EUTROPHICATION

TOPIC : WATER POLLUTION 75 MINUTES

OVERVIEW: STUDENTS WILL USE THE GOOGLE EARTH TIMELAPSE, MODISETS TO SHOW THE IMPACTS OF EUTROPHICATION ON LAKES (LINK FOR PPT) AND OTHER SOURCES TO UNDERSTAND THE CONNECTION BETWEEN GLOBAL POPULATION GROWTH AND INCREASING THREATS TO THE ENVIRONMENT AND EVALUATE EFFORTS TO REDUCE THEM.

SUBJECT/TOPIC:

CHEMISTRY/ENVIRONMENTAL

CHEMISTRY LEARNING OBJECTIVES:

- STUDENTS WILL ANALYZE GLOBAL POPULATION DATA AND MAKE INFERENCES ABOUT THE IMPACT INCREASING POPULATION HAS ON THE ADDITION OF ORGANIC WASTE IN LAKES .
- STUDENTS WILL DEEPEN THEIR UNDERSTANDING OF THE NEGATIVE IMPACT THE INCREASING ORGANIC WASTE IN LAKES.
- STUDENTS WILL RESEARCH ORGANIZATIONS WORKING TO ADDRESS THE IMPACTS OF HUMAN POPULATION ON THE HEALTH OF THE LAKES AND EVALUATE THE STRATEGY OF EACH ORGANIZATION.
- STUDENTS WILL IDENTIFY THE ORGANISATIONS WORKING FOR RESTORATION OF IMPORTANT LAKES IN INDIA

GRADE LEVEL:

11TH -12TH GRADE

LESSON SUMMARY:

- ENGAGE: EXAMINE GLOBAL POPULATION GROWTH IN THE PAST, CURRENTLY AND PROJECTIONS FOR THE FUTURE.
- EXPLORE: UNDERSTAND THE RELATIONSHIP BETWEEN GLOBAL POPULATION GROWTH AND CREATION OF ORGANIC WASTE THAT FLOWS IN LAKES EXAMPLES FROM AROUND THE GLOBE,-EUTROPHICATION AND ITS EFFECTS ON ECOSYSTEM THE LAKES.
- EXPLAIN: RESEARCH AND EVALUATE THE STRATEGY OF ORGANIZATIONS THAT ARE TAKING ACTION TO REDUCE THE IMPACT OF ORGANIC WASTE ADDED TO THE LAKES HEALTH OF THELAKES AND AQUATIC LIFE .
- REVISE: DISCUSS FINDINGS IN SMALL GROUPS.

• APPLY: IDENTIFY THE BEST STRATEGY FOR REDUCING THE ENVIRONMENTAL IMPACT OF GLOBAL POPULATION GROWTH AND CREATE A PRESENTATION TO ENCOURAGE OTHERS TO SUPPORT IT.

MATERIALS NEEDED:

ADOBE FLASH PLAYER VERSION 10.2.S

• ACCESS TO GOOGLE EARTH.
• STUDENT COPIES OF THE MAP IMPACT OF EUTROPHICATION ON COASTAL AREAS OF WORLD
• STUDENT INTERNET ACCESS. •

INQUIRY:

• STRATEGY TO REDUCE EUTROPHICATION

SUSTAINABLE DEVELOPMENT GOALS: CULMINATING TASK/ASSESSMENT:

• STUDENTS WILL STUDY THE IMPACT OF EUTROPHICATION ON COASTAL AREAS
• STUDENTS WILL IDENTIFY THE DEAD ZONES CREATED IN LAST 30 YEARS AROUND THE WORLD AND PRESENT A PROJECT USING GOOGLE EARTH .
• ALSO TO PROPOSE STRATEGY TO REDUCE THE IMPACTS OF HUMAN POPULATION ON THE ECOSYSTEM OF LAKES .

LESSON PLAN

ENGAGE (15 MINUTES) 1. PROJECT THE CHANGE IN THE DEMOGRAPHY OF SOME LAKES DURING LAST 30 YEARS USING TIME LAPSE
2. PROMPT STUDENTS TO COMPLETE THE SEE, THINK, WONDER THE REASONS FOR DEMOGRAPHIC CHANGES .
3. DISCUSS THE FOLLOWING QUESTIONS: • HAS THE GLOBAL POPULATION BEEN INCREASING AT THE SAME RATE OVER TIME?
• WHAT DOES THIS MEAN FOR THE ADDITION OF ORGANIC WASTE DUMPED IN WATER SOURCES ?
• WHAT CAN YOU INFER ABOUT THE IMPACT

OF THE INCREASE IN ORGANIC WASTE IN THE LAKES?

