

Autism, a Pervasive Dilemma

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Abstract:

Research suggests that autism may be due to a combination of environmental factors which impact genetic information and lead to errors in the development process during gestation. Students explore autism and engage in research on the causes of autism through problem-based learning and a Web Quest. They will create an informational brochure based on their research findings.

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Teachers, we would appreciate your feedback. Please complete our brief, online Environmental Health Science Activity Evaluation Survey after you implement these lessons in your classroom.

The survey is available online at: www.surveymonkey.com/s.asp?u=502132677711

Name _____ Class _____

1. Autism is most likely caused by
 1. poor parenting when a child is young
 2. a specific environmental chemical
 3. poor nutrition
 4. the exact cause of autism is not yet known

2. Some scientists believe that autism results from changes in the “brain stem” that are caused by gene mutations in the HOXA 1 gene. Because development of the “brain stem” occurs in early stages of gestation, we can assume that the “brain stem” is responsible for
 1. Problem solving ability and creative thinking.
 2. Long term memory and learning ability.
 3. Voluntary muscle action such as walking
 4. Simple automatic actions such as facial and eye movements.

3. Researchers do not think that a genetic test can be devised for autism because
 1. Several environmental factors interact to produce the disorder.
 2. Environmental factors and genes interact to cause autism
 3. Genetic tests would not be able to tell the difference between autism and behavioral disorders.
 4. Autism is caused by abnormalities to the brain which are not associated with genetic traits or environmental factors.

4. Thimerosal is a preservative made from mercury that is was used as a preservative in a variety of vaccines. Why would the United States Food and Drug Administration recommend that drug companies to eliminate this material from the vaccines?
 1. The preservative did not protect the vaccines from spoiling.
 2. The rate of neurological disorders increased in young children.
 3. There were adults who developed autism after receiving vaccinations which contained Thimerosal.
 4. Tests outside the United States did not indicate any problems with Thimerosal.

5. Traits such as autism can sometimes appear in one identical twin, but not in the other. Which of the following might lead to such results?
 1. Exposure to environmental chemicals might influence the genes.
 2. Only one twin inherited the gene for autism.
 3. The autism gene disappears in some children.
 4. Autism only appears in children who inherit two recessive genes. .

6. Autism is currently regarded as “Autism Spectrum Disorder” because
 1. A cure has not been found.
 2. A specific cause can't be determined.
 3. Scientists think it is a disease that has not been identified.
 4. It is really a variety of different, but related, conditions.

7. Autism has been identified as an environmental health issue because
 1. Autism is so common today
 2. Exposure to contaminants might be responsible for autism
 3. The genes that cause autism have been identified
 4. It has many social and ethical implications

8. Which of the following is not generally considered a characteristic of a child with Autism Spectrum Disorder?
 1. Poor social activity
 2. Non-verbal communication
 3. Repetitive or obsessive behavior
 4. Hyperactivity

9. Which of the following body systems is most closely associated with autism?
 1. Immune system
 2. Circulatory system
 3. Respiratory system
 4. Digestive system

10. Which characteristic of the brain is usually associated with autism?
 1. An unusually large brain
 2. Lack of neurotransmitters
 3. Lack of synapses
 4. Well-developed speech and language centers

Answer Key for Pre/Post Test

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Learning Context

This activity is designed to have the students examine the cause of a behavioral disorder that has not been definitively described by scientists. There is research to suggest the combination of environmental factors that have an impact on the genetic information lead to errors in the development process during gestation.

Subject Area: Biology and Environmental Science

Overall Purpose: To understand the possible impact of environmental factors and genes responsible for the increased prevalence of Autism Disorder Spectrum (ASD) conditions.

Learning Objectives:

- To identify Autism Disorder Spectrum conditions.
- To recognize the prevalence of autism.
- To investigate the research to identify possible environmental factors that have a role in causing autism.
- To investigate the research to identify possible genetic factors that have a role in causing autism.

Prerequisite knowledge and skills:

- Knowledge of the nervous system and it's role in the behavior of an individual.
- Knowledge of the development process of the nervous system during gestation
- Knowledge of the coordinated gene expression in the development process.

Procedure

Classroom Timeline:

DAY 1: Students will begin this activity by completing the first column of a PBL chart based on the reading of the first scenario. They will use the information from the reading and their prior knowledge about autism. The second scenario will be presented for class reading and then completion of the second column of a PBL chart.

DAY 2: Students will read the third scenario and then discuss any modifications to their PBL charts, including completion of the third and fourth column. The class will then read the concluding scenario and resources provided from a reading list, students with their will investigate the topic of autism in more depth and complete the PBL chart.

DAY 3: Students will work in teams to complete a Webquest on autism. Each member of the team will focus on one group of questions. Students will share the information they have found with other members of their team.

DAY 4: Student teams will prepare a brochure on autism based on their research and information shared within their group.

Equipment and Supplies:

- One copy of the PBL scenario per student
- One copy of the PBL chart per student
- One copy of the Web Quest per student
- Chart paper
- Markers
- Access to computers
- Print articles on autism from the reading list.

