The function of education is to teach one to think intensively and to think critically. Intelligence plus character - that is the goal of true education. ~ Dr. Martin Luther King Jr.

Pictured on the right: my Lovely mother in white, me In black and my son Ayden

I believe strongly that the most important objective of being an educator is to provide my students with a safe, secure, and nurturing learning environment where they can increase in knowledge, develop critical thinking skills, learn how to work together to develop problem-solving strategies, and become responsible citizens in their community. To achieve these goals, parents, teachers, and their surrounding community must collaborate to create an atmosphere and culture where learning can take place. My goal is to provide the opportunity for all students devoted to learning a chance to succeed academically and expand their knowledge and understanding. It is my duty as a teacher, to keep my students interest in the field of science. I wish to help my students become scientifically literate in a world that inundates us with medical issues and technological advancements. Science is about discovery and I want my students to be involved in their learning. I look forward to changing lives one day at a time. ~~~Ms. Amesheia Scruggs Secondary

DNA Structure and Replication

9th grade Biology **Ms. Amesheia Scruggs** Summer 2013

Lesson Overview

Rationale: The study of DNA/genetics has completely revolutionized our knowledge in Biology – it is the code to life, so to speak. Anything living has DNA; this includes insects such as bumble bees, plants and peas. By studying DNA we have been able to figure out genes responsible for many things – everything from why some flowers are certain colors to which parts of our DNA are responsible for hair color and everything in-between. Furthermore by studying DNA, we have been able to figure out much about evolution and how species evolve – in particular sorting out how different plants and animals are related to each other. Understanding how DNA mutates, changes and replicates is also important, as it can inform us about the underlying mechanisms that cause DNA to change. The effect of the discovery of DNA on scientific and medical progress has been enormous, whether it involves the identification of our genes that trigger major diseases or the creation and manufacture of drugs to treat these devastating diseases. It is critical for our students to know the importance of DNA and learn how it is structured and replicated; the future is counting on this upcoming generation to take us to the next level. While the discovery of DNA has been a significant one in the twentieth century, it will continue to revolutionize medicine, agriculture, forensics, paternity and many other important fields in society today. Our scholars can be the next scientists to further explore DNA and make new discoveries. DNA research encompasses an evolving area of progress and continued funding and interest in its relevance will likely fuel new discoveries in the future.

Summary: Students will learn the function of DNA and why it is so important in Biology. Students will be able to describe the structure of the DNA molecule. Students will learn basic DNA structure and be able to explain the rules of base pairing while building a 3D model of DNA. Students will be modeling the process of DNA extraction in several experiments. Students will understand that information is stored within the DNA molecule in the form of its sequence of chemical bases, each referred to by the first letter of its name (A, T, C and G). Students will know that DNA is the molecule that causes each Individual to be different. Students will relate the size and location of DNA to other parts of the body, such as the cell, nucleus, and tissues. . Students will identify and evaluate different uses of DNA typing techniques and pair three murder cases with a technique. Students will play Codon Bingo that involves deciphering the genetic code. Students will create a display DNA poster at the end of the unit.

Objectives:

- CCSS.ELA-Literacy.RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics*.

- CCSS.ELA-Literacy.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.

- CCSS.ELA-Literacy.RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Essential Questions:

- **How does DNA replicate and why is it necessary for this process to take place?**

- **How can DNA be studied and manipulated?**

- **How is DNA used by scientists?**

- **How did Watson and Crick discover the structure of DNA and how did the work of other scientists play a role?**

Time frame: 4 weeks

Materials & Resources: School: computer lab, Smart board, overhead projector
Teacher: transparencies, student handouts, 3 case studies, licorice, Marshmallows, toothpicks, alcohol, detergent, enzymes (meat tenderizer), paper clips, masking tape, drinking straws, strong needle,
Student: scissors, paper glue, markers, pen/pencil

Means of assessment:

Formative: Student learning will be formatively evaluated based on daily participation in classroom discussions and in-class assignments and experiments, comprehension questions, literacy strategies and project deadlines.

Summative: The summative project will be a display poster of DNA replication, with illustrations and descriptions about DNA. Students may want to retrieve artwork from the websites they explored or draw their own. Illustrations should be labeled and the poster will need to address several essential questions about DNA. Each student final grade will be based on the attached rubric. Groups will be critiqued by their peers on their 3-5 minute presentation about their individual display board.

