in nature. It is the sugar molecule the body uses to create energy, and it is the fuel used by brain cells.

# Student Approach: Tables

**Carbohydrate:** (Sugars, disaccharide, monosaccharide's, polysaccharides) Store energy and maintain... are hydrophobic.

Monosaccha  
Polysacchar  
Disaccharide  
Glycogen: st  
Chitin: Polys  
Starch: Plant  
Cellulose: pr  
Glucose: the  
the body uses

Sugars	Deoxyribose, fructose, glucose, lactose, ribose, sucrose
Sugar Identification	Monosaccharides, disaccharides, polysaccharides
Nucleobases	Adenine, cytosine, guanine, thymine
Nucleic Acid	Deoxyribonucleic acid, nucleotide, nitrogenous base, ribonucleic acid
Cell essentials	Cellulose, protein, cholesterol, chitin
Fats	fatty acids, glycerol, lipids, phospholipid, steroid, triglyceride, waxes
Storage	Carbohydrates, glycogen, starch
Reactions	Amino acids, Enzymes,
Chemical Identification	Peptide bond, saturated, unsaturated

# Student Approach: Online Flashcards

Carbohydrate: (Sup...  
energy and mainta...  
are hydrophobic.

Monosacc...  
Polysacch...  
Disacchar...  
Glycogen: ...  
Chitin: Pol...  
Starch: Pla...  
Cellulose: ...  
Glucose: t...  
the body us...

### Functions of Cell Structures

Remaining: 8   Correct: 1   Wrong: 3

8%   07:45.0   Quit

Chloroplast	Photosynthesis
Cytoskeleton	Protein synthesis
Cytosol	cellular respiration and ATP production
DNA	control calcium release and muscle contractions, and breakdown toxins in liver
Golgi apparatus	digestive function in plant cells
Mitochondrion	directs synthesis of ribosomes and proteins, houses DNA
Nucleus	distributes lipids and proteins after modifying, sorting, tagging, and packaging them
Plasma membrane	genetic codes or markers, making everyone unique
Ribosomes	organelles stay in specific positions, lets cytoplasm and vesicles move around in the cell, and unicellular organisms to move independently keeps the shape of the cell
Rough endoplasmic reticulum	
Smooth endoplasmic reticulum	
Vesicle	

sucrose  
se, ribonucleic acid  
triglyceride, waxes

# Student Approach: Handwritten Flashcards

**Carbohydrate:** (Sugars, disaccharide, monosaccharide's, polysaccharides) Store energy and maintain structure. Carbohydrates are hydrophobic.

**Monosaccharide:**

**Polysaccharide:**

**Disaccharide:**

**Glycogen:**

**Chitin:** Poly

**Starch:** Pla

**Cellulose:** p

**Glucose:** th

the body us

Sugars	Deoxyribose, fructose, glucose, lactose, ribose, sucrose
	Disaccharides
	Genous base, ribonucleic acid
	d, steroid, triglyceride, waxes

**Fatty Acid**  
A carboxylic acid consisting of a hydrocarbon chain and a terminal carboxyl group, especially any of those occurring as esters in fats and oils.

**Glycogen**  
A substance deposited in body tissues as a store of carbohydrates. It is a polysaccharide that forms glucose and on hydrolysis.

**Guanine**  
A compound that occurs in guano and fish scales, and is one of four constituent bases of nucleic acids.

**Glycerol**  
A colorless, sweet, viscous liquid formed as a byproduct in soap manufacture. It is used as an emollient and laxative, and for making explosives and antifreeze.

**Lipid**  
A class of nonpolar organic compounds built from hydrocarbons and distinguished by the fact that they are not soluble in water.

