Transgenic Salmon

At a Glance:
For middle school students
Lessons assume a 45-50 minute class
Lessons need to be done in sequence.

Introduction:
This unit is designed for students in science class for grades 6, 7, 8. The program was 'borrowed' from the NWABR website and modified to fit my classroom. Obviously, you can modify as you need to. The website where I originally got the unit is:
http://nwabr.org/education/ethicscurriculumtopic.htm#SA

OREGON State Benchmarks:
Science:

1. Describe how the traits of an organism are passed from generation to generation.
2. Identify and describe the factors that influence or change the balance of populations in their environment.
3. Understand science as a human endeavor.
4. Understand that science provides a basis for understanding and acting on personal and social issues.

Objectives:

1. Synthesize information gained in previous classes regarding genetics
2. Comprehend technical genetics' information and use facts to support a scientific opinion.
3. Read and organize scientific facts for and against a given viewpoint.
4. Participate in a model town meeting listening to other's viewpoints.
5. After researching, discussing, presenting and listening to scientific facts, students will write their own position paper regarding transgenic salmon.

Vocabulary:

transgenic	stakeholder
aquaculture	species
genetically modified	sterile
DNA	

Materials/Resources:
Vocabulary Word Tracker (provided in this lesson)
Transgenic Salmon – Note taking Organizer (provided in this lesson) need many
Background on Transgenic Salmon (provided in this lesson)
Dictionaries for student use.
Transgenic Stakeholder Position (provided in this lesson)
Stakeholder Comparison Handout. (provided in this lesson)

Resources for Stakeholder Groups to Use for Facts:

- Background on transgenic fish:http://www.uscsusa.org/Nucleus/OOwi.salmon.html
- Article: *Genetically Engineered Food* found at http://www.globalissues.org/Envlssues/GEFood.asp
- Article: *Drop in Salmon numbers expected for Washington* found at http://www.spokesmanreview.com/local/story.asp?ID=178475
- Article: *Bioenergetics of growth hormone transgenic salmon reared under simulated aquaculture conditions* found at http://www.bioatlantech.nb.ca/rv99/abstracts/sutterlin.htm
- Article: *Commercialization of path-breaking transgenic salmon faces stumbling blocks* found at http://www.netlink.de/gen/Zeitung/2000/000405h.html
- Article: *Information for Consumers* found at http://www.fda.gov/cvm/transgen.htm
- Article: *Transgenic Fish* found at http://www.serconline.org/transFish/fact.html
- Article: *Transgenic Fish Coming* found at http://www.i-sis.org.uk/TFC.php?printing=yes
- Article: *Get Active for Farmed Animals* found at http://www.goveg.com/getactive.asp
- Article: *Creating A New Variety of Fish: The Technique to Make Transgenic Animals* found at http://fda.gov/Fdac/features/2001/101_fish.html
- Article: *A New Kind of Fish Story: The Coming of Biotech Animals* found at http://www.fda.gov/Fdac/features/2001/101_fish.html
- Article: *Transgenic Salmon an Ecological Threat* found at http://users.westnet.gr/~cgian/salmon.htm
- Article: *Fish Farming* found at http://en.wikipedia.org/wiki/Fish_farming
- Article: *NOAA Fisheries Led Group Forecasts Strong Returns of Key Northwest Salmon Runs in 2003* found at http://www.publicaffairs.noaa.gov/releases2003/mar03/noaa03r117.html
- Article: *Fish Farm: Underwater Factories* found at http://www.nofishing.net/fishFarms.asp
- Article: *Is Fish Farming Safe?* found at http://www.time.com/time/printout/0,8816,391523,00.html

Timeline of the Lesson:

Prior to the transgenic unit of study, students should have a basic understanding of the following information:

Basic genetics: how traits are passed from one generation to the next
Reproduction of salmon

Day 1: Introducing the Transgenic Salmon Issue

1. Introduce the unit by reading with your students the handout: Transgenic Salmon: Background.
2. Hand out the Vocabulary word tracker and have students read back through the article, identify words they are not familiar with, write them on the Vocabulary Word Tracker, and define them in the context of the issue: Transgenic Salmon.
3. Groups of students can share their words and definitions.
4. End with a class discussion of words they chose and clarify the definitions they found. The last thing you want is students moving forward using an incorrect understanding of the content.

