

Family Secrets

A Problem-Based Learning Case

Part 2

The Dilemma

Family Secrets

Part 2 The Dilemma

Narrator: Jenny had expected the doctor to give her some kind of lab test. But instead, the doctor began to talk to them about her grandmother's disease.

Dr. Day: Let me review this one more time to make sure I understand the facts. Jenny and Jeremy's grandmother just passed away. She was your ex-husband's mother and we know that she had Huntington's disease. Your ex-husband is not having any problem with his health at this time, but since he is relatively young, he could have the HD gene and not show any symptoms of the disease yet. He doesn't want to get tested, so we don't know if he has the HD gene or not. You want Jenny tested so you can help her prepare for her future. Is that pretty much it?

Mother: Yes, doctor. But I need to know how much testing costs. Does my insurance pay for it?

Dr. Day: Before we have that discussion, there are a number of other things we need to discuss first. However, before you and I talk, I would like to talk to Jenny privately for a moment, if you don't mind.

Mother: Well.....I guess that would be okay. I'll be in the waiting room.

Dr. Day: Jenny, I know what you are going through with your grandmother passing away. You should know that the last thing your grandmother would have wanted is for you to be sad. You heard what your mother and I were discussing just now. What do you think of all this?

Jenny: I don't know what to think. I know my mother wants the best for me. I loved my Grandma, but the last few years really made me scared about her Huntington's disease. Grandma was so helpless! When my mother told me I was going to get tested to see if I'll get the same disease, it really scared me. I don't know anything about this test. What happens if the test says I'll get Huntington's disease?

Dr. Day: Jenny, first, let me reassure you that I'm not going to give you a gene test today. Genetic testing requires informed consent from the person being tested. Because you are 16, and are legally considered a minor, testing for Huntington's disease is not recommended. You shouldn't be tested until you are 18 and can make this decision for yourself. I'll explain this to your mother before you leave.

Jenny: But I don't like thinking about getting this disease.....

Dr. Day: You're right. Worrying you may develop Huntington's disease is scary. You should know that some people decide to be tested and others, like your father, decide not to be tested. The decision about whether or not you should be tested for Huntington's disease is a very difficult one, but it's one you will need to make.

Jen: From the way Mom and my friends talk, I thought everybody got tested. Can you explain why my Dad refuses to get tested?

Dr. Day: No, because of doctor-patient confidentiality, I'm required to keep that conversation private. But it might be a good idea for you to ask him that question yourself. Many people with a family history of Huntington's disease spend years thinking about whether or not to be tested, so you should not rush into any decision.

Jenny: Mom and Dad never really explained much to me.....

Dr. Day: You need to learn more about Huntington's disease and learn more about genetic testing. You also need to think about what kinds of choices you could make and what the consequences of each of these choices could be. To help you with this, I'm going to recommend to your mother that she make an appointment for you to meet with a genetic counselor.

Jen: Uh, I don't think that my Mom will do that. She really doesn't like the idea of counselors getting involved in family stuff.

Dr. Day: Then I'll need to be sure that both you, and your mother, understand what genetic counselors do. They help people understand the information that they need so that they can make an informed choice for themselves. Genetic counselors don't tell people what to do. They are trained to help you think about how getting tested or not getting tested might affect your future and your family.

Jenny: Mom and Dad never really explained.....Talking to somebody who could answer my questions might help.

Dr. Day: Let's talk to your mother about scheduling a chance for you to meet with a genetic counselor. Do you have any questions for me before I talk to your mother?

Part 2 *Family Secrets* - Record of Individual and Team Work

Name: _____

Class: _____

FACTS

What are the facts of the case?

Part 2 *Family Secrets* - Record of Individual and Team Work

Name: _____

Class: _____

Questions

What questions do you have, or think others might have, about the case?

Parts 1 and 2 *Family Secrets* - Individual Research Log

Name: _____

Class: _____

Category

Category Question(s) for your research:

Source used: _____

What I found out:

Source used: _____

What I found out:



Source used: _____

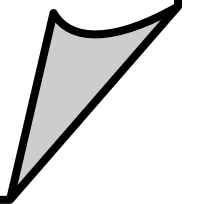
What I found out:



Parts 1 & 2 *Family Secrets* - Category Specialist Report Plan

Name _____ Class _____

What information will you present to your PBL team or to the class.



Family Secrets Part 2: The Dilemma **Quick Guide for Sample Lesson Sequence**

Overview

PBL Part	Class #	Check Off	Time	Strategy / Activity Name
The Dilemma	2			Script Reading: Part 2
				Individual Facts & Question: Part 2
				Team Brainstorm (F & Q)
				Categorizing Questions
				Round Robin of Questions
				Optional: HD video clip
	3			Jigsaw #1: Category Specialists research
	4			Jigsaw #2: Category Specialists report (Round Robin to whole class or "home" team reports)
				PBL Rubrics (early reflection) #1: Problem Solving #2: Team Processing
				Homework: Informed Consent

You will need

For each student:

- Student folders, s, from Part 1
- 1 copy per student of
 - *Family Secrets Part :2 The Dilemma* script
 - "*Part 2 Record of Individual and Team Work*"
 - "*Part 2 Student Research Log*"
 - PBL Rubric #1: Problem Solving (Part 1: Appendix F)

Per Team:

- Team Facts and Question posters from Part 1
- Additional large poster paper sheets for team
- 1 marker, a different color than one used in Part 1
- Lists of suggested Internet sites and computer access and/or printed resources for Part 2 (see Appendices A and B)

Per Class:

- Four highlighted copies of Part 2 script, one for each reader: Narrator, Mother, Jenny, Doctor

Class 2

- Students stay in same teams but should change roles
- Distribute *Part 2: The Dilemma* script and *Part 2: Record of Individual and Team Work*
- Read Part 2 as a class; assign one student to read each character's dialog
- Individual students write additional Facts and Questions on their *Part 2 Record of Individual and Team Work* sheets
- Teams brainstorm Facts and Questions and continue to record these on the large poster paper from Part 1 but in a different marker color
- Teacher leads class through Question Categorizing activity (see Part 1: Appendix D for options)
 - C = Causes and Inheritance Patterns
 - S = Symptoms
 - DT = Diagnosis and Treatment
 - F = Family Issues (not researchable)
- Teams categorize their own questions by writing category letters in front of their questions
- Teacher uses "Round Robin" strategy (Part 1: Appendix C) for sharing of Part 1 and 2 Questions by category. Teacher records on class category posters and individual students add new questions to their sheets (including category letters). Each team member becomes a Category Specialist.
- Individual and team folders collected