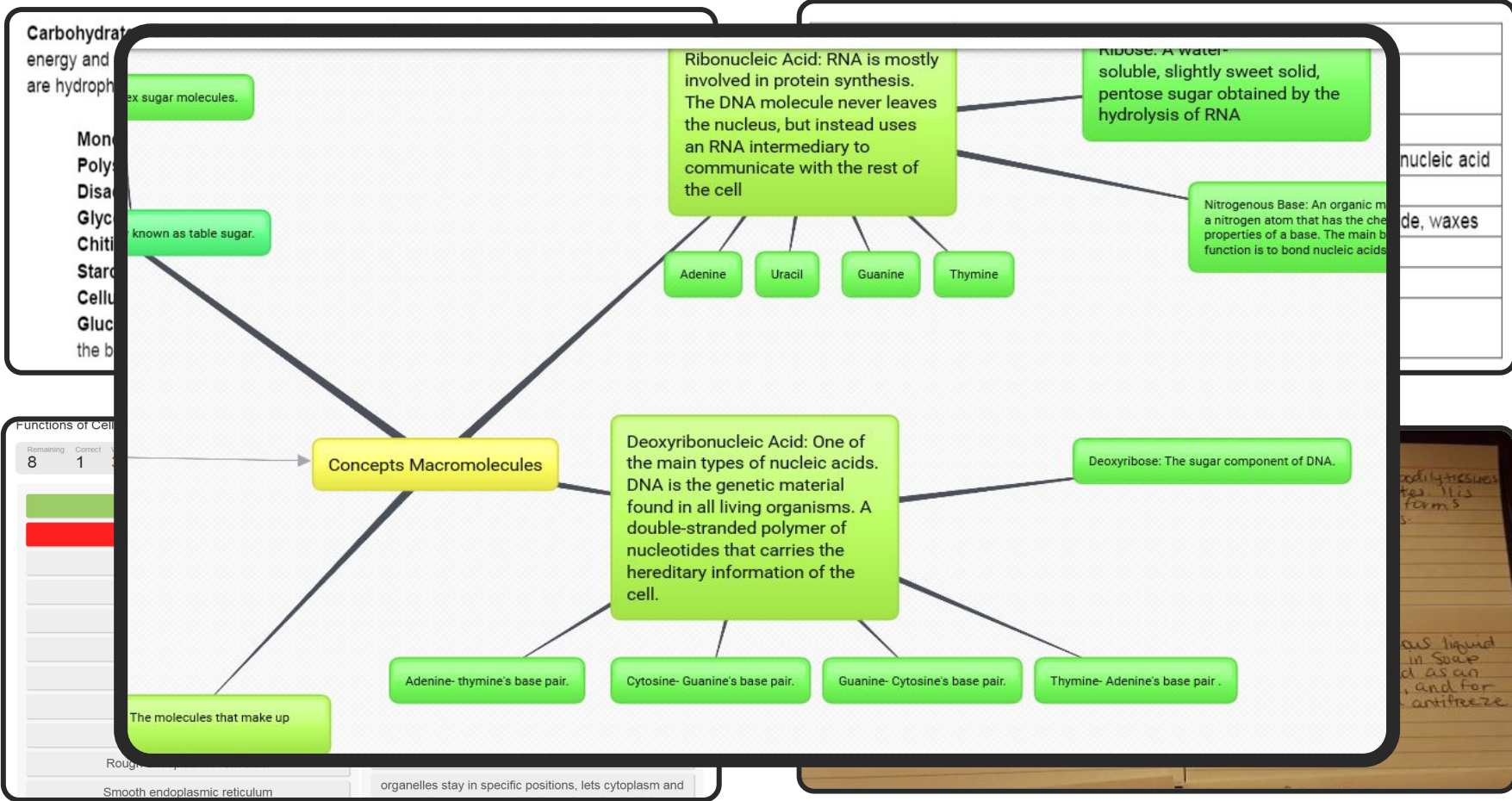
**Glucose**  
A simple sugar that is an important energy source in living organisms and is a component of many carbohydrates.

Functions of Cell Structure

Remaining	Correct	Wrong
8	1	3

- Chloroplast
- Centriole
- Cell wall
- Cell membrane
- Golgi apparatus
- Mitochondrion
- Plasma membrane
- Rough endoplasmic reticulum
- Smooth endoplasmic reticulum