Day 2: Stakeholder Groups Assigned

1. Begin the day with a 'Where do you stand?" activity. Prompt the students with the question: Based on what you know today, should humans be eating transgenic salmon?"
2. Let the students line up on a continuum from "not okay", "maybe" to "yes, I would eat it today".
3. Lead the class through a discussion of why students chose a particular stance.
4. Ask the students what they think the word stakeholder means? List their ideas.
5. Once the class has an idea of what a stakeholder is (a person or group with a particular interest in a topic or issue), inform them that they will become stakeholders in the transgenic salmon issue.
6. Read the Notice of Town Meeting handout with the students, then assign them their stakeholder groups. The groups will need to be well thought out in advance of this day! Cut the stakeholder sections apart and give the group only their stakeholder information. You can make the others available if groups ask.
7. Let the groups meet and discuss their stakeholder position.
8. For homework: have the students fill in the Transgenic Stakeholder Position paper using what they have learned so far and answering from THEIR stakeholder position only.

Days 3-4: Researching the Assigned Stakeholder Viewpoint

1. Have the students meet in their stakeholder groups and share their responses to the homework. Then, you may want them turned in so you can see what the students are thinking and if they understand their stakeholder positions.
2. Today the students will read and take notes on the issue. Provide folders of the resources; example: a PETA folder with copies of PETA information. The students will take the notes on the Note Taking form provided in this lesson.

**** Depending on your students, you will have to decide how many days to let them research.

3. Make a point of having a member from each stakeholder group visit the other groups and report back who those groups are and what their positions may be. You may even want to make available the information about all stakeholder groups.

4. For homework tonight, have the students do the Stakeholder Comparison Handout.

Days 5-6: Introduce poster for town meeting.

1. Begin by having stakeholder groups share their homework. Tell the class that it is important each group anticipates other stakeholder opinions and it may be beneficial to address those opinions in their town meeting preparation.

2. This is the last day to gather information.

3. Present the poster rubric and tell the students their group will make a poster to show their viewpoint for the meeting. The group will also present their viewpoint at the town meeting. The goal is for the group to be so compelling that the City Council votes in their favor. Note on City Council poster: have the council do pros and cons on their poster.

4. Let students work on making their posters. Guide them to use the scoring guide.

Day 7: Work Day – Practice Presentations

1. This is the last work day.
2. Posters need to be finished and groups need to practice their presentations for the meeting in class tomorrow. The stakeholder presentation should present their viewpoint, address other opinions, and clearly state the groups position. The presentation should be limited to no more than 5 minutes.

Day 8: Hoodsport Town Meeting

1.Have the classroom set up with a table the City Council members can sit at. Line other chairs around the room or in rows to model a meeting room. Move tables to the sides. If you have desks, try to use a different room that can be set up like a meeting room.

2. Have groups sign in as they arrive. The sign in is the order in which they will present. If a group doesn't sign in, they don't get to present and their viewpoint is not heard. This is a hard, but valuable lesson.

3.Call each group up. Give them 5 minutes. Have the group turn in their poster rubric as they go up to present. Try to score the poster then if possible!!

4. Once all of the stakeholder groups have presented, have the council discuss and present their decision.

5. You can close by having the students do a "where do you stand?" line from open to don't open the facility.

Assessment Options:

1. Group position poster (use rubric provided in this lesson)
2. Do the position poster as an individual assignment.
3. Position paper – good synthesis activity for students. (rubric provided in this lesson)
4. Create your own rubric to assess the presentation or use the Oregon State speaking scoring guide.
5. The Notetaking sheet and Word Tracker can be assessed for student work. Give students a minimum number of words and notes prior to turn in day so they know what you expect.

Modifications:

TAG:
Cluster the students in one group or spread them out to lead other groups. Some of the articles can be tough, so steer your good readers to these.

SPED:
Students will need some help with the articles and fact finding. Pair them with a reading buddy or have someone (maybe an Instructional Aid) read the material with the student.

Transgenic Salmon

Background: read the background information below. Put words that you don't know on the vocabulary tracker. Take notes on the Note Taking Organizer.

Due to superior taste and nutritional benefits, salmon have been a prized food source in the Northwest, and many other regions of the world, for the past 150 years. Additionally, salmon have been a key food for many Native Americans for centuries. The yearly harvest of salmon (usually by fishing) has been reduced (made smaller) in the last several years. Fishermen are not allowed to catch as many salmon as in past years because there just aren't as many salmon to catch. The United States Fish and Wildlife Service (USFW) decides how many fish get harvested (caught) each year. USFW decide based on how many fish are actually in the streams, rivers and ocean.