Class 3

- Jigsaw #1 (Part 2: Appendix D): Category Specialists meet in groups and divide the questions in that category equally
- Students record their assigned Category Specialist Question(s) on their *Student Research Log*.
- Teams receive selected print resources and/or internet website access
- Allow class time for Category Specialists groups to research information about their assigned questions on their *Student Research Log*. If time permits, Category Specialists exchange information in their Jigsaw #1 groups and get ready to report to their home groups in next class

Class 4

- Jigsaw #2 or Round Robin reporting out: Category Specialists report back to their “home” PBL teams on the answers to the question(s) that they researched, or Coach facilitates a whole-class Round Robin of answers to questions within each category
- Students, individually, complete PBL Rubric #1: Problem Solving (Part 2: Appendix E), putting number ratings in both the Individual and Team columns. This is the “early PBL” reflection, done by each student individually about their own and their team’s skill level so far during the PBL. The “post” reflection will occur as part of Part 5.
- Students meet in teams to compare ratings on PBL Rubric #2: Team Processing, and come to consensus on their work as a team.
- Coach collects both rubrics for each student, **and saves them for later use at the end of Part 5.**
- Students are given copies of the Informed Consent form (Part 2: Appendix F) to read for homework. This reading is both as background research material and as an introduction to some ELSI issues.

Family Secrets

Part 2 – The Dilemma

Detailed Instructional Guide

Overview

Jenny visits the doctor and learns that, once she becomes 18, she will need to decide whether or not to be tested for the Huntington's disease (HD) gene. She learns some of the facts and issues she should consider before she makes a decision about gene testing for the HD gene. In Part 2, students do research to learn about Huntington's disease and genetic testing (the process and its risks, benefits, and limitations), genetic counseling, and informed consent.

Objectives

After completing Part 2, students should provide evidence that they have:

- Identified relevant facts and questions based on the PBL scenario.
- Located, interpreted, and processed information about HD (symptoms, prognosis, cause, risks, diagnosis, prevention, impact of family)
- Located, interpreted, and processed information about gene testing (the process and its risks, benefits, limitations), genetic counseling, and informed consent.
- Made judgments about the reliability of sources and relevance of information.
- Applied their understanding of genetics (classical and molecular) to an autosomal dominant disorder.
- Applied their understanding of genes and DNA to the gene testing process.
- Become aware of psychological, ethical, legal, and social issues associated with the application of DNA technology.

Coach's Preparation

Before beginning Part 2, coaches should:

- Read and select Internet resources for student research that are appropriate for your students' ability levels. See Part 2: Appendix A for information about HD and Part 2: Appendix B for information on genetic testing. Copy printed resources for student research and/or arrange for internet access.
- Preview the Virtual Laboratory and consider its use as a demonstration or as a student activity.
 - Note that the "*Family Secrets* Gel Electrophoresis and Data Analysis" section of the Virtual Laboratory CD should not be used as a replacement for the

hands-on laboratory in Part 4 of *Family Secrets* unless a hand-on experience is not feasible.

- Note that the “*Family Secrets* Gel Electrophoresis and Data Analysis” sections on the Virtual Laboratory CD may be used as a follow-up for the hands-on lab. This virtual lab activity is based on using “real DNA” samples (not dyes, as is the hands-on lab activity done in Part 4 of the PBL) and contains some details not incorporated into the hands-on laboratory. Hint: the passwords are “gelsix” and “gelseven.”
- Preview and consider using the Genetic Testing PowerPoint. See Genetic Testing Power Point provided in the Part 2 folder
- Make one copy of *Family Secrets* Part 2 (including forms for student work) for each student.
- Review information about Categorizing the student’s Part 1 and 2 questions. See Part 2: Appendix C.
- Review information on the “Jigsaw” strategy in Part 2: Appendix D. Decide whether students will report on their individual research by using the Jigsaw strategy or Round Robin strategy.
- Have a supply of flip chart or 11”x17” paper and markers for group work.
- Review appendices from *Family Secrets* Part 1 Coach’s Guide.
- Use the PBL Rubrics #1 and #2 for early (or Pre-PBL) formative assessment. See Part 2: Appendix E – *PBL Rubrics*.
- Make one copy for each student of Part 2: Appendix F - *Informed Consent Form for the Huntington's Disease Direct Genetic Test*.
- Consider providing an additional class period in which students do their individual research. This will allow you to support the development of students’ research and literacy skills.

Concepts for Class Discussion: Background or Supporting Lessons

For their research, students will need to understand the concepts listed below. Lessons on these concepts may be completed as background information before Parts 1 and 2 (a more traditional approach), or may be provided as supporting lessons during Parts 1 and 2 (a more constructivist approach).

- Meiosis and fertilization
- Inheritance patterns
- Disease symptoms, cause, diagnosis, prognosis, treatment, and cure
- Predicting genetic risk
- Chromosomes, genes, and DNA

- DNA → Protein → Trait
- DNA structure, replication, translation
- DNA technology - PCR (polymerase chain reaction)
- DNA technology - molecular separation using gel electrophoresis
- Mutations
- Ethical, legal, and social implications/issues (ELSI)
- Technological risks, benefits, limitations, and tradeoffs
- Informed medical consent
- Role of health care professionals and support groups

Possible ELSI Coaching Questions

The questions students develop should include at least some of the ethical, legal, and social implications listed below. Teachers should not expect students to identify all of the issues or to use these vocabulary terms (in bold). Students may also identify additional ethical, legal, and social issues. These coaching questions may be used to direct students' focus as they begin to discover at least several potential ELSI issues. Encouraging students to compare genetic testing for HD with genetic testing for other genetic diseases helps them understand both the science and ELSI issues. These issues should be noted but will not be discussed further until Part 3.