Heading	**Biology** **From Cell to DNA** **4 weeks** **Lesson Plan 1** **9th grade**
Rationale	Found in the shape of a double helix, DNA or deoxyribonucleic acid provides the blueprint for various forms of life. This includes humans, monkeys, and even things like strawberries. Students may have learned from books and from previous science courses the structure of the DNA and how it looks like in the molecular level but they don't have real life knowledge on the appearance of DNA when it is extracted from cells in the laboratory for study. Take note that in order to start a genetic testing or DNA fingerprinting, the DNA should first be released from the nucleus and from the cell in a process called DNA extraction.
Objectives	*Students will learn what DNA is, where it is stored in the cell, and how it duplicated from cell to cell. Students will learn the simple method of DNA extraction and will be able to explain the rationale of each step. Students will be able to explain why DNA extraction is important to scientists.
Materials	Pen, chart paper, markers. Computers, worksheets, salt, alcohol, detergent
Instructional Framework	Initiating
Lesson Plan Format	Teacher Centered: Concept Student Centered: Discussion, Problem Solving
Grouping	Whole class, small groups, individuals
Materials & Resources	School – Projector and teacher laptop and white/blackboard Teacher – student handout, worksheets, chart paper, video Student – Pen and paper,
Literacy Strategies	**Circle map/brainstorming** **What's in a picture?**
Phase One	Have students make a simple DNA circle map. (pre-assessment on current topic) To make their maps, students should draw a small circle with the word DNA in it and then draw a

	much larger circle around the first circle. Inside the outer circle, have students write down ten things they associate with DNA. Encouraging them to write down any ideas they have, even if they are afraid the ideas might be wrong. Discuss their answers and any misconceptions. After the class discussion, students will go back to their desks and watch a short online animation called "from Cell to DNA". Students will be responsible for answering questions on the handout given prior to the showing of the video. (20 min
Phase Two	Review questions from cell to DNA student and discuss with class. What's in a Picture? Show the class pictures of slides viewed under a microscope that contain DNA extractions from different species and things such as bananas, plants, etc. Have the students guess where the source of DNA is from.
Phase Three	Prepare slides of cheek cells, stained with methylene blue. Have student look at slide under microscope or show on screen. Discuss what they see (methylene blue stains the nucleus) and the size of nucleus, chromosomes, DNA. Students will pair up with a partner to perform the extraction; following their worksheet and watching me (the instructor) model the extractions while the whole class follows along step by step. Directions for the extraction (also see attached worksheet). Have students observe human cheek cells and chromosomes under the microscope to reinforce the idea of the scale of DNA molecules.
Formative **Assessment**	Student handout review, participation in class discussions and activities, While students are doing the experiment, I will walk around and ask questions such that make students think about the rational of steps of the extraction process: Why are we using the detergent? What does it do to the cell?
Summative * **Assessment**	The summative assessment will come later in the display poster.
Homework **Assignment**	Students will research who discovered the structure of DNA and be prepared to discuss next class period.
Reminder	Review with students that a unique feature of eukaryotic cells is the presence of a nucleus, where the DNA is stored.

Heading	**Biology** **From Cell to DNA** **4 weeks** **Lesson Plan 2** **9th grade**
Rationale	Students need to understand and know the different vocabulary associated with DNA in order to fully understand the concept of replication, extraction, and structure.
Objectives	*Students will discuss differences and similarities among members of the class and connect these differences to their DNA. They will build on prior knowledge of DNA and complete an activity where the many words associated with the unit will be put into context.
Materials	Enough for each pair of students to have one set of: • Index Cards with the words: HUMAN BODY, ORGAN, TISSUE, CELL, NUCLEUS, GENOME, CHROMOSOME, GENE • Index Cards with the words: ENZYME, NUCLEIC ACID, MONOSACCHARIDE, and NUCLEOTIDE
Instructional Framework	Initiating constructing utilizing
Lesson Plan Format	Teacher Centered: Concept Student Centered: Discussion, Problem Solving
Grouping	Whole class, small groups, individuals
Materials & Resources	School – chart paper, pen/pencil Teacher – student handout, index cards Student – Pen and paper,
Literacy Strategies	**Top 10 list** **Word tournament**
Phase One	Top 10 List: Have students work in pairs to make a list of ten differences between the two of them. This will be purposefully left open-ended. Have students also come up with three reasons behind these differences. Listen to answers from several sets of partners. If no one gives the answer, lead students to the idea that DNA is the major