EXPLORE (20 MIN) 1.PROMPT STUDENTS TO COMPLETE THE SEE, THINK, WONDER ON HOW PHOSPHATE AMOUNT FOR ASSESSMENT THE TROPIC STATE OF THE LAKE HTTPS://WWW.MEMPHREMAGOG.ORG/EN/WATER_QUALITY

2. SHARE MAP IMPACT OF EUTROPHICATION ON COASTAL AREAS OF WORLD
EXPLORE THE MAP AND MAKE CONNECTIONS BETWEEN THE DIFFERENT PARTS OF THE COASTAL LINES WITH LOW OR VERY LOW IMPACT.

3. DISCUSS THE FOLLOWING QUESTION: WHAT IS THE RELATIONSHIP BETWEEN GLOBAL POPULATION, AGRICULTURAL PRACTICES AND THREATS OF EUTROPHICATION
BY STUDYING THE WORLD CHART HTTP://KODU.UT.EE/~OLLI/EUTR/CULTFIG1.GIF

EXPLAIN (30 MIN) 1. DISCUSS THE CONCEPT OF EUTROPHICATION AND FACTORS AFFECTING EUTROPHICATION WITH EMPHASIS ON POPULATION DENSITY AND AGRICULTURE ACTIVITIES AROUND WATER BODY.WHY PHOSPHORUS AMOUNT CAN BE USED TO ASSESS EXTENT OF EUTROPHICATION.WHAT ARE DEAD ZONES ?

2. INTRODUCE THE GOOGLE EARTH VOYAGER STORY, DEAD ZONES OF THE WORLD. WHERE STUDENTS APPRECIATE THE IMPACTS OF EUTROPHICATION ON MARINE LIFE
3. STUDENTS WORK IN SMALL GROUPS OR PARTNERS TO RESEARCH

ADDITIONAL ORGANIZATIONS THAT ARE WORKING TO REDUCE THE NEGATIVE ENVIRONMENTAL IMPACTS OF EUTROPHICATION .

REVISE (10 MIN) IN THEIR SMALL GROUPS, ASK STUDENTS TO DISCUSS THE FOLLOWING QUESTIONS: •
WHAT IS THE BEST WAY TO REDUCE THE IMPACT OF POPULATION GROWTH ON THE EUTROPHICATION? •
IS IT MORE EFFECTIVE FOR A STRATEGY TO BE PROACTIVE OR REACTIVE? WHY? •
WHAT CAN INDIVIDUAL PEOPLE DO TO REDUCE THE IMPACT OF ORGANIC WASTE ON THE ENVIRONMENT?

EVALUATE: CULMINATING TASK RUBRIC

	Exceeding	Meeting	Approaching	Beginning
	STUDENT DEMONSTRATES MASTERY OF KEY CONCEPTS SUCH AS GLOBAL POPULATION GROWTH, AGRICULTURAL PRACTICES ,ASSESSMENT OF EXTENT OF EUTROPHICATION AND THE MANY WAYS IT NEGATIVELY IMPACTS THE EUTROPHICATION	PROVIDES A CLEARLY STATED CLAIM NAMING ONE ORGANIZATION AS HAVING THE BEST STRATEGY FOR REDUCING THEEUTROPHICAT ION,BY SEVERAL PIECES OF SPECIFIC EVIDENCE. STUDENT IS ABLE TO EXPLAIN HOW EACH PIECE OF EVIDENCE SUPPORTS THEIR CLAIM AND STRENGTHENS THEIR ARGUMENT	STUDENT DEMONSTRATES ADEQUATE UNDERSTANDIN G CONCEPTS SUCH AS GLOBAL POPULATION GROWTH, AGRICULTURAL PRACTICES ,ASSESSMENT OF EXTENT OF EUTROPHICATIO N AND THE MANY WAYS IT NEGATIVELY IMPACTS THE EUTROPHICATIO N	CLEARLY STATED CLAIM NAMING ONE ORGANIZATIO N AS HAVING THE BEST STRATEGY FOR REDUCING THE IMPACTS OF POPULATION GROWTH. CLAIM IS SUPPORTED BY 1-2 PIECES OF SPECIFIC EVIDENCE. STUDENT IS ABLE TO EXPLAIN HOW EACH PIECE OF EVIDENCE SUPPORTS THEIR CLAIM
	STUDENT		STUDENT PROVIDES A	STUDENT