- When (at what ages) should genetic testing be done?
- Why should genetic testing be done? What are the benefits (pros)?
- Why should genetic testing not be done? What are the risks (cons)?
- What are limitations of the genetic testing process that people should understand? Is it reliable and accurate? Is the testing process regulated? Should patient's have the test repeated (get a second opinion)?
- Why is making decisions about genetic testing difficult for people?
- What help and support is available for people with HD or people considering genetic testing?
- **Autonomy (right to decide)** - Can Jenny make her own decisions about medical treatment and diagnostic tests? Should minors be allowed to make medical decisions?
- **Beneficence (do good)** – Is her mother doing what is good for Jenny?
- **Non-maleficence (do no harm)** – Could having the gene test or finding out the results of the test harm Jenny?
- **Justice (be fair)** – Is her mother doing what is fair to Jenny and to her father?

- **Privacy/Confidentiality** - Can Jenny have a private discussion with her doctor without her parents' participation or knowledge? Why did Jenny's parents want to keep Grandma's HD a secret?
- **Informed consent** – Has Jenny been given enough information about the gene testing process? What options are available to Jenny when she sees the doctor?
- **Empathy**– Why is Jenny still grieving? Should her family be worried about her? Are other members of her family still grieving?
- **Stress** – How did Grandma's illness impact the family? Who cared for Grandma while she was ill?
- **Denial** – Why has Jenny's father refused to be tested? Why doesn't he want to know?
- **Autonomy (right to decide) - Beneficence (do good)** – Is her mother doing what is good for Jenny? Should the decision about genetic testing be made by the patient, by medical professionals, or by family members? Why don't genetic counselors make recommendations or make the decision for patients?
- **Non-maleficence (do no harm)** – Could having the gene test or finding out the results of the test harm Jenny? How might Jenny's decision harm others? How might gene testing harm others or society in general?
- **Beneficence (do good)** - Is her mother doing what is good for Jenny? How might Jenny's decision help others? How might gene testing benefit others or society in general?
- **Justice (be fair)** – Is her mother doing what is fair to Jenny and to her father?
- **Privacy/Confidentiality** - Can Jenny have a private discussion with her doctor without her parents' participation or knowledge? Why did Jenny's parents want to keep Grandma's HD a secret? Who has the right to know the results of genetic testing - family, friends, insurance companies, employers? Who should Jenny tell about the results of her tests?
- **Informed consent** – Has Jenny been given enough information about the genetic testing process? What options are available to Jenny when she sees the doctor? What should Jenny know about genetic testing before she decides? How does she learn this? How do health care professionals provide adequate patient education?
- **Empathy**– Why is Jenny still grieving? Should her family be worried about her? Are other members of her family still grieving?
- **Stress** – How did Grandma's illness impact the family? Who cared for Grandma while she was ill?
- **Denial** – Why has Jenny's father refused to be tested? Why doesn't he want to know?
- **Compassion** – Are the family members showing the appropriate empathy for others? Why is making a decision about genetic testing difficult for Jenny? What kind of

support or help do people and families need in coping with the stress of HD and HD testing?

- **Morality** - Are there religious beliefs that might conflict with genetic testing?
- **Honesty** - Is it honest to not share the family history of genetic disease or the results of gene testing with others?
- **Respect** - What would Jenny's friends do if they knew about the HD in her family? Could having a family history of HD or having HD lead to social discrimination - in families, friendships, school, employment?
- **Golden Rule** - How would you want to be treated if you had HD or were considering HD testing?

Sample Lesson Sequence:

Part 2: The Dilemma – Classes 2, 3, and 4

Estimated Time (min.)	Summary of Steps	Suggested Strategies
Class 2		
	Describe goals Read aloud Part 2	<ul style="list-style-type: none"> • Students work in same groups as they did for Part 1 • Coach explains the purpose of Part 2 is to learn more about gene testing - the process, risks, benefits, limitations, and ELSI issues. • Coach distributes copies of <i>Family Secrets</i> Part 2 to all students. • Students are asked to listen and highlight important <u>Facts</u> and <u>Questions</u> as the PBL is read aloud. • Three students read aloud to class - Narrator, Jenny, and Father
5	Individual student work	<ul style="list-style-type: none"> • Students work individually to make a list of <u>Facts</u> and <u>Questions</u> related to genetic testing. They record their work on a <u>new</u> <i>Family Secrets Part 2 - Record of Individual and Team Work</i> form.
10	Teams brainstorm Facts and Question	<ul style="list-style-type: none"> • Coach asks students to switch group roles. • Recorder continues to add <u>Facts</u> and <u>Questions</u> to the team's Part 1 charts. Additional sheets of paper may be necessary. • Recorder should use a different color of marker for the new information. • Teams brainstorm and make a new list of <u>Facts</u> they know about gene testing from the <i>Family Secrets</i> Part 2 scenario. • Teams brainstorm and make a new list of <u>Questions</u> they have about gene testing from the <i>Family Secrets</i> Part 2. • As the team works, each student should record additional <u>Facts</u> and <u>Questions</u> on his/her <i>Record of Individual and Team Work</i> forms. • Coach asks one or two different ELSI or science coaching questions to each team.
8	Categorizing Questions	<ul style="list-style-type: none"> • Coach puts four column headings on board/transparency/poster paper: SP-symptoms and prognosis, CR-cause and risks (inheritance patterns), DT-diagnosis and treatment, FI- family issues. See Part 2: Appendix C. • Coach asks students to work with their team to classify each of their questions by writing the letters SP, CR, DT, or FI in front of each of their team's questions.