In response to not being able to catch a lot of fish to sell for food, some companies have been formed to make salmon available to consumers (people) at a low cost. These new companies 'farm' salmon instead of catching them in the wild (this practice is called **aquaculture**). These fish are typically raised in pens, mostly in the ocean, on good diets to maximize the size of the fish. Fish farmers want their fish to be big since it is sold by the pound.

Recently, research on transgenic organisms (organisms whose genes have been changed in some way) by the company known as Transgenes America (TGA) has produced a **transgenic** Atlantic salmon that grows very big and doesn't have to be fed as much as other salmon in farms. This results in a quick turn around in the product (salmon) with lower environmental impact than traditional salmon aquaculture.

Many people are opposed (against) traditional salmon aquaculture (the ones farmed, but not transgenic). Now, these same people are opposed to transgenic salmon farming. They argue that genetically modified (GM) foods have not been tested enough and are therefore not known to be safe for humans to eat. Additionally, environmentalist groups such as Green Peace say that transgenic salmon are a risk to the natural environment because these fish, if they are accidentally released, could out-compete native salmon or the transgenic fish could transfer their genes into the native (wild) salmon population. It is unclear whether or not the transgenic fish could mate (reproduce) with wild salmon.

Transgenic Salmon – Note taking Organizer: As you read through different texts for this unit, keep track of important information here. Source = the document you are taking the information from.

Source these notes are coming from: _____

Notes to inform me about the topic:

Source these notes are coming from:

Notes to inform me about the topic:

Source these notes are coming from:

Notes to inform me about the topic:

Transgenic Salmon
Vocabulary Word Tracker

Vocabulary Word you need to learn about:	Definition of the word – AND – how it relates to transgenic salmon.

Notice: Town Meeting
Date:
Time:

Why a town meeting?

Transgenes America (a company raising transgenic salmon) wants to build an experimental 'farm' to raise transgenic salmon to sell to food markets across the world. Transgenic salmon have not been approved for humans to eat, so the company is going to raise the salmon and sell it to companies to be used in making dog food. The Food and Drug Administration (FDA) is expected to make a decision within 2 years on whether or not transgenic salmon can be eaten by humans.

The transgenic facility is going to be located in Hoodsport, WA. The company plans to produce 3 million mature salmon per year. The salmon would take only 1 year to mature which is twice as fast as wild salmon. The salmon will be held in pens 200 yards (two football fields) off shore.

The salmon facility plans to employ about 150 people with most jobs paying $12/hour with benefits (health care, sick days) included.

As you know, the Hoodsport area is low on jobs. The tourists are not coming here as often and many people are out of work.

The Hoodsport City Council will be holding a public meeting for interested stakeholders to present their positions regarding the opening of the Transgenes America company.

Transgenic Salmon

Stakeholders

Fish Farmer's Union

You represent the local owners of non-genetically modified salmon farms. Many of the farmers in the union have had families in this business for many generations. Your members make a good living farming the traditional wild Atlantic and native Chinook and Coho species of Salmon. However, in recent years foreign farming operations in Canada have started putting severe pressure on your members' farms because of the market competition they have introduced (their product selling instead of yours). With the introduction of this new farming operation, your members could be driven out of business.

Local Wild Salmon Fisherman

You are a group of local fishermen who do not believe in fish farming. Your group believes that salmon are wild animals and should be allowed to roam the ocean just as other animals roam the land. Your group depends on fishing wild salmon; you can't compete with the big corporations that farm fish. The local fishermen would like to see fish farming become illegal.

Another issue concerning your group is the decreased numbers of wild salmon being available for them to catch. They feel left out by all sides of the issue.

PETA (People for the Ethical Treatment of Animals)

PETA believes that no animals should be eaten, farmed or caught. PETA is totally opposed to the Transgenes America company opening this facility.

United States Department of Fish and Wildlife (USDFW)

Your group researches fish biology and genetics. The mayor of Hoodsport has asked you to participate in this town meeting as an expert. You are very familiar with the research of transgenic salmon.

According to you, the transgenic fish grows 3-6 times faster than the traditional wild fish. Some studies show also that transgenic fish eat 20 % less than wild fish.

There are environmental concerns about the transgenic facility. Genetically modified (changed) fish could escape and could mate with wild salmon. Your research team is working on making the transgenic salmon sterile (unable to reproduce).

Food and Drug Administration (FDA)

The Food and Drug Administration is responsible for making sure the food and drugs made available for the American public are safe.

