

Title: Incorporating Emerging Pathogens Virtual Gaming into the Classroom

Dan Downs, Pre-AP and Pre-IB Biology Instructor-9<sup>th</sup> Grade  
Winter Park High School 9<sup>th</sup> Grade Center

**ABSTRACT:**

With biotechnology expanding due to new technology and scientific understanding it is crucial that younger students not just understand basic biological concepts in class but to be able to apply it in the nation's economy, environment, healthcare system, and agriculture. With computer based gaming becoming very popular among young children, adolescents, and adults Mission Biotech can bridge and make aware the importance of this science and enlighten students on additional careers in the field to help our country place bright young minds in the proper career path. Mission Biotech's virtual gaming program can be introduced after the DNA and viruses units to show application and gain knowledge in these concept areas. Students will demonstrate understanding of these concepts, understand basic lab procedures of PCR, DNA extraction, and reverse transcription. Students will develop skills using this program and be assessed on knowledge before, during, and after completion of the 2 levels that they will work through as the end goal.

**ACTION PROPOSALS RATIONAL:**

The mission of this activity is to enlighten and teach many aspects of biotechnology and techniques to ninth grade students. Through this two week unit students will engage in a virtual gaming scenario that will lead students to solve challenging problems through application of biotechnology. Students will learn equipment usage, DNA extraction techniques, PCR lessons and analysis, game play, and introductions to biotechnological careers. By completion of certain sections of the game, the students will be evaluated by a survey (on attitudes towards biotechnology), a unit test, and a standards-based test of science content, quick writes, and embedded assessments.

**DESCRIPTION:**

The Mission Biotech Project is designed as a first person game that uses 3-D graphics in a virtual gaming technology to create a virtual science scenario in which my students would take on the role of a scientist to solve challenging realistic problems through application of biotechnology. Mission Biotech occurs within the virtual space of "The National Laboratory for Biotechnology and Bioinformatics (NLBB)". Players will become the role of a biotechnologist in the lab. Their mission is to apply knowledge of certain viruses, performs tests in the lab, and overall diagnoses potential deadly viruses that can spread throughout the city and avoid a pandemic. As the students proceed thought-out the game they will complete small missions, gain basic understanding of science principles and create an understanding of biotechnology techniques.

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### **Plan of Action:**

Before this resource is utilized and tested I want to prepare my students knowledge of several concepts in biotechnology and cell biology. I will have taught and evaluated basic cell anatomy, DNA and RNA structure and function, viruses, common laboratory equipment, and basic laboratory safety before I introduce the Mission Biotech virtual game. In addition, I plan on using "Idea Paint" on the walls as a dry erase board concept to review basic concept knowledge needed before heading into explanation of the game.

At this time I plan to begin the partnership with Dr. Troy Sadler and request all the resources needed. I am not sure of our computer access at this time because my school is being rebuilt and I am not sure of the availability of computers and time frames. Depending on computer access I am planning on implementing the "group of 4" scenario where each player has a role to work though the game.

As of now I am planning on completing the 2 week scenario with both use of video gaming and 3 of the supporting lessons to maximize student learning. I will utilize the "equipment power point" and assessment in the first lesson. I will also utilize the "DNA extraction" resource with the strawberry DNA extraction. Finally, I will use the "PCR extraction power point" from the CD as a lesson to help clarify concepts. To assess understanding of these concepts students will practice the procedures of all of them on the "Idea Paint" section of the room. The goal will be for students to complete the first two levels of the game. Through this accomplishment the students will learn about and engage in the science concepts stated above in the description section. In week one the students will complete equipment lessons, game introduction/game play, DNA extraction and PCR lessons. For week 2 the students will have additional game play time, understand PCR analysis, and career lessons according to the schedule on page 10 and 11 of the Mission Biotech Teachers Guide booklet. Depending on the classes I teach this year I also plan on including the research variable of composing this research with both my Pre-AP and Pre-IB classes to supply possible data that one level of student gets more understanding out of it than another.

### **EXPECTED OUTCOMES:**

- Demonstrate understanding of core concepts in biotechnology including (but not limited to) cellular biology, DNA, RNA, and viruses.
- Identify and follow common protocols used in a biotechnology laboratory (i.e. DNA extractions, PCR, reverse transcription).
- Interact with laboratory equipment in a virtual environment.
- Identify a variety of viruses, their characteristics, and symptoms caused in humans.
- Analyze real-time PRC results to identify unknown viruses.
- Identify and follow basic laboratory safety protocols.
- Identify careers in biotechnology
- Communicate with other individuals in a virtual learning environment.