10	Round Robin sharing questions	<ul style="list-style-type: none"> • Coach directs “Round Robin” sharing of <u>Questions</u> by asking teams to share questions for the “SP-symptoms and prognosis category.” • Repeat using each of the remaining categories. • Teams should report only new <u>Questions</u> that were not already reported by other teams.
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Estimated Time (min.)	Summary of Steps	Suggested Strategies
Class 3		
10	Category Specialists Meet	<ul style="list-style-type: none"> • Each team member is assigned as a Category Specialist for one category. • Category Specialists meet and divide the questions from that category evenly. • Each Category Specialist records his/her assigned <u>Question(s)</u> on the <i>Student Research Log</i>. • Coach distributes print resources (selected to be appropriate for class reading level) and/or provides list of suggested internet websites and computer access.
30	Category Specialists Research	<ul style="list-style-type: none"> • Category Specialists use print and/or internet resources (Part 2: Appendix A and B) to gather information about their questions
	Optional video	<p>If time permits, coach could show :</p> <ul style="list-style-type: none"> • Video on demand http://www.learner.org/resources/series142.html then select #12 Huntington's disease. Registration is free. • Part 1 of the Virtual Laboratory which provides background on Huntington's disease. • Selected video clips from http://www.ygyh.org/hd/have.htm

Estimated Time (min.)	Summary of Steps	Suggested Strategies
Class 4		
20		<p>Round Robin Class Report Strategy</p> <ul style="list-style-type: none"> • Coach asks students from the SP - Symptoms and Prognosis category to report on what they learned when they researched their question(s). • Repeat for other categories. <p style="text-align: center;">OR</p> <p>Jigsaw Strategy</p> <ul style="list-style-type: none"> • Students do "Jigsaw Part 1" (see Appendix C - <i>Jigsaw</i>) by meeting in Category Specialist groups. Category Specialist groups share and organize the results of their research. • They plan for a 5 minute presentation to their own PBL team. This presentation should summarize the important and relevant information that they will explain to their team members. • Team members do "Jigsaw Part 2" by returning to their PBL team. They present the 5-minute summary of their research to members of their PBL team.
20	PBL Rubrics	<ul style="list-style-type: none"> • Coach distributes copies of PBL Rubrics #1 and #2 to each student. • Students complete PBL #1 individually, rating themselves and their team and putting the rating number in the Individual and Team columns • Students complete PBL #2 individually, rating their team by putting the rating number in the Individual Column • Students meet as a team to compare individual Rubric #2 ratings and arrive at a consensus rating for the team; consensus ratings are put into the Team column of Rubric #2. • Coach collects and saves these rubrics for important later use in Part 5.
Homework		<p>Coach assigns reading the "Informed Consent Form for the <i>Huntington Disease Direct Genetic Testing</i>" (Appendix F). Students are asked to sign the form only if they would agree to be tested. They should also write an explanation of why they would choose or would not choose to be tested. This could be collected before Part 3 or before Part 4.</p>

Part 2: Appendix A

Huntington's Disease (HD) Main Concepts

What is HD? What part of the body is affected and how?

- HD is a brain disorder which causes specific cells of the brain die. HD is a progressive disease caused by the degeneration of nerve cells.
- 3 main symptoms of HD:
 - Physical: movement disorders (chorea), twitching
 - Emotional: personality changes, depression, aggressive outbursts
 - Cognitive: memory loss, dementia
- Age of onset of HD symptoms: 30-45 (can be as young as 5 and as old as 70)
- People do not die of HS itself, but rather from a complication of the disease, such as choking or infection.
 - Death from HD usually occurs about 15-20 years after the onset of the disease

What causes HD?

- HS is an Inherited genetic disorder of huntingtin gene, located on chromosome 4
 - The huntingtin protein is found in cells throughout the body, not just the brain
 - The mutant form of the huntingtin protein is found in people who have HD
 - In people with HD the mutant huntingtin protein interacts abnormally with other proteins to form protein products that are toxic to cells in the brain.
- HD is a dominant genetic mutation
 - Each child of an affected parent has a 50% chance of inheriting HD. Those who do not inherit the mutant gene will not develop the disease, and they will not pass the disease on to their children.
 - HD occurs in about 1 in 10,000 people in the United States. About 30,000 people in the U.S. have HD, and another 150,000 are at risk for HD.
- The HD gene mutation involves repeats of the DNA nucleotides CAG within the huntingtin gene ("tri-nucleotide repeats")
 - The "normal" gene has 35 or fewer CAG repeats
 - The HD mutant gene has 36 or more CAG repeats (sometimes, more than 100 CAG repeats)

How is HD diagnosed?

- A “clinical diagnosis” of HD (diagnosis of HD symptoms) includes:
 - Neurological and psychological testing
 - A detailed family history

- Genetic testing for HD
 - DNA testing uses a small amount of blood – DNA is extracted from white blood cells
 - The huntingtin gene is amplified (using the polymerase chain reaction) so that there are millions of copies of it in the small sample of DNA.
 - The huntingtin gene is analyzed (using agarose gel electrophoresis) to see how many CAG repeats there are.

- Who is it possible to test?
 - Symptomatic adults (clinical testing and genetic testing)
 - Asymptomatic adults (genetic testing)
 - Asymptomatic children (genetic testing)
 - Prenatal testing (genetic testing)

Treatment for HD

- No “cure” is available for HD
- Certain drugs can slow down the symptoms of HD
- HD has an enormous impact on family members

Huntington Disease

Internet Resources

1. *Huntington Disease*

Huntington disease information presented in a very user-friendly, comprehensive web site. Wonderful animations, video-clips and great text. Provides information in HD, symptoms, inheritance, genetic screening, treatment, and interviews with families of HD patients.

Dolan DNA Learning Center, *Your Genes, Your Health* web site.

<http://www.ygyh.org/hd/whatisit.htm>

2. *Fast Facts about Huntington's Disease*

From the Wisconsin Chapter of the Huntington's Disease Society of America.

http://www.hdsawi.org/fast_facts.html

3. *National Institute of Neurological Disorders and Stroke*

Huntington's Disease Information

http://www.ninds.nih.gov/health_and_medical/disorders/huntington.htm

4. *The Huntington's Disease Society of America*

A national non-profit voluntary health agency that is dedicated to finding a cure for HD while providing both vital services to improve the lives of those affected by HD, and support and guidance for HD families.

<http://www.hdsa.org/>

5. *Hereditary Disease Foundation*

A non-profit, basic-science research organization dedicated to the cure of genetic disease.

<http://www.hdfoundation.org/>

6. *HOPES: Huntington's Outreach Project for Education, at Stanford*

This is a public web resource on Huntington's Disease. The site contains information about HD, including background information, diagnosis, and treatment. Excellent graphics for basic genetics concepts.