	cause of the differences between them. (10 min)
Phase Two	. Give each pair a set of index cards with the following words on them: HUMAN BODY, ORGAN, TISSUE, CELL, NUCLEUS, GENOME, CHROMOSOME, and GENE. The cards should not be in order. Students should attempt to put them in order from largest to smallest. Students will probably not know ALL the answers, but I will resist the temptation to help them too much. Instead, answer their questions with questions such as: "Where is the nucleus found?" "How big is a cell?" "What is a genome?" "What is a chromosome?" When students have finished, discuss answers, and have them make any necessary corrections.
Phase Three	Next groups will be given an additional four cards: ENZYME, NUCLEIC ACID, MONOSACCHARIDE, and NUCLEOTIDE. Students are instructed to add the four cards to the other set of cards they have sequenced. This part will be more challenging. Chromosomes are smaller than the nucleus, but most molecules will be larger than enzymes, which are proteins. When students have finished, discuss correct answers, and again have them make any necessary corrections. Have students define all words that have not been presented previously. Students will answer the following questions among each other and as a class. "Were there any traits of your partner's that you had never noticed before? Any of your own traits that you had never noticed before?" Lastly students will play Word tournament. Discuss the Word tournament and emphasize why the chosen words and terms are important in understanding DNA. Go over the vocabulary and explain any new vocabulary introduced by the animation such as bacterium, eukaryote, micrometers, nanometers, histone proteins, and polymeric molecule.
Formative **Assessment**	Class discussion and participation, feedback from homework assignment
Summative * **Assessment**	The summative assessment will come later in the display poster.
Homework **Assignment**	Students will write about the following and turn in next class period. "When you were first conceived, you were made up of only one cell with only one copy of the DNA that makes you who you are today. However, today you are made up of millions of cells, most of which contain copies of your DNA, the same DNA in that first cell. Talk about some things that had to happen to the original cell and DNA molecules from the moment of conception until present day. (Ex: growth, division)

Heading	**DNA structure and replication 4 weeks Lesson Plan 3 9th grade**
Rationale	DNA contains the information for the production of proteins necessary for growth and function of cells. 2. Knowledge of the structure and chemical properties of DNA allow scientists to developed ways to study and manipulate DNA.
Objectives	Students will: 1. Learn and demonstrate the structure and function of DNA 2. Learn and demonstrate the replication of DNA
Materials	Student handouts, paperclips, masking tape, copies of nucleotide pairs, paper, markers
Instructional Framework	Initiating constructing utilizing
Lesson Plan Format	Teacher Centered: Concept Student Centered: Discussion, Problem Solving
Grouping	Whole class, small groups, individuals
Materials & Resources	School – chart paper, pen/pencil Teacher – student handout, nucleotide pairs, masking tape Student – markers, scissors,
Literacy Strategies	**Reaction Guide** **Western union**
Phase One	Reaction Guide: Divide students into pairs. Write the following sentences on the board: 1. Each cell's DNA would be six feet long if spread out. 2. Your DNA is 99.9% the same as the person sitting next to you. 3. Your DNA is 90% the same as a mouse. 4. Your DNA is 60% the same as a fruit fly. Have students decide and provide reason why each of the statements is true or false. (All are true.) Tell students all statements are true. Ask what it is about DNA that makes them 99.9% similar to other humans. Have students contribute their own ideas, then lead them to the idea that the structure and sequence of DNA makes you unique. Once I have established that the structure of DNA makes us both unique and similar to others, I will