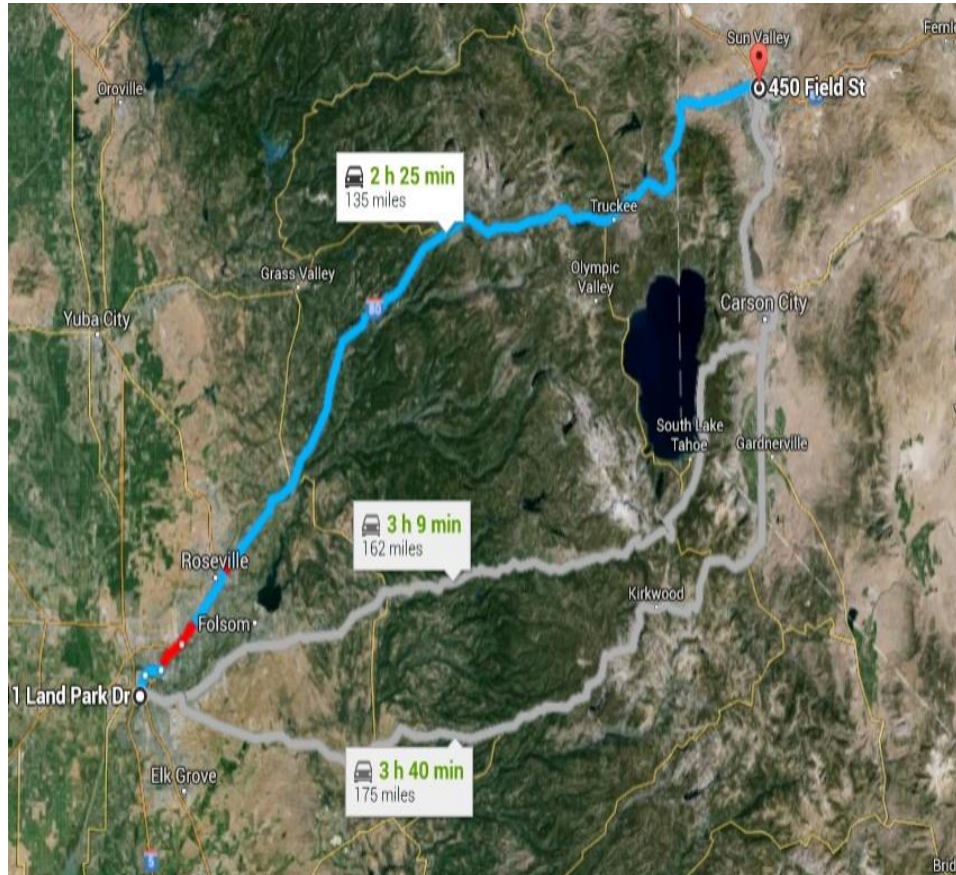
# Student Approach: Mind Maps



# Benefits

- Assessing SLO directly - single variable
- Students learning is focused on content rather than form
- Helps Identify misconceptions
- Universal Design for Learning
  - Multiple means of action and expression
  - Multiple means of engagement
  - Multiple means of representation

# Choices and constants



- Constant
  - Content
  - Rigor
- Choices
  - Learning Resources
  - Assignments



# Considerations

- Scaffold learning
  - Provide examples in early assignments
  - Encourage students to try different strategies in later assignments
- Provide a detailed rubric
  - Students know exactly what to do
  - Makes grading easier

# TILT: Transparency in Learning and Teaching

- Discuss assignments' learning goals and design rationale before students begin each assignment
- Engage students in applying the grading criteria that you'll use on their work
- Debrief graded assignments

# Pause for Processing

Questions, thoughts,  
ideas?



## Learning Outcome 2

Explain a process

Explain how your nervous system allows to you see a pen on the table and pick it up. Include: sensory neuron, interneuron, brain, motor neuron, skeletal muscle, electrical message, chemical message, synapse, axon, dendrite, sodium channels, potassium channels, the Na/K pump, and ATP.

## **Essays: Traditional Assessment**

What are some confounding variables for this assessment?

Write an essay explaining how your nervous system allows to you see a pen on the table and pick it up.

# Reflect and discuss

How else can we assess the ability to explain a complex process?



# Assessment options

- Multimedia presentations
- Case studies
- Portfolios
- Collaborative learning
  - Annotations
  - Study resources
- Open Educational Practices (OEP)
  - Renewable v. disposable assignments

# Benefits and considerations

- Accurately assess synthesis
  - Teachable Moments
- Writing and test taking are important skills
  - Opportunities to explain the content in different ways
- Peer review
  - Provide training
- Self evaluations
  - Metacognitive skills



# Learning Journals

- Identify where they found information (w/ citation)
- Explain their learning process
- How did they progress through the assignment
  - Where they ran into challenges
  - How they overcome challenges

# Benefits (1)

- Helps students
  - Metacognitive skills
  - How to approach learning difficult topics
- Helps me
  - understand how to help each student
  - with ongoing course improvements

# Benefits (2)

- Helps prevent cheating
  - Students more likely to cheat with fewer, high stakes assessments
  - Easier for me to see similarities
- Helps overcome AI concerns
  - Ask for specific information from references
  - Link to the book or lectures

# Working with AI

- New - Fact checking option for assignments
- Copy answer from AI
- Find reliable resources (or information from lectures) that verifies each point
- Remove topics not covered in class
- Add examples from class

# Pause for Processing

Questions, thoughts,  
ideas?



# What is an authentic assessment?

<b>Authentic assessment</b>	<b>Low-impact assessment</b>
Requires students to do something to demonstrate knowledge and skills.	Requires students to respond to a question to demonstrate knowledge and skills.
Fosters active learning.	Fosters passive learning.
Requires students to contextualize and apply what they have learned.	Asks students about what they have learned out of context and tends to encourage rote memorization.
Achieves deep learning, which is more likely to transform students' views and be remembered.	Achieves shallow learning that is less likely to be retained over long periods of time.
Inspires students to make connections between course content and the real-world.	Generally keeps learning confined to a book or other academic context.

# Discuss and Practice

## Assessment Worksheet



# Resources

- [TILT](#) – Transparency in Learning and Teaching
- [UDL](#) – Universal Design for Learning
- [Understanding by Design](#)
- [Culturally Responsive Assessment](#)
- [Biology Class with sample assignments and rubrics](#)



**Thank you!**

**Recorded webinars and a schedule of upcoming events  
are available at  
[onlinenetworkofeducators.org/spring-2024-webinars](https://onlinenetworkofeducators.org/spring-2024-webinars).**

**Email [support@cvc](mailto:support@cvc) with any questions!**