<http://www.stanford.edu/group/hopes/>

7. *Huntington's Disease Advocacy Center*

The Huntington's Disease Advocacy Center provides help to caregivers, families, and patients with Huntington's Disease.

<http://www.hdac.org/>

8. *National Organization for Rare Disorders (NORD), Inc.*

Information on Huntington's Disease

http://www.rarediseases.org/search/rdbdetail_abstract.html?disname=Huntington%27s%20Disease

9. GeneReviews - Huntington Disease

Comprehensive information about HD, including diagnosis, testing, management, genetics, genetic counseling. A good background article for teachers and advanced students.

<http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=gene&part=huntington>

10. Genetics of Huntington Disease

Description, with diagrams, of the inheritance pattern of Huntington's Disease. Kansas University Medical Center.

<http://www.kumc.edu/hospital/huntingtons/genetics.html>

11. Molecular Genetics of Huntington's Disease

Description and diagram of the molecular biology of the HD gene product, huntingtin. Society for Neuroscience

http://web.sfn.org/index.aspx?pagename=brainBriefings_huntingtons_disease

12. Huntington's Disease: Hope Through Research (44-pages)

Very comprehensive booklet, with photos and diagrams. Topics include: causes of HD, effects of the disease, diagnosis, genetic testing, treatment, community resources, research. Also includes a glossary of terms.

National Institute of Neurological Disorders and Stroke.

http://www.ninds.nih.gov/health_and_medical/pubs/huntington_disease-htr.htm

13. Huntington's Disease Video (~7 minutes)

In this video from Annenberg Media, Inc., Dr. Nancy Wexler of the Hereditary Disease Foundation and Columbia University recounts her research on the demographics, symptoms, and genetic cause of this debilitating illness. The video also explores ethical and moral dimensions of DNA testing, which can determine who will develop the disease. Register for free to view the video at:

<http://www.learner.org/resources/series142.html#>

Part 2: Appendix B

Genetic Testing Main Concepts

What is genetic testing?

Use of a DNA-based diagnostic test to determine if an individual has a gene associated with a genetic disorder. Currently there are several hundred genetic tests in clinical use and their numbers are expected to increase rapidly over the next decade. Once a gene associated with an inherited disorder has been isolated and investigated, scientists can usually develop a test that detects either:

- a mutation of the DNA code in the gene
- an abnormal protein product of the gene

When/Why is genetic testing done?

Genetic testing may be used for:

- pre-implantation diagnosis to select normal embryos for in vitro fertilization
- prenatal diagnosis to determine if a fetus may be affected by a genetic disorder
- neonatal (newborn) screening to permit prompt treatment for a genetic disorder
- pre-symptomatic testing to determine the risk for adult-onset genetic disorders or genetic predispositions
- carrier screening to identify unaffected individuals who carry a defective gene that could be passed to their offspring
- diagnostic testing to confirm the diagnosis for individuals who exhibit symptoms of a genetic disorder
- forensic or identity (paternity) testing

What are some limitations to genetic testing?

For some diseases, the current tests have limitations that may include:

- failure to detect every mutation associated with a particular genetic disease
- there may be different disease risks for individuals due to the influence of other genes or environmental factors.
- possibility of inconclusive results or false positive/negative results
- lack of effective treatment or preventative measures for the disease
- variable accuracy of tests for different diseases
- lack of government regulation to assure reliable test procedures
- lack of available tests or high cost of tests for some genetic disorders (particularly rare disorders)
- need for education of healthcare providers and patients about informed consent and interpretation of test results

What are some benefits of genetic testing?

The results of genetic testing may be used to assist physicians and patients in:

- determining appropriate treatments
- identifying people at high risk of conditions that are preventable (for example by change in diet or frequent medical monitoring)
- making informed life choices (relationships, family planning, career, support systems, etc.)

What are some risks of genetic testing?

There are concerns for both patients and their families that genetic testing may lead to:

- emotional and psychological effects
- discrimination related to insurability and employment
- social stigmatization
- privacy/confidentiality issues related to appropriate access to genetic information
- legal issues surrounding potential use and misuse of genetic records
- inequity of access to testing (cost, awareness, availability)

How can people get help in making a decision about genetic testing?

Individuals who have, or have a family history of, genetic disorders should seek help from medical geneticists (an M.D. specialty) and genetic counselors (graduate degree training) through a genetic testing center. These professionals can:

- explain the disorder and review available options for genetic testing and possible treatment
- provide pre-testing counseling to assure patient's informed consent, which includes understanding of risks, benefits, and limitations of testing
- address personal, ethical, legal, and social issues of concern for patients/families
- provide post-test support to assist patients/families addressing the impact of test results

Genetic Testing - Resources

Internet Resources for Students

- 1. *Your Genes Your Health: Huntington's Disease-How is it Diagnosed***
Outstanding animations for the gene testing process.
<http://www.ygyh.org/hd/diagnosis.htm>
- 2. *Fast Facts about Huntington's Disease***
Highly student friendly site for basic HD information including genetics concepts needed to understand gene testing. Effectively incorporates basic biology concepts through information and graphics.
http://www.hdsawi.org/fast_facts.html
- 3. *Gene Testing***
Highly recommended web resource for information on gene testing. It includes many links that students could follow to address issues related to gene testing.
http://www.ornl.gov/sci/techresources/Human_Genome/medicine/genetest.shtml
- 4. *Understanding Gene Testing***
On-line tutorial version of printed booklet. Illustrates what genes are, explains how mutations occur and are identified within genes.
<http://www.cancer.gov/cancertopics/understandingcancer/genetesting/allpages>
- 5. *What Is a Genetic Counseling?***
Information on genetic counseling as a career. Includes links.
http://www.genetichealth.com/Resources_What_Is_Genetic_Counseling.shtml
- 6. *Huntington's Disease Advocacy Center***
Illustrates what it is like to have HD or support a family member with HD. See particularly "Families" and "Finding Resources and Advocating for those with Huntington's Disease".
<http://www.hdac.org/>
- 7. *The HD Lighthouse***
Another user friendly site designed for families with HD. Click on Diagnosis for information on gene testing.
<http://www.hdlighthouse.org/>
- 8. *Genetic Testing for Huntington's Disease***
Comprehensive discussion of gene testing for HD. Includes an explanation (with diagram) of the testing procedure.
HOPES: Huntington's Outreach Project for Education at Stanford
<http://www.stanford.edu/group/hopes/diagnosis/genetest/s0.html>
- 9. *Predictive Testing for Huntington's Disease***
Comprehensive discussion of gene testing for HD including a variety of issues.
University of Virginia Health System
<http://www.healthsystem.virginia.edu/internet/hunt/disease/geninfo.cfm>