	discuss with students basic information about the structure. DNA is made up of nucleotides. Show students a picture of a double helix. (25 min)
Phase Two	Distribute the paper nucleotide replicas, crayons/markers, scissors, and tape to students. Students should still be in pairs; however each person will color, cut out, and construct his or her own model. Instruct them to color each part of the nucleotide a specific color. That is, color all phosphates one color, all deoxyriboses another color, all adenines another, etc. Then, instruct students to cut out each nucleotide and piece them together like a DNA molecule. One partner should tape his or her strands together but not tape them in the middle. (Students should be able to open and close the DNA strand that they build.) The other partner's model should be put together, but not taped anywhere.
Phase Three	When finished, students 'structures will be used to model the way DNA copies itself through replication. Have students take the model with the taped sides and separate the two strands. (This is the first step of replication, where the DNA molecule unzips.) Then they should use their partner's untaped nucleotides, bringing in each nucleotide and binding it to the appropriate base. (This is the second step of replication where free floating nucleotides come and bind to each of the old strands.) Finally, students will check their two new DNA strands to ensure they did not make any mistakes. (This is the third step of replication, where an enzyme checks for errors.) When finished, all students will tape their models to a white piece of paper to display them. Discuss with students how to make strand with template and how each strand are part "old" and part "new" and think about why that might be a good way to copy and proofread. Discuss why specific base pairing is essential in the process of replication and the importance of the final step of replication where the enzyme checks for mistakes. Play Codon Bingo to further expand student understanding
Formative Assessment	Class discussion and participation, display models of DNA double helix
Summative * Assessment	The summative assessment will come later in the display poster.
Homework Assignment	Western Union- This task will see you research one of the individuals or groups of scientists whose work contributed to the discovery of DNA. Have the scientist of your choice write a letter to another scientist you did not choose. Letters should address DNA discovery. 1. Griffiths 2. Avery *et al.* 3. Hershey and Chase 4. Chargaff 5. Franklin and Wilkins 6. Watson and Crick

Reminder	
Heading	**Biology** **DNA fingerprinting** **4 weeks** **Lesson Plan 4** **9th grade**
Rationale	DNA is different from that of every other person in the world. . Experts can use DNA fingerprints for everything from determining a biological mother or father to identifying the suspect of a crime. This is one reason DNA is important in our lives What, then, is a DNA fingerprint and how is it made? My students need to know what techniques are used to decipher DNA fingerprints in order to become future forensics. This lesson gives students a more detailed idea of how DNA fingerprinting works and how it can be useful in the world today and in the future.
Objectives	
Materials	Student handouts, highlighters, tape, scissors, overhead projector, transparencies
Instructional Framework	Initiating constructing utilizing
Lesson Plan Format	Teacher Centered: Concept Student Centered: Discussion, Problem Solving
Grouping	Whole class, small groups, individuals
Materials & Resources	School – chart paper, pen/pencil, computer Teacher – student handout, transparencies of DNA Electrophoresis and DNA Case Worksheet Student – markers, scissors,
Literacy Strategies	**Raft**
Phase One	Write the following information about DNA fingerprinting on the board: DNA fingerprinting is a technology that looks for similarities in specific sections of DNA samples. Since each person's DNA is unique but every cell in that individual contains the same DNA, this technique can be used to identify an individual from such samples as skin,

	saliva, blood, or hair, which contain DNA. Put the students in pairs, and have them make a list of five scenarios where DNA fingerprinting would be a useful technology. Discuss the students' answers, and clarify any misconceptions.
Phase Two	Read the students the story to the class about the bank robberies in Haywood and clerk counties. Explain to students how a Southern Blot test works. Show students a great animation of a Southern Blot using computer at http://www.dnalc.org/shockwave/southan.html Distribute the handout, and tell students that it shows the results of the Southern Blot test done on the hair sample found in the ski mask recovered from the robbery. Have students cut out the DNA fragments for Gerald Walker and for Suspect 2 and tape them in the correct places on the blot. If the direction of electricity is going up, students should understand that the shortest pieces would be found toward the top. They should then cut out the probe sequence and try to match the probe sequence with those on each suspect. Have students highlight any probe sequence that finds a perfect match (but not other sequences) For example, the probe sequence of AGGT binds perfectly to any segment containing a TCCA sequence. Any sequence with TCCA should be highlighted. The suspect with the match from the hair sample is most likely the one who committed the robbery. (They should find that it wasn't Gerald Walker!) RAFT: Have students pretend they are the detectives and write a police report regarding their findings.(30 min)
Phase Three	Have students work in teams of two and provide each team one of the following handouts: VNTR analysis, RFLP analysis, STR analysis, mtDNA analysis , PCR analysis. Each team is to review the handout, research the given DNA analysis technique on the Internet, and prepare to present their findings to the class in 10–15 minutes. Review each analysis technique by asking teams to share their findings. Meanwhile, ask students to evaluate whether one analysis may work better than another in a specific situation. Summarize the lesson by stating that the scientific work is often applied to solve societal challenges—one example being how DNA analysis may be used in identifying disaster victims.
Formative Assessment	Class discussion and participation,
Summative * Assessment	The summative assessment will come later in the display poster.
Homework Assignment	Work on Display poster
Reminder	Next class period we will pick up where we left off with this lesson plan. Students will finish case studies