Instructions for Implementing the Problem-Based Learning Activity

Day 1:

1. Distribute a copy of the scenario and a PBL chart to each student.
2. Read Part 1 the problem-based learning activity aloud.
3. Organize students into working groups of 4 students.
4. Assign each student in the group to a role: facilitator, timekeeper, recorder, and reporter.
5. Provide each group with poster paper and a marker.
6. Students work to complete the complete COLUMN 1 on the PBL chart: **What do you know?** They use the “Brainstorming Strategy” to get as many suggestions as possible from the group participants. It is suggested that each person contributes before additional items are added.
7. Read Part 2 of the problem-based learning activity aloud.
8. Students then work to complete COLUMN 2 on the PBL chart: **What do you think is going on here?**

Day 2:

1. Read Part 3 and Part 4 in groups.
2. Distribute copies of these two articles:
 - Wallis, Claudia. *Inside the Autistic Mind*. Time Magazine, Vol 167, No. 30, May 15, 2006. <http://www.time.com/time/magazine/article/0,9171,1191843,00.html>
 - Rodier, Patricia. *The early origins of Autism*. Scientific American, Volume 282 #2, February 2000, pages 56-63. <http://www.autistics.cc/Autism/sciamone.html>
3. Ask students to use the information in the scenario and the articles to complete COLUMN 3 and COLUMN 4 on their PBL Charts:

PBL Chart

Column 1	Column 2	Column 3	Column 4
What do you know?	What do you think is going on?	Why?	What information would you like to have?

Problem-Based Learning Activity

PART 1

Tim Brown is 16 years old and he has been very worried lately about his 2-year-old brother, Christopher. Tim expressed his concerns to his mother, Sue Brown.

TIM BROWN: "Mom, why has Christopher been doing these strange things? Just look, right now, he is sitting in the corner and he is squeezing an apple and rocking back and forth. Mom, why does he do this all day long?"

SUE BROWN: "Dr. Long says that he may be going through a phase that many kids do at his age."

TIM BROWN: "But Mom, cousin Michael was born at the same time and he is walking around and talking to us."

SUE BROWN: "Well Tim, the doctor said that not all kids begin speaking at the same time and that there is no reason yet for concern. The doctor says if Christopher is still not talking in a few months, then he will refer us to a specialist. Don't worry about it right now. "

PART 2

Two months later

Sue Brown and her husband Steve visit Dr. Long with Christopher for his regular checkup and vaccination. After examining Christopher, Dr. Long gives him his next vaccination injection. Christopher begins shaking back and forth as the tears well-up in his eyes, but he does not cry. At the end of the check-up, Dr. Long suggests to Mr. and Mrs. Brown that they visit Dr. Cynthia Marks, a specialist in children's brain development.

SUE BROWN: "Dr. Long, why have you decided that we should take Christopher to see Dr. Marks?"

DR. LONG: "After observing Christopher over the last two years, I have some concern for the decline in his communication ability over the past year. At first, I thought it might have just been a temporary delay in speaking, but now there are some indications that this matter needs to be investigated more thoroughly."

The Brown's return home and make an appointment to bring Christopher to see Dr. Marks the following week.

PART 3

One week later

Mr. and Mrs. Brown bring Christopher to see Dr. Cynthia Marks. In Dr. Marks' office, Christopher was making repeated nonsense sounds and rocking back and forth.

DR. MARKS: "Sue and Steve, can you tell me a little more about Christopher's past year. Has he had any illnesses or other unusual things happen or have you noticed any change in his behavior?"

SUE BROWN: "Nothing unusual has happened to Christopher this past year. There were no accidents and he was not sick. The only behavior change that we've seen is that he does not seem to notice other children and the noises he makes and his swinging arms."

DR. MARKS: "These nonsense sounds and Christopher's repetitive body movements could be signs of a communication disorder. Although speech delay, on its own, is nothing to worry about, I am concerned about the combination of behaviors that I am observing. My preliminary investigation reveals some communication delay which could be autism."

STEVE BROWN: "What exactly is autism?"

DR. MARKS: "Autism is a condition that can vary greatly in different children. At this early stage it might just be a delay in speaking, but it could result in a more permanent loss of communication ability. Some autistic children are tremendously intelligent. We just don't know if and when he will develop some of the other characteristics of the condition. But to be on the safe side, I'm going to suggest counseling and therapy for Christopher."

SUE BROWN: "What could have caused Christopher to develop autism?"

DR. MARKS: "We don't really know exactly what causes autism, but there is a lot of research being done to try to find out."

PART 4

Two days later

When Tim comes home from school his mother is talking on the phone with Dr. Marks. When his mother hangs up the phone, Tim can see that she is very upset.

TIM BROWN: "Mom, what did Dr. Marks say to you?"

SUE BROWN: "Dr. Marks says that Christopher definitely is showing signs of something called autism spectrum disorder. She said that she would send us some information to read and that we should make another appointment to see her in a week."

To figure out what's going on with Christopher, Tim decides to do some "net surfing" to find out more about autism. He reads about research that was done on the effect of mercury in vaccinations.