- 10. *Informed Consent Form for Huntington's Disease Direct Genetic Test***
Example of form signed by patients at a genetic testing center.
University of Virginia Health System
<http://www.healthsystem.virginia.edu/internet/huntndisease/appendix.cfm>
- 11. *Genetic Testing: The Case For and Against Testing***
Presents the cases for and against genetic testing. Easy to understand.
University of Chicago
<http://www.lib.uchicago.edu/~rd13/hd/testing.html>
- 12. *Medical risks, benefits and uncertainties of genetic testing***
A concise and well organized introduction to the ethical, legal, and social implications of genetic technology. Written in student friendly language.
Bionet Online
http://www.bionetonline.org/English/content/gh_eth.htm

Internet Resources for Teachers and Advanced Students

- 13. *Promises and Perils of Biotechnology: Genetic Testing***
Activities, handouts, video material, and resources. Consider ordering the video that shows a genetic counseling session for young woman who is considering testing for HD.
<http://www.accessexcellence.org/AB/WYW/wkbooks/PAP/index.html>
- 14. *HOPES: Huntington's Outreach Project for Education, at Stanford***
See particularly the diagnosis section and the graphics. Well worth the time to explore the variety of HD, genetics, and nervous system resources. Excellent graphics for basic genetics concepts.
<http://www.stanford.edu/group/hopes/>
- 15. *The Center for Genetics Education***
This Australian website has a number of genetics fact sheets on a variety of topics, including HD and gene testing. These fact sheets are concise and well illustrated.
<http://www.genetics.com.au>
- 16. *Hereditary Disease Foundation: Huntington's Disease-Testing***
A variety of links to various sites related to testing for HD.
<http://www.hdfoundation.org/home.php>
- 17. *GeneTESTS***
Highly detailed information on HD provided for physicians. Only for advanced students or teachers. Click on Gene Reviews and enter "Huntington's."
<http://www.genetests.org/>
- 18. *Gene Testing in a clinical setting***
<http://www.accessexcellence.org/AE/AEPC/BE02/zanko/>
Access Excellence site with information on genetic counseling for HD.

19. Newborn Genetic Screening

Website examines issues associated with testing of newborns for genetic diseases.
<http://learn.genetics.utah.edu/content/health/ngs/index.html>

Activity resource packet: <http://teach.genetics.utah.edu/content/health/ngs/NGS-student%20packet.pdf>

20. Understanding Gene Testing – booklet or online tutorial

Provides extensive but understandable information on genes, mutations, gene testing, and risks/benefits. Most examples related to cancer genetics rather than Huntington's disease. Excellent graphics.

<http://www.cancer.gov/cancertopics/understandingcancer/genetesting/allpages>

Free print copies: **NIH Publication No. 97-3905** National Cancer Institute, Cancer Information Service, 31 Center Drive, MSC 2580, Building 31, Room 10A16, Bethesda, MD 20892-2580, **1-800-4-CANCER**

Access Excellence and National Cancer Institute

26. Genetic Testing in a Clinical Setting

Extensive information and activities related the role of a genetic counselor. Huntington's disease patients are used as an example.

<http://www.accessexcellence.org/AE/AEPC/BE02/zanko/>

21. Guidelines for Genetic Testing for Huntington's Disease

Information for healthcare professionals that specifies recommended procedures for HD gene testing and informed consent.

Huntington's Disease Society of America, Inc.

<http://www.hdfoundation.org/html/hdsatest.php>

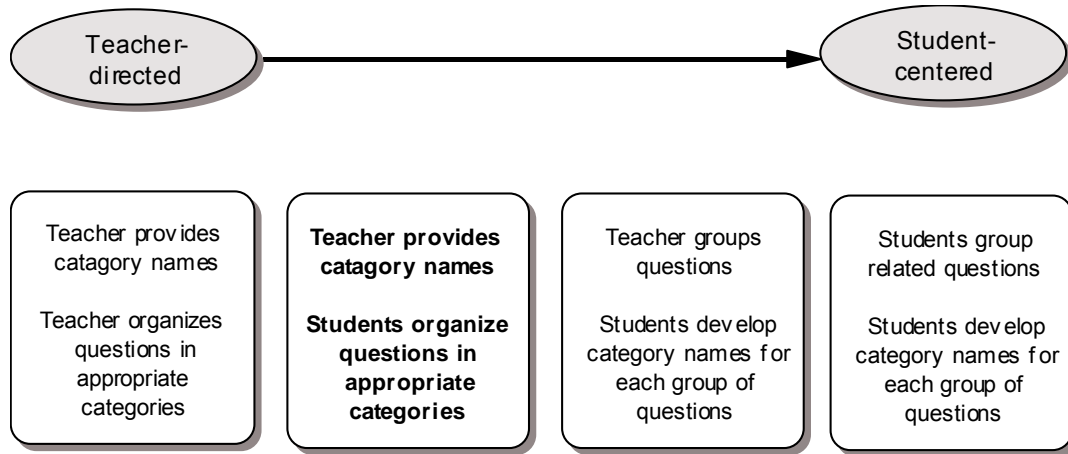
22. Genetics Fact Sheets

Centre for Genetics Education in Sydney Australia

<http://www.genetics.com.au/factsheet/index.asp>

Part 2: Appendix C – Categorizing Strategy

Teachers should provide strategies to assist students with organizing their questions into categories. These strategies may range from teacher-directed to student-centered. The strategy described in the Coach’s Guide for *Family Secrets* Part 1 is illustrated below in bold.