Heading	**Biology** **DNA fingerprinting/DNA extraction** **4 weeks** **Lesson Plan 5** **9th grade**
Rationale	There are many ways to convict a criminal of a crime, but one of the best is to have evidence that he or she was actually present at the scene! Fingerprints, and later, DNA evidence have been used for over a hundred years to identify who was there (and, more recently, who wasn't!). Students will look at the pros and cons of fingerprinting and DNA evidence.
Objectives	• Students examine three different situations where DNA typing was used to carry out justice. Students also identify and evaluate different uses of DNA typing techniques and its possible benefits and misuses. Students will understand that DNA uniquely identifies an individual and explain how a DNA fingerprint can be used to solve a mystery or resolve a question regarding paternity.
Materials	Student handouts, overhead projector, transparencies,
Instructional Framework	Initiating constructing
Lesson Plan Format	Teacher Centered: Concept Student Centered: Discussion, Problem Solving
Grouping	Whole class, small groups, individuals
Materials & Resources	School – chart paper, pen/pencil Teacher – student handout, transparencies of DNA Electrophoresis and DNA Case Worksheet, printouts to be distributed among students: Pitchfork Murder Case, Michael Blassie, Kirk Bloodsworth, DNA Timeline Student – pencil/paper
Literacy Strategies	**Exit slip**
Phase One	This lesson ties in with lesson 4 Review the structure of DNA and the process of Southern blotting that is done in actual DNA fingerprinting. Prepare students to explore three cases where DNA analysis was used in carrying out justice.

	1. Distribute DNA Case Worksheet) to students and review question 1 of the worksheet. Have students work in teams of two and assign each team one of the following three cases. Ask teams to spend about 10 minutes to complete question 1 for their respective cases: 1. Pitchfork Murder Case—this is the first case that used DNA tandem repeat testing to solve a double murder in England. 2. Michael Blassie—this is the unknown soldier from the Vietnam War whose remains were identified and returned to his family after DNA testing became available.\ 3. Kirk Bloodsworth—this is a case where a death-row inmate was exonerated through the DNA testing
Phase Two	Teams will share their findings while completing the case summary table using a transparency of the worksheet on an overhead projector. Remind students that they discussed in Lesson 4 how DNA analysis can be used in many different situations. Review the notes taken from the discussion in Lesson 4. Review questions 2–4 of the worksheet and conduct a classroom discussion. First, allow students to write their own answers to these questions, and then ask students to share their answers.
Phase Three	Exit slip: Ask students whether DNA typing should be available to everyone in the United States. Encourage students to explain why or why not? Have students reflect on the three cases they examined earlier and the recent discussions. Ask students to answer question 5 of the worksheet and turn in the completed worksheet before the end of the class.
Formative Assessment	The group presentations, class discussions and completed worksheets serve as evaluation tools.
Summative * Assessment	The summative assessment will come later in the display poster.
Homework Assignment	Research and write about any positive and/or negative consequences of establishing an international DNA database. Work on Display poster
Reminder	

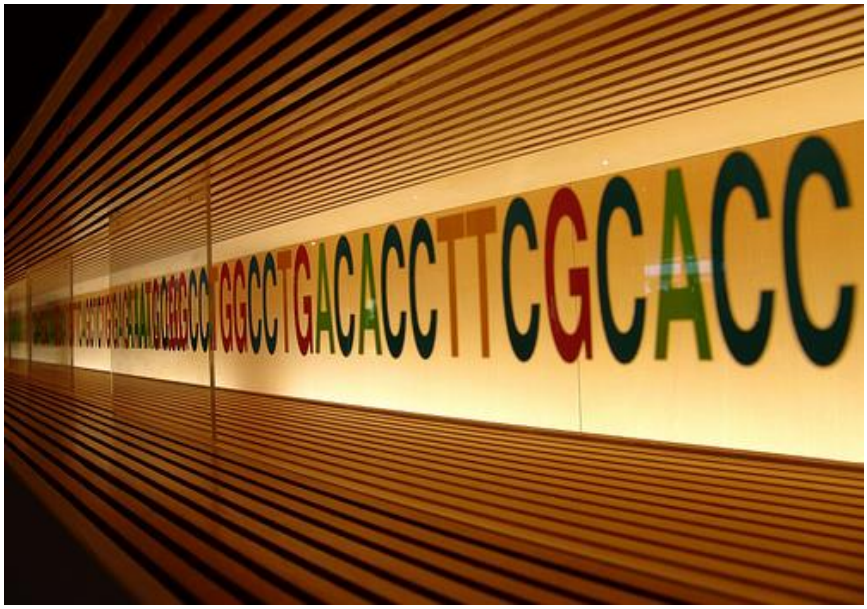
Ms.Amesheia Scruggs
9th grade Biology
Summer 2013
Teachers Calendar

