Survival of the Fittest
LEGO “Lizard” Challenge

Grade Level: 10th Grade
Course: General Biology
Students will need prior Lego ROBOLAB experience

Mrs. Cangemi

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This Unit Plan is my original work completed specifically for ENG5101. All work that has been adapted/adopted for use in this Unit Plan has been properly cited.

Betty A. Cangemi
Signature

7/26/07
Date
Unit Overview:

This unit is intended to be a follow-up to the textbook unit on evolution. I’m specifically looking for the students understanding of adaptations and how they may give one organism an advantage over others and how this “survival of the fittest” may lead to evolution over time. What I’m going to have the students do is design a Lego robot to represent a lizard. Their lizards will then compete for a female and the “fittest” lizard will pass on it’s genes. Their lizard will have to negotiate a course with obstacles and dark/light variations and also the terrain will be sand. Students will have to decide how they are going to deal with those three factors and hopefully there will be plenty of variations for natural selection to work on. I then want the students to look at their design and suggest improvements for future generations of “lizard Lego robots” and theorize how the species would change through evolution. If time permits in the schedule I would let them implement the improvements and discuss the results. This unit ties in with ENG5101 because the whole assignment represents the engineering process and we also get to work with those really neat lego robots that we were introduced to us during the course.

Students will be assessed through:
- Time spent on task
- Question worksheet
- Class presentation
- Lizard course performance
- Final written assignment
- Class discussion

Books/Sources Consulted

1. Miclimbscience.org - A website that clarifies the Michigan Benchmarks


Learning Objectives

1. Students will be able to discuss how variations are related to adaptations.
2. Students will be able to discuss how adaptations may lead to an organism being more fit.

3. Students will be able to identify the variations and adaptations in the LEGO lizards.

4. Students will be able to explain how these variations are sometimes advantages and sometimes a disadvantage.

5. Students will be able to discuss why some variations persist in a population because it increases reproductive success of that organism.

**Michigan Content Standards Addressed**

1. English Language Arts
   Integrate listening, speaking, viewing, reading, and writing skills for multiple purposes and in varied contexts.

2. Science
   Explain how a new species or variety may originate through the evolutionary process of natural selection (SCI.III.4.HS.2).

3. Science
   Design and conduct scientific investigations. (SCI.I.1.HS.2)
Lesson Plan and Assessment Tools

Top Lizard Challenge

**Purpose of Challenge:** In this LEGO challenge you will use your knowledge gained in the last chapter of adaptations, evolution and natural selection to design and build a
robotic lizard. Each team will get two days to design, build and program their lizard. All teams will make a male lizard. In order for any species to survive they must reproduce and have viable offspring. Those individuals that reproduce pass on their genes and are considered more “fit” for their environment. Your teams lizard will be in competition with the other teams lizards to reach the female first, mate and return home. If your lizard hangs around the female to long she will eat him! Your lizard also must have adaptations that allow it to exist in it’s environment.

Prior Knowledge Needed:

* Evolution unit from textbook
* Previous Lego building experience
* ROBOLAB
  - Loops
  - Timers
  - Touch sensors
  - Light sensors
  - Forks

Information Needed to Build Lizard:

1) The habitat will be a desert biome.
2) There will be large fixed obstacles that your lizard will have to navigate around.
3) The female will be located on a dark surface.
4) You have 10 seconds to mate and get away from the female.
5) Predators are looking for you so you must return to the starting point (your shelter) as quickly as possible.

Groups:
I will be assigning the groups. Each group must come up with a name to represent their group and their lizard.

Grading:

Your grade will be determined by the following:

1) Pre-build question sheet 11 pts
2) Class presentation of your lizard 10 pts
3) Performance of your lizard on the course 10 pts
4) Work Ethic 15 pts
5) Final paper on project  
   30 pts  
Total  
   76 pts  

* Questions and rubrics are attached

**Final Grade**

<table>
<thead>
<tr>
<th>Total Points Earned</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>76 - 72</td>
<td>A</td>
</tr>
<tr>
<td>71 - 69</td>
<td>A-</td>
</tr>
<tr>
<td>68 - 65</td>
<td>B +</td>
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<tr>
<td>64 - 63</td>
<td>B</td>
</tr>
<tr>
<td>62 - 61</td>
<td>B -</td>
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<tr>
<td>60 - 57</td>
<td>C +</td>
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<tr>
<td>56 - 55</td>
<td>C</td>
</tr>
<tr>
<td>54 - 53</td>
<td>C -</td>
</tr>
<tr>
<td>52 - 50</td>
<td>D +</td>
</tr>
<tr>
<td>49 - 46</td>
<td>D</td>
</tr>
<tr>
<td>45 or lower</td>
<td>E</td>
</tr>
</tbody>
</table>

**Timeline and Due dates:**

Day 1: As a group answer pre-build question sheet and review with teacher. Begin building/programming your lizard.