This group is informed about transgenic salmon research. The FDA is currently examining the possibility of allowing transgenic salmon to be sold for humans to eat. No decision has been made yet.

President and staff of Transgenes America

Transgenes America is leading the way in fish farming and food production in America. If this experimental facility is successful, Transgenes America will create more facilities like it around the world. The transgenic salmon will provide jobs and lots of food for the world. The facility will also allow wild salmon numbers to improve since catching so many salmon will not be necessary.

Hoodsport Citizen Group

The Citizen Group is made up of local citizens who are actively involved in their community. Anyone who lives in the city of Hoodsport can be a member. The citizens of Hoodsport are torn on this issue. They want and need jobs, but worry about their local fishermen and environment.

Hoodsport City Council

The City Council of Hoodsport is made up of elected citizens. The Council's role in the meeting is to come in informed about the issue – all sides of the issue. The members of the council need to know if what they are being told is true.

Once all stakeholders have presented at the town meeting, the City Council will vote on whether to build the Transgenes America facility or not.

Transgenic Stakeholder Position

Assigned Stakeholder position:

_____

After reading the material given out so far, list 3 supporting facts for your assigned position.

1. My stakeholder position is _____ because _____
_____
_____.

2. My stakeholder position is _____ because _____
_____
_____.

3. My stakeholder position is _____ because _____
_____
_____.

What do you personally (not your assigned stakeholder position) think of the transgenic facility opening?

_____
_____
_____
_____

Stakeholder Comparison Handout.

After reading about other stakeholders' positions,
1. List the stakeholder (not your own)
2. State that stakeholder's position on the issue.
3. Give a response from your stakeholder group to the one listed. You may disagree or agree with the stakeholder's position.

Stakeholder:	Stakeholder:	Stakeholder:
Position:	Position:	Position:
Your response:	Your response:	Your response:

Transgenic Salmon Position Paper Rubric

Write a 5-paragraph essay telling how their opinion has changed or solidified their stance on the transgenic salmon issue. Provide details to support their position.

Criteria	Received	Possible
Definition of transgenic salmon 5 points: What is a transgenic salmon? How is a transgenic salmon created? Who (what companies) are behind the research? 3 points: 2 of 3 questions answered. 1 points: 1 of 3 questions answered. 0 points: No viable answer.		5
Statement of position clearly stated 5 points: Position is clearly stated. 3 points: Position is vague and non-conclusive. 0 points: Position not stated.		5
Support of position 5 points: Scientific data is cited from multiple (3 min.) sources. 3 points: Limited data is cited and/or less than 3 sources. 1 points: Vague reference to possible data. 0 points: No data reference.		5
Other positions 5 points: Alternative positions stated with data (3 min sources) to support those alternative viewpoints. 3 points: Alternative positions stated with limited data cited and/or less than 3 sources. 1 points: Alternative positions stated without supporting data. 0 points: No alternative positions stated.		5
Summary of position 5 points: Position restated with a key point 3 points: Position restated without a key point 0 points: Paper ends without closure		5
Spelling and Grammar One point deduction for every two mistakes		5
References 5 points: At least 3 sources referenced and cited 3 points: At least 2 sources referenced and cited 0 points: No references.		5
Final Score		35

Transgenic Salmon Poster Project Rubric

Group Members Names: _____
_____
_____
_____

Criteria	Received	Possible
Clarity/Purpose 5 points: Terminology from the project is used. Purpose and stance are clear. Poster is easily understood by uninformed bystanders. Correct spelling (Vocabulary words are defined on the poster, technical procedures are explained) 3 points: Poster contains vocabulary or procedures unfamiliar to the general public and are not defined, explained and/or are used incorrectly. Most spelling correct 0 points: Poster is not readable by the general public and/or does NOT make sense. Several misspelled words		5
Data 6 points: Poster contains 3-4 facts of supporting data. 4 points: Poster contains two facts of supporting data 2 points: Poster contains one fact of supporting data. 0 points: Poster contains no facts supporting the data.		6
Visuals 10 points: Visuals helps to convey the stakeholder's view and are neatly done. They add to purpose and clarity of the poster. 6 points: Visuals are somewhat neat and clear. Somewhat add to the purpose and clarity of the poster. 4 points: Visuals are messy and not clear. Very little relation to purpose and clarity of the poster. 0 points: Visuals are lacking, messy and/or overall distracting		10
Total		21