	Monday	Tuesday	Wednesday	Thursday	Friday
Week One	Lesson Plan 1 Introduce to DNA replication unit. Phase1: carousel brainstorming Short film	Lesson plan 1 continued: Phase2 Word tournament DNA extraction of cheek cells		Lesson plan 2: phase 1: Differences note-card activity Circle mapping	Continue lesson Plan 2, Review Homework
Week Two	Lesson plan 3: Phase 1: Reaction guide Class discussion on structure/ Review HW from lesson 1	Lesson plan 3 continues: Phase 2: build DNA models, Discuss DNA replication using models		Introduce Final project: pass out handout/ Discuss	Begin research for Final project
Week Three	Lesson Plan 4: phase 1 and 2 DNA fingerprinting/ analysis	Lesson Plan 4 continues Phase 3		Research for display poster	Lesson 5:phase 1 and 2 DNA case studies
Week Four	Wrap up lesson 5: Phase 3: Reflect on 3 cases/ Review HW	Research for display poster		Work on display poster/ Meet with teacher	Present display posters

I invite you to learn about the secret code of life: D N A

Student name

You have learned a lot over the past 2 weeks about DNA. Now I want to see if you can demonstrate your learning to others by creating an enticing display board. You can work on your own or in a group. If you are working in a group you will need to take some time to divide up the work.



Directions:

Research illustrations, findings, and uses of DNA. You can also use info learned in class to help you create a poster to display what you learned about DNA. The poster must address one of the topics listed at the bottom of the page. Your poster can be organized in any way that you think will best provide information to others.

- **DNA structure**
- **DNA replication**
- **DNA extraction**
- **DNA fingerprinting**
- **DNA techniques**

You will be responsible for presenting your poster in class. Students with the best display poster will present their posters in front of a class of their choice. The class will be a non-science related course. View the attached rubric to see how you will be graded.

The task is split up into four parts:

1. **Research the topic**
2. **Produce the poster**
3. **Practice presenting your poster**
4. **Present the poster to your class**

The posters will be displayed in class and you will be given time to look at posters other members of the class produced. You will also need to write down one question that you want to ask each group about their work. Your presentation should take 5 minutes and cover the information on your poster, with extra bits you may not have had room to include. If you are working in a group you will need to work out who will say which bit.

Student Name: _____ Ms. Scruggs 9th Grade Biology

Scoring Rubric for DNA Poster Presentations

Category	Scoring Criteria	Total Points	Score
Organization (15 points)	The type of presentation is appropriate for the topic and Audience.	5	
	Information is presented in a logical sequence.	5	
	Presentation appropriately cites requisite number of references (3).	5	
Content (45 points)	Introduction is attention-getting, lays out the problem well, and Establishes a framework for the rest of the presentation.	5	
	Technical terms are well-defined in language appropriate for the target audience.	5	
	Presentation contains accurate information.	10	
	Material included is relevant to the overall message/purpose.	10	
	Appropriate amount of material is prepared, and points made reflect well their relative importance.	10	
	5 out of the 8 question is addressed	5	
Presentation	Speaker maintains good eye contact with the audience and is appropriately animated (e.g., gestures, moving around, etc.).	5	
	Speaker uses a clear, audible voice.	5	
	Delivery is poised, controlled, and smooth.	5	

(40 points)	Good language skills and pronunciation are used.	5	
	Visual aids are well prepared, informative, effective, and not distracting.	5	
	Length of presentation is within the assigned time limits.	5	
	Information was well communicated.	10	
Score	**Total Points**	**100**	