TIM BROWN: "Mom, could Christopher's vaccinations have caused his autism?"

SUE BROWN: "I was worried about that too, but Dr. Mark's said that the vaccinations that Christopher had did not seem to pose any increased risk of autism".

While Tim continues his research he finds Toxline*, a website about toxic conditions in the environment, vaccinations, and immune system responses that might be implicated in cases of autism. Tim is surprised to learn that there is so much information about different factors that might be involved with cases of autism.

That evening Tim's mom and dad begin searching the "net" with Tim and find more information about the causes of autism. They realize that despite the extensive information that they have found there is no clear answer given for the causes of autism. They also realize that more testing will be necessary to narrow down this particular situation for Christopher. They all have even more questions for Dr. Mark's that they would like to discuss.

* <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?TOXLINE>

Webquest

INTRODUCTION:

The purpose of this activity is to work with a group to expand on your knowledge of autism, including its symptoms, diagnosis, causes and treatments.

PROCESS:

Each member of your group should take responsibility for one group of questions. Use the web sites provided to locate information that will assist you in answering these questions. Following your Webquest, you will work together as team to put together the information you have gathered and design an informational brochure.

Questions:

1. What is autism?
2. What is the Autism Disorder Spectrum?
3. How would you describe a child with autism?
4. How can you describe a communication disorder? How is autism different from other communication disorders?
5. What are some treatments that are used to treat patients with autism?

Web sites:

<http://www.autism-society.org/site>

<http://www.ninds.nih.gov/disorders/autism/autism.htm>

<http://www.nimh.nih.gov/publicat/autism.cfm>

Questions:

1. Why are there some problems in making an accurate diagnosis of autism?
2. How can you differentiate autism from other behavioral disorders?
3. Do you think that children are born with autism? Support your opinion.

Web sites:

<http://www.ninds.nih.gov/disorders/autism/autism.htm>

<http://www.nimh.nih.gov/publicat/autism.cfm>

Questions:

1. Why is there concern about mercury coming from vaccinations? Are there other sources of mercury exposure?
2. Are the symptoms of mercury poisoning similar to the symptoms of autism?
3. What evidence supports the claim that vaccinations cause autism?
4. What evidence refutes the claim that vaccinations cause autism?

Web sites:

<http://www.cdc.gov/nip/vacsafe/concerns/thimerosal/default.htm>

<http://www.newstarget.com/011764.html>

<http://www.atsdr.cdc.gov/tfacts46.html>

<http://www.generationrescue.org/index2.html>

Questions:

1. Why do some researchers believe that the prevalence of autism has increased?
2. What can we learn about autism from studies of the brain?
3. What are the genetic factors that researchers think might contribute toward understanding autism? What evidence is available?
4. What are the environmental factors that researchers think might contribute toward understanding autism? What evidence is available?

Web sites:

<http://www.ehponline.org/members/2006/114-7/focus.html>

Rodier, Patricia. The early origins of Autism. Scientific American, Volume 282 #2, February 2000, pages 56-63. <http://www.autistics.cc/Autism/sciamone.html>

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12503976

<http://pediatrics.aappublications.org/cgi/content/full/115/3/e277>

Informational Brochure

To find out what you have learned from your research about different aspects of autism each group will create a 3-fold informational brochure (on unlined paper that measures 8.5 x 11 or 8.5 x 14).

- This brochure should be designed to inform parents or family members about autism.
- Your brochure should include the following information:
 - symptoms of autism
 - diagnosis of autism
 - possible causes of autism
 - treatment of autism
- Provide a brief list of literature on autism (web sites or articles) and information on how to locate this literature on the Internet.

New York State Learning Standards and Performance Indicators:

- 2.1i The work of the cell is carried out by the many different types of molecules it assembles, mostly proteins. Protein molecules are long, usually folded chains made from 20 different amino acids in a specific sequence. This sequence influences the shape of the protein. The shape of the protein, in turn, determines its function.
- 3.1i Behaviors have evolved through natural selection. The broad patterns and behavior exhibited by organisms are those that have resulted in greater reproductive success.
- 4.1e Human reproduction and development are influenced by factors such as gene expression, hormones, and the environment. The reproductive cycle in both males and females is regulated by hormones, such as testosterone, estrogen and progesterone.
- 4.1h In humans, the embryonic development of essential organs occurs in early stages of pregnancy. The embryo may encounter risks from faults in its genes and from its mother's exposure to environmental factors such as inadequate diet, use of alcohol/drugs/tobacco, other toxins, or infections throughout her pregnancy.
- 5.2a Homeostasis in an organism is constantly threatened. Failure to respond effectively can result in disease or death.
- 5.2h Disease may also be caused by inheritance, toxic substances, poor nutrition, organ malfunction, and some personal behavior. Some effects show up right away; others may not show up for many years.
- 5.2j Biological research generates knowledge used to design ways of diagnosing, preventing, treating, controlling or curing diseases of plants and animals.
- 5.3a Dynamic equilibrium results from detection of and response to stimuli. Organisms detect and respond to change in a variety of ways both at the cellular level and at the organismal level.