	DEMONSTRATE S PARTIAL UNDERSTANDI NG OF KEY CONCEPTS SUCH AS GLOBAL POPULATION GROWTH, AGRICULTURAL PRACTICES ,ASSESSMENT OF EXTENT OF EUTROPHICATI ON AND THE MANY WAYS IT NEGATIVELY IMPACTS THE EUTROPHICATI ON STUDENT BEST WAY TO REDUCE THE NEGATIVE IMPACTS OF EUTROPHICATION AND THE WAYS THAT OTHER ORGANIZATIONS' STRATEGIES FALL SHORT. ACTION STEPS ENCOURAGING OTHERS TO GET INVOLVED ARE INCLUDED.	PROVIDES A CLEARLY STATED CLAIM NAMING ONE ORGANIZATION AS HAVING THE BEST STRATEGY FOR REDUCING THE IMPACTS OF POPULATION GROWTH. CLAIM IS SUPPORTED BY SEVERAL PIECES OF SPECIFIC EVIDENCE. STUDENT DOES NOT EXPLAIN HOW EACH PIECE OF	STUDENT LACKS UNDERSTANDI NG OF KEY CONCEPTS SUCH AS GLOBAL POPULATION GROWTH, AGRICULTURAL PRACTICES ,ASSESSMENT OF EXTENT OF EUTROPHICATI ON AND THE MANY WAYS IT NEGATIVELY IMPACTS THE EUTROPHICATI ON STUDENT ADDITIONAL RESOURCES AND STRENGTHENS THEIR ARGUMENT PRESENTATION	PROVIDES A CLEARLY STATED CLAIM NAMING ONE ORGANIZATION AS HAVING THE BEST STRATEGY FOR REDUCING THE IMPACTS OF POPULATION GROWTH. EVIDENCE IS EITHER ABSENT OR DOES NOT SUPPORT THE STUDENT'S CLAIM. CLEARLY AND CREATIVELY COMMUNICATES THE GOALS, STRATEGY AND SUCCESSES OF ONE ORGANIZATION AND REASONS WHY THIS IS THE BEST WAY TO REDUCE THE NEGATIVE IMPACTS OF EUTROPHICATIO N. STEPS ENCOURAGING OTHERS TO GET INVOLVED ARE INCLUDED. EVIDENCE
PRESENTATION CLEARLY AND CREATIVELY COMMUNICATES THE GOALS, STRATEGY AND SUCCESSES OF ONE ORGANIZATION AND REASONS WHY THIS IS THE				

SUPPORTS THEIR CLAIM AND STRENGTHENS THEIR ARGUMENT PRESENTATIO N CLEARLY AND CREATIVELY COMMUNICAT ES THE GOALS, STRATEGY AND SUCCESSES OF ONE ORGANIZATIO N BUT	DOES NOT INCLUDE WHY THIS IS THE BEST WAY TO REDUCE THE NEGATIVE IMPACTS OF EUTROPHICATI ON AND THE WAYS THAT OTHER ORGANIZATIO NS' STRATEGIES FALL SHORT. ACTION STEPS ENCOURAGING OTHERS TO GET INVOLVED ARE NOT INCLUDED	PRESENTATIO N IS LACKING INFORMATION ABOUT THE GOALS, STRATEGY AND	SUCCESSES OF ONE ORGANIZATIO N AND DOES NOT INCLUDE REASONS WHY THIS IS THE BEST WAY TO REDUCE THE NEGATIVE IMPACTS OF POPULATION GROWTH. ACTION STEPS ENCOURAGING OTHERS TO GET INVOLVED ARE NOT INCLUDED

STUDY MATERIAL EUTROPHICATION

https://www.open.edu/openlearn/ocw/mod/oucontent/view.php?printable=1&id=2317

WATER QUALITY AND PRESENCE OF NUTRIENTS

https://www.memphremagog.org/en/water_quality

STUDY MATERIAL WHAT ARE DEAD ZONES

https://oceanservice.noaa.gov/hazards/hypoxia/

https://www.biointeractive.org/classroom-resources/dead-zones-coastal-ecosystems

VIDEO EUTROPHICATION

https://oceanservice.noaa.gov/facts/eutrophication.html

STORY FROM INDIA

Dying Waters: India Struggles to Clean Up Its Polluted Urban Rivers

CREDITS

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