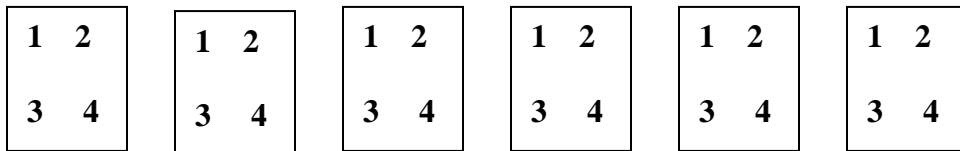
Sample Posters/Chart

SP Symptoms Prognosis	CR Causes Risks (inheritance)	DT Diagnosis Treatment	FI Family Issues

Part 2: Appendix D – Jigsaw Strategy

Jigsaw is most effective for learning activities that include questions that are challenging and are open-ended, require interpretation, and/or encourage students to offer opinions. To implement this strategy, PBL teams divide task and assigns portions (1, 2, 3, 4) of the research task to each member. Each PBL team member is assigned a portion of the task, such questions they will answer, roles that they will play, or topic about which they will learn more about. These questions, roles and topics become the subject of their expert research.

PBL teams:

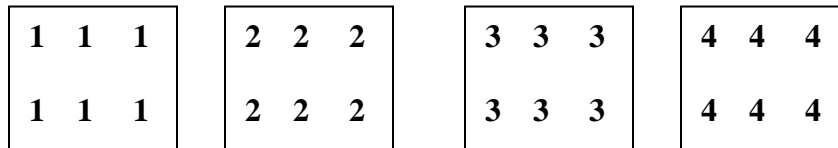


Students then leave their PBL teams form expert groups composed of students who will research information about the same questions or role or topic.

Jigsaw Part 1 – Learn in Expert Groups (Category Specialists)

Members of each expert group work to complete their assigned portion of the task.

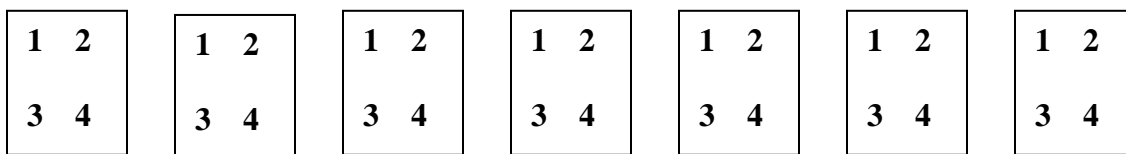
Expert groups:



An expert group uses available resources to complete and share relevant research. All members of the expert group prepare to share what they have learned with their PBL team. Each person will have to share their research with other members of their PBL team.

Jigsaw Part 2 – Present to PBL teams

Students return to their PBL teams. They are now experts who present the information to the members of their PBL team.



The teacher's role is to circulate among expert groups and PBL teams to correct misconceptions or provide assistance/clarification.

Appendix E - Problem Based Learning (PBL) Rubrics

#1: PROBLEM SOLVING RUBRIC

Student:	1 Limited	2 Developing	3 Proficient	4 Advanced	5 Exemplary	Self	Team
Identifies Relevant Facts (“What do we know?”)	Cannot identify facts, or mixes facts with opinions.		Identifies most relevant facts.		Helps distinguish facts from opinions/inferences.		
Asks Relevant Questions (“What more do we want to know?”)	Asks no questions or ones unrelated to script.		Asks basic kinds of “who, what, where, when” questions.		Asks higher-level questions which reflect depth of thought.		
Organizes Questions for Research	Is unable to organize questions into categories.		Organizes questions into appropriate categories.		Identifies questions that fit into multiple categories.		
Selects Useful Information from Appropriate Sources	Cannot locate information to answer research questions.		Obtains relevant information from key sources provided.		Obtains reliable and wide-ranging information from sources beyond those provided.		
Organizes and Presents Information Effectively	Does not organize information to clearly present answers to research question(s).		Organizes information to clearly present answers to research question(s)		Summarizes information from many sources; presentation is concise accurate, and insightful.		
Identifies Major Problem(s) and Stakeholders	Cannot state a major problem or identify important stakeholders.		Identifies major problem and major stakeholders.		Distinguishes between major & minor problems; identifies direct & indirect stakeholders.		
Develops Multiple Solutions to Major Problem(s)	States only one (obvious) course of action to major problem.		Develops two or more solutions to the major problem(s)		Develops multiple solutions based on pros/cons and stakeholder perspectives.		
Chooses a Course of Action and Supports Choice	Cannot select or support a course of action.		Selects and supports a course of action based on ethics <u>or</u> risks/benefits to one stakeholder		Selects a solution based both ethics and risks/benefits to multiple stakeholders		

#2: PBL TEAMWORK AND TEAM PROCESSING RUBRIC

Team Members:	1 Limited	2 Developing	3 Proficient	4 Advanced	5 Exemplary	Self	Team
Distribute Tasks	Do not distribute tasks equally.		Distribute tasks equally.		Distribute tasks based on team members' skills.		
Collaborate & Contribute Equitably	Let one or two team members do most of the work.		Ensure that all team members contribute fully.		Know and encourage each other's strengths to do quality work.		
Manage Conflict	Do not recognize or take action to reduce conflict		Resolve conflicts to continue to stay "on task."		Identify and actively use "win-win" solutions to manage conflict.		
Use Brainstorm "Rules"	Do not use brainstorm "rules"; allow others to block the process.		Follow brainstorming "rules" and contribute ideas equally.		Develop new "rules" as needed to facilitate the brainstorming process.		
Effectively Reflect on Teamwork	Do not contribute to discussions about their work as a team.		Use the results of this rubric to suggest ways to improve teamwork.		Regularly monitor and assess teamwork of individuals and group as a whole.		
Build Consensus	Do not attempt consensus process.		Use consensus process to work effectively.		Seek out feedback and process this information to improve teamwork.		
Manage Time	Do not monitor their progress or recognize time constraints.		Use time efficiently and complete all tasks on time.		Regularly monitor and assess progress to exceed task expectations.		
Produce Quality Work	Show no, or limited, attention to making quality products.		Create high school products that meet expectations		Create products that resemble practicing professionals "in the field."		
Stay on Task	Are easily distracted or frequently go "off task."		Use time in focused & productive ways.		Create work-plan agenda and monitor progress.		
Come Prepared	Are not consistently prepared with needed materials.		Are consistently prepared with needed materials.		Take time daily to assure that materials are ready for next work session.		
Maintain Positive Attitude	Exhibit negative behaviors; use "put down" expressions.		Exhibits positive attitudes/behaviors towards work and others.		Assist others in maintaining positive attitudes and behaviors.		