**DATA COLLECTION TECHNIQUES AND STUDENT ASSESMENTS:**

There will be a variety of data collection and student assessments. A total of 5 types of assessments including diagnostic, formative, and summative to comply with Florida State Standards are planned to be utilized:

\*Embedded Assessments-players will have to successfully answer questions posed by Mission Biotech “workers” related to the scientific concepts addressed earlier in the game before they can continue with play. If the students answer incorrectly, they will be asked to go back and review information in the virtual environment. The players must then return and answer the questions correctly to move on.

\*Student Checklists-there will be a series of checklists (about 3 for the two week program) that are sequential lists of steps players need to accomplish to move further in the game. This can be a tool for me to collect data and asses student progress and knowledge.

\*Quick-Writes-Utilized to recall prior knowledge of the scientific concepts covered in the previous lesson and will motivate the students to find other similar issues from the game These quick writes will be reviewed by myself for understanding.

\*Level Quizzes-these multiple-choice quizzes are completed after the students complete each level. The quizzes assess players understanding of the scientific concepts and key concepts from previous levels. Each quiz is 10 questions and can be assessed by myself.

\*Summative Assessment-a 20 question multiple-choice exam that is given at the end will asses the understanding of concepts focusing on two major sections –Equipment and Reagents and Processes and Concepts. Students will be tested on content covered in Mission Biotech as well as reading and interpreting graphs and charts.

**ICORE Summer Institute Elements Specifically Included:**

The elements that will help guide this action proposal will be the Mission Biotech Teachers Guide, Mission Biotech website, and the Mission Biotech CD. These resources will aid in the mission with providing instructional materials, guidance and assessments. Additionally, based on computer availability at my school I might also need to borrow laptops with the program loaded onto it.

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### **LITERATURE CITED:**

Mission Biotech Teachers Guide. Michelle L Klosterman and Troy Sadler. 2010.

[www.ideapaint.com](http://www.ideapaint.com)

### **BUDGET AND BUDGET JUSTIFICATION:**

The following list summarizes the supplies needed for the activity including the approximate costs and sources of supply:

