SAMPLE LESSON DESIGN: CELL TRANSPORT (DIFFUSION AND OSMOSIS)

GRADE LEVEL: HIGH SCHOOL BIOLOGY (9TH-10TH)

UNIT: CELL TRANSPORT AND ENERGY

LESSON LENGTH: 50 MINUTES

STANDARDS:

- NGSS HS-LS1-2: DEVELOP AND USE A MODEL TO ILLUSTRATE THE HIERARCHICAL ORGANIZATION OF INTERACTING SYSTEMS THAT PROVIDE SPECIFIC FUNCTIONS WITHIN MULTICELLULAR ORGANISMS.
- TEKS BIOLOGY 4C: INVESTIGATE AND EXPLAIN CELLULAR PROCESSES, INCLUDING HOMEOSTASIS, TRANSPORT OF MOLECULES, ENERGY CONVERSIONS, AND SYNTHESIS OF NEW MOLECULES.

LEARNING OBJECTIVES:

- STUDENTS WILL MODEL AND EXPLAIN THE PROCESSES OF DIFFUSION AND OSMOSIS.
- STUDENTS WILL PREDICT HOW CELLS RESPOND IN HYPOTONIC, HYPERTONIC, AND ISOTONIC ENVIRONMENTS.
- STUDENTS WILL CONNECT THE IMPORTANCE OF CELL TRANSPORT TO HOMEOSTASIS IN LIVING ORGANISMS.

5E LESSON BREAKDOWN

ENGAGE (5 MINUTES)

- HOOK QUESTION: "WHY DO YOUR FINGERS WRINKLE IF YOU STAY IN THE POOL TOO LONG?"
- SHOW AN IMAGE OF WILTED CELERY VS. CRISP CELERY
- STUDENTS BRAINSTORM QUICK EXPLANATIONS IN PAIRS - SHARE WITH CLASS.

EXPLORE (15 MINUTES)

- LAB ACTIVITY: *OSMOSIS IN POTATO CORES*
  - STUDENTS PLACE POTATO SLICES IN DISTILLED WATER, SALTWATER, AND SUGAR WATER.
  - OBSERVE CHANGES IN TEXTURE/SIZE AFTER A SHORT SOAK.
  - RECORD QUALITATIVE OBSERVATIONS IN A DATA TABLE.

EXPLAIN (10 MINUTES)

- TEACHER-LED MINI-LESSON WITH DIAGRAMS:
  - DIFFUSION, OSMOSIS, FACILITATED DIFFUSION, ACTIVE TRANSPORT
  - HYPERTONIC, HYPOTONIC, ISOTONIC SOLUTIONS.
- STUDENTS ANNOTATE PROVIDED DIAGRAMS IN NOTEBOOKS.

ELABORATE (10 MINUTES)

- APPLICATION CASE STUDY:
  - "MEDICAL MYSTERY: A DEHYDRATED PATIENT IS GIVEN PURE WATER INTRAVENOUSLY. WHAT WILL HAPPEN TO THEIR RED BLOOD CELLS? WHY?"
- STUDENTS WORK IN GROUPS TO SOLVE THE CASE AND EXPLAIN REASONING.

EVALUATE (10 MINUTES)

- EXIT TICKET:
  - DEFINE OSMOSIS IN ONE SENTENCE.
  - PREDICT WHAT WILL HAPPEN TO A PLANT CELL PLACED IN SALTWATER (DRAW + EXPLAIN)
- COLLECT AND REVIEW FOR FORMATIVE ASSESSMENT.

DIFFERENTIATION STRATEGIES

- ELL SUPPORT: PROVIDE LABELED DIAGRAMS AND A WORD BANK OF TERMS.
- ADVANCED LEARNERS: CHALLENGE TO DESIGN AN ADDITIONAL EXPERIMENT TESTING ACTIVE TRANSPORT (E.G., USING YEAST + SUGAR SOLUTIONS).
- STRUGGLING LEARNERS: USE HANDS-ON MODELS (GUMMY BEARS IN WATER/SALT) TO VISUALIZE OSMOSIS.

ASSESSMENT ALIGNMENT

- FORMATIVE: LAB OBSERVATIONS, CLASS DISCUSSION, EXIT TICKET.
- SUMMATIVE (LATER IN UNIT): QUIZ WITH SCENARIOS ON CELL TRANSPORT.

MATERIALS

- POTATO SLICES, BEAKERS, DISTILLED WATER, SALT SOLUTION, SUGAR SOLUTION, PAPER TOWELS
- PRE-PRINTED DIAGRAMS OF CELL TRANSPORT
- STUDENT LAB HANDOUT + DATA TABLE