Part 2: Appendix F: Informed Consent Form

Informed Consent Form for the Huntington's Disease Direct Genetic Test

Modified from document at <http://www.healthsystem.virginia.edu/internet/hunt/disease/appendix.cfm>

I understand that the gene for HD has been found and is located on Chromosome 4. It has been described as having a trinucleotide (CAG) repeat mutation. It is the size of this trinucleotide repeat which determines whether or not HD will be expressed. The blood test will determine the size of this CAG repeat.

I understand that there can be three outcomes to my test:

1. Negative: I will be told that the CAG repeat size is in the normal range (35 or fewer repeats) and that I am not likely to develop HD.
2. Positive: I will be told that the CAG repeat size is expanded into the HD range (40 or more repeats) and that I am highly likely to develop HD at some point in my life.
3. Uninformative: I will be told that the CAG repeat size is in the intermediate range (36-39 repeats) and that it is unclear whether I will or will not develop HD at some point in my life.

I understand that a positive test result cannot tell me when I will begin showing signs of HD. I understand that the diagnosis of the onset of HD can only be made through a neurological exam.

If available, it is recommended that this blood test first be performed on an affected family member in order to confirm the presence of HD in my family.

I agree to participate in the counseling sessions and neurologic exam required for the test. Sessions will last from one to three hours. I am aware that the neurological examination may disclose that I have clinical signs of Huntington's Disease. Time between sessions will vary depending upon my own desire for space between visits and the number of other people scheduled for testing and neurologic consult. I understand that during this time I will take part in psychological evaluations, including in-depth interviews regarding my attitudes toward predictive testing, how I could react to various test outcomes, my personal relationships, how I would handle these and other aspects of psychological functioning which have a bearing on the testing procedure.

I agree to have a neurological exam. I am aware this examination may show that I have clinical signs of HD and I will be told of my results if I so request. The neurological exam can also sometimes be indeterminate and an accurate diagnosis may require further exams at later dates.

I agree to select and meet with a local therapist (social worker, psychologist, psychiatrist, minister). I understand it is critical to have this emotional support in place before the test results are given; you will help me to identify an appropriate therapist in my area, if requested. This person should be someone whom I can trust and feel comfortable discussing HD with. I agree to provide the name of this person to you so that you can contact this person and let him/her know that the members of the Huntington's Disease team will serve as a resource regarding HD. At least one follow-up session with the HD team

psychologist is recommended with a positive test result. More may be requested as they are needed and desired.

I am fully aware that my decision to seek testing in the program is wholly voluntary and that I can choose to withdraw at any time without jeopardy to my medical care. If I decide to withdraw from the program, I agree to at least one visit with the test staff following my decision. I also understand that the HD program staff may decide to postpone my testing. The reasons for doing this will be fully explained to me.

I understand that I am encouraged to have a companion of my choice to act in a support-giver capacity. This companion may accompany me through the entire program or parts of it as I choose.

The risks of such testing are primarily psychological. A negative result, indicating that I am not likely to develop HD, can produce feelings of guilt as well as joy. A positive result, indicating that the HD gene is present, could lead to serious psychological consequences including feelings of depression, futility, despair, and severe stress. An uninformative outcome can be frustrating and can intensify the ambiguity of the risk situation or can provide relief. Counseling provided during the testing process is designed to help me adjust as well as possible to negative, positive, or uninformative information. Counselors will discuss with me other possible risks such as difficulties with confidentiality, employment, or insurance.

Physical risks include the discomfort of a needle prick and the possibility that a bruise may form as a result of blood being drawn.

I understand that I will be responsible for the costs of testing, which should be about \$1500-2000 on average. Some of these costs may be covered by third-party coverage, but insurance payment will require disclosure of test information.

I understand that all information will be held strictly confidential. The results of testing will be given only to me, in person, and will be released only with appropriate consent from me or other appropriate legal consent. I understand that DNA testing results, as with all genetic information, may adversely affect my employment, ability to keep or maintain insurance and/or rates of insurance coverage. I am aware that although your lab will maintain confidentiality of samples and test results, you cannot guarantee that this information will not be obtained by subpoena by other third parties. I also understand that information about myself/family member's test results may be requested by family members/myself by third parties and that failure to give this information may be considered fraudulent.

Results from this clinical genetic testing will be sent by written report to the referring professional. They will discuss the results, the laboratory interpretation and answer questions. Testing center staff will be available to discuss testing protocol/methodology, test results and interpretation and to answer questions if needed.

Results will NOT be entered by us into your medical record and is stored in our files with a code number identifier only. Access to these records is restricted in accordance with applicable laws. You should be aware that genetic information, including molecular DNA test results, may influence insurance and/or employers regarding your health status.

Information obtained from the test may be used in scientific publications, but the identity of all persons in the test will not be revealed in such publications or in any other report. I have given accurate information about the biological relationships of my family members to the best of my ability and understand that incorrect information may result in an incorrect diagnosis. I also understand that DNA testing on multiple family members may indicate that a person named as a father of an individual may not be that individual's biological father (i.e., non-paternity).

Despite the highly accurate nature of this testing and laboratory quality control measures, errors (false positives and false negatives) may occur at a frequency estimated to be less than 1%.

We currently do not offer presymptomatic DNA testing to those under the age of 18 years. We do offer fetal testing and pre-implantation diagnostic testing for IVF embryos. My signature on this form signifies that I have decided to participate in this testing program after reading the above information. I have been given the opportunity to discuss pertinent aspects of the testing program, to ask questions, and hereby consent to participation in the testing outlined above.

Indicate below whether you agree, or do not agree, to be tested to see if you have the HD gene.

- I REQUEST predictive testing for the presence of the Huntington's Disease gene.
- I DO NOT REQUEST to have predictive testing for the presence of the Huntington's Disease gene.

Patient name (please print) _____

Patient signature _____ Date _____