ITEM	COVERAGE	PRICE
Pro Idea Paint Package	50 sq ft kit	\$199.50/kit

## Explanation of 5 Es Science Lesson Plan Template

<b>Instructor:</b>  Dan Downs	<b>Course:</b>  Pre-AP/Pre-IB Biology	<b>Date(s):</b>  12/1-12/14
<b>Essential Question and Learning Outcome:</b> Will students gain an understanding of biotechnology and careers in biotechnology?		
<b>2010 SSS Benchmarks:</b> SC.912.L.16.5, SC.912.L.16.7, SC.912.L.16.10, SC.912.L.16.11, SC.912.L.16.12, SC.912.L.18.4, SC.912.L.18.11, SC.912.N.1.3, SC.912.N.1.4, SC.912.L.14.52, SC.912.L.16.3, SC.912.L.16.4, SC.912.L.16.12:		
<b>NGSSS Benchmarks:</b> Copied from learning schedule as applicable		
<p style="text-align: center;"><b>Instructional Activities***</b></p> <p style="text-align: center;">ALL 5 Es WILL NOT BE DONE IN ONE CLASS PERIOD. However, an informal assessment must be completed at the end of each class period.</p> <p><b>Engage</b> Day 1 (students will have been taught the following concepts before the two week activity): DNA, RNA, cell biology, and viruses. Students' background knowledge will have been checked by prior assessments and activities. A problem based scenario and power point will be introduced of the gaming activity to engage students on the "Idea Paint" surface of my classroom.</p> <p><b>Opening</b> (Day 2) Students today will get an orientation of equipment and how to properly use it.</p> <p><b>Explore (Investigation):</b></p> <ul style="list-style-type: none"> <li>• the students' will utilize a guided activity of game introduction and game play by utilizing a checklists</li> <li>• PowerPoint's and worksheets will help guide the students through procedures</li> <li>• Quick-writes and quizzes will be used to monitor data interpretation and identify students' misconceptions</li> </ul> <p>How I will informally assess the Explore:</p> <p><b>Explain:</b> Teacher explanation will be done in the prior lessons of scientific knowledge based on the concepts of DNA, RNA, cell biology, and viruses. The use of probing/higher order questions will be obtained:</p> <ul style="list-style-type: none"> <li>• whole group discussion while debriefing investigations of the game levels and manipulation of the lab simulations</li> <li>• clarify concepts that consistently were missed in prior quick-writes or quizzes</li> <li>• provide pertinent information through direct instruction via power point or handout resources</li> <li>• introduce and use vocabulary pertaining to DNA, RNA, viruses, and reverse transcription on the "Idea Paint" surface</li> <li>• determine levels of understanding by quiz assessments</li> <li>• address students' misconceptions identified in the game and evaluations</li> </ul> <p>How I will informally assess the Explain: This will be done by checking the embedded assessment pace as the students work through the game</p> <p><b>Extend:</b> Using differentiation based on previous informal assessments of the Explain,</p> <ul style="list-style-type: none"> <li>• For enrichment I will allow the students to move on to farther levels of the game</li> <li>• For remediation the students will have to answer the embedded questions in the game in order to move on. The students will explore previous clues in the level until they answer correctly</li> </ul> <p>• How I will informally assess the Extend:</p> <p><b>Evaluate (Method):</b> What are you going to use to give your students a grade (formal assessment)?</p> <ul style="list-style-type: none"> <li>• Embedded Assessments within the game</li> <li>• Student Checklists to help guide students but also for me to evaluate</li> <li>• Quick-Writes written the first few minutes of class to recall prior knowledge from the day before to be turned in</li> <li>• Level quizzes</li> <li>• Summative assessment at the end</li> </ul> <p><b>Vocabulary:</b></p>		<p><b>Learning Strategies</b> To check box, highlight box and right-click; choose Properties and then choose Checked or copy &amp; paste a checked box</p> <p><input type="checkbox"/> KWL or Anticipation Guide</p> <p><input type="checkbox"/> Vocabulary Strategy (Frayer Model or Concept of Definition or _____)</p> <p><input type="checkbox"/> Reciprocal Reading</p> <p><input type="checkbox"/> Other reading strategy _____</p> <p><input type="checkbox"/> QAR</p> <p><input type="checkbox"/> Graphic Organizer/Concept Map</p> <p><input type="checkbox"/> Cornell Notes/Two Column Notes</p> <p><input type="checkbox"/> Expository Writing</p> <p><input type="checkbox"/> Higher Order Questioning</p> <p><input type="checkbox"/> Think-Aloud</p> <p><input type="checkbox"/> Modeling</p> <p><input type="checkbox"/> Cooperative/Collaborative Learning Groups</p> <p><input type="checkbox"/> Think, Pair, Share</p> <p><input type="checkbox"/> _____</p> <p><b>ESOL Strategies</b></p> <p><input type="checkbox"/> Paraphrase; simplify grammatical structure of sentences; summarize sections; highlight or underline key words</p> <p><input type="checkbox"/> Pronounce words clearly; explain meanings; model key or difficult words in lesson</p> <p><input type="checkbox"/> Teach study skills, use of textbook structure, scanning technique</p> <p><input type="checkbox"/> Ask students to perform simple tasks and observe their understanding</p> <p><input type="checkbox"/> Use manipulative materials, hands-on activities, and multimedia materials to support content</p> <p><input type="checkbox"/> Provide alternative instruction via computer-assisted instruction or tutoring</p> <p><input type="checkbox"/> Provide alternative assessment such as drawing diagrams or demonstrating</p> <p><input type="checkbox"/> _____</p> <p><b>ESE</b></p> <p><input type="checkbox"/> Provide accommodations per IEPs</p> <p><input type="checkbox"/> _____</p> <p><b>AVID Strategies</b></p> <p><input type="checkbox"/> SQ3R for reading</p> <p><input type="checkbox"/> Socratic Seminar to discuss a reading</p> <p><input type="checkbox"/> Philosophical Chairs discussion</p> <p><input type="checkbox"/> Developing written procedures</p> <p><input type="checkbox"/> _____</p> <p><b>Response to Intervention (RtI) and Florida Continuous Improvement Model (FCIM)</b></p> <p><input type="checkbox"/> Assess individual student progress daily</p> <p><input type="checkbox"/> Provide remediation or enrichment</p>

<ul style="list-style-type: none"> <li>• Demonstrate understanding of core concepts and vocabulary of DNA, RNA, cell biology, and viruses.</li> <li>• Understand DNA extraction, PCR, and reverse transcription</li> <li>• Understand basic lab equipment</li> <li>• Understand basic biotechnology careers</li> </ul>	
<p><b>Materials Needed:</b> 12 computers, handouts for analysis and assesment, Mission Biotech Virtual Gaming CD program</p>	
<p><b>Homework:</b> Embedded through the 5 E's</p>	

\*\*\*Teacher should be able to identify where students are reading, writing, listening, and speaking within this lesson plan.