

**AN ANALYSIS OF OCEAN WATER QUALITY USING THE GAMETES and
LARVAE OF THE SEA URCHIN (*Strongylocentrotus purpuratus*) AS
TOXICITY INDICATORS.**

**Based on procedures used at the California Department
of Fish & Game Marine Toxicology Laboratory,
Granite Canyon, California**

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Guiding Question:

***HOW CAN YOU TELL WHEN IT'S SAFE TO HARVEST SEAFOOD, SWIM OR
SURF AT YOUR BEACH ?***

Background Information:

- Urchin anatomy & physiology.
- Urchin reproduction & development.
- Use of endemic species as toxicity indicators.
- Lab. techniques.

Incorporation of SCANS:

Foundation Skills:

Basic = Read, Write, Speak, Listen, Math

Thinking = Critical, Visualization, Reason, Problem Solving

Personal = Personal, Interpersonal

Competencies:

**Resources - Coordinate use of team members and save use of
materials.**

**Information - Apply reading analyses to interpret data; self gathered
and technology based information.**

Interpersonal - Collegial directive relationships.

**System = Application of laboratory equipment and software for data
reporting.**

Technology = Software data reporting and analysis.

Skill & Knowledge Guidelines:

Computer Use

Technical Writing

Scientific Sampling

Aquatic Husbandry

Marine Survey Methods

Marine Biology

Environmental Regulations

Statistics

Goals:

Specific data collection and analysis can be accomplished using live models.

Introduce toxicology rationales into curriculum.

Re-emphasize technical writing as an end and a means.

Learning Objectives:

- 1- Collect and separate fertilized sea urchin embryos.
- 2- Collect sea water for analysis.
- 3- Create necessary test samples.
- 4- Build experimental models.
- 5- Observe and record accurate data.
- 6- Use computer graphing software.
- 7- Analyze and evaluate meaning of data.
- 9- Review and evaluate experimental design.
- 10- Communicate with peers.

Grade Levels

9th - 12th Grade

PROCEDURES:

1- HAVE TEAMS OF STUDENTS BRING IN SEAWATER SAMPLES FROM VARIOUS STUDY LOCATIONS.

2- TEAMS FERTILIZE GAMETES AND INCUBATE SAMPLES IN SEAWATER FROM EACH LOCATION.

3- TEAMS RECORD NUMBER OF DEFORMED AND NORMAL SPECIMENS; CALCULATE PERCENTAGES.

4- WHOLE CLASS: SYNTHESIZE DATA, GRAPH AND ANALYZE DATA.

5- COMPARE WITH ALTERNATIVE GEOGRAPHIC LOCATION AND DISCUSS WITH PEERS THERE.

Materials Needed:

live sea urchin specimens
test tubes
dropping pipettes
microscopes, slides
spawn induction equipment

Background References:

- 1- Stanford Urchin Website:
<http://www.stanford.edu/group/Urchin/>
- 2- EPA Protocols and Methods
Doc # epa/600/r-95/136 (August 1995)

Discussion Questions:

- 1- What do you think causes beach closures?
- 2- Who regulates these closures?
- 3- What guidelines are used?
- 4- What additional technologies could we develop or use in our classroom to further analyze what it is that may have toxic effects on urchin gametes and larvae?
- 5- List the occupations that might use techniques similar to those you developed and learned in this lab. investigation.

Assessment:

**Performance based assessment.
Written experiment report.
Peer review and holistic rubric.**

Lesson extensions:

- What specific aspects of water quality may have disturbed the growth and development of our sea urchins?
- How might we develop test procedures for these qualities?
- Do it !