Day 2: Complete building/programming lizard. (some classes may require an additional day to test and complete building their lizard.

Day 3: Present your lizard to the class and point out all adaptations your lizard has for it’s environment.

Day 4: Lizard performance will be tested. The fastest lizard is the most fit and therefore will pass on it’s genes to future generations. Prizes will be awarded to the winning team members each hour and the fastest time overall will be listed on the survival of the fittest board. Prizes will also be given to the group with the best looking lizard.

Day 5: You will receive the criteria for your final paper which will be due the following
Wednesday. There will also be a class discussion on what observed overall.

Pre-Build Questions (answer on a separate piece of paper and turn in)

1) What is an adaptation? (1 pt)
2) What are the characteristics of a desert biome? (1 pts, you need more than 2 characteristics)
3) What adaptations would you expect a desert animal to have to deal with the characteristics listed in question 2? (2 pts, you need more than 2 adaptations)
4) Why would a lizard be located in the dark during the day in the desert? (1 pt)
5) How are you going to deal with navigating around the fixed obstacles on the course? (1 pt)
6) How are you going to find the female? (1 pt)
7) How are you going to deal with the 10 second maximum time you are allowed to be in the females habitat? (1 pt)
8) What part of an organism does the robotic program represent? (1 pt)
9) What does it mean when we say an organism is fit? (1 pt)
10) What is a variation? (1 pt)

**Maximum Points 11**

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**Presentation Rubric:**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
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<tbody>
<tr>
<td>All group members participate</td>
<td>2</td>
</tr>
<tr>
<td>Minimum of 3 adaptations are present</td>
<td>2</td>
</tr>
<tr>
<td>Robot looks like a lizard</td>
<td>2</td>
</tr>
<tr>
<td>Discuss how lizard will deal with obstacles</td>
<td>2</td>
</tr>
<tr>
<td>Discuss how lizard will find female</td>
<td>2</td>
</tr>
</tbody>
</table>

**Maximum Points 10**

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**Lizard Performance Rubric**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>Your lizard completes the course</td>
<td>10 points</td>
</tr>
<tr>
<td>Your lizard completes the course but stays by the female too long</td>
<td>8 points</td>
</tr>
<tr>
<td>Your lizard reaches the female but never makes it back to his refuge</td>
<td>6 points</td>
</tr>
</tbody>
</table>
Your lizard navigates the obstacles but never reaches the female | 4 points
---|---
Your lizard starts the course but can’t get past the obstacles | 2 points
Your lizard never moves | 0 points

**Maximum Points** 10

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**Work Ethic Rubric**

<table>
<thead>
<tr>
<th>No reminders to get on task</th>
<th>15 points</th>
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</thead>
<tbody>
<tr>
<td>1 - 2 reminders to get on task</td>
<td>10 points</td>
</tr>
<tr>
<td>3 - 4 reminders to get on task</td>
<td>5 points</td>
</tr>
<tr>
<td>5 or more reminders to get on task</td>
<td>0 points</td>
</tr>
</tbody>
</table>

**Maximum Points** 15

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**Final Paper Criteria and Rubric**

Your final paper will be worth 30 points. This is approximately 40% of your final grade so please put some thought and effort into it. This is also the only part of this project that will be done individually. In this paper you will discuss the performance of your lizard compared to the others in the class. I want you to identify the features of your lizard that allowed it to run better than the other groups. Give examples of variations among the lizards. If they were living organisms what causes these variations? I also want you to identify what features made your lizard less fit. What does it mean to be less fit or more fit? What would you change/improve on your lizard either in programming or design. I then want you to discuss natural selection in regards to all the lizards that you observed
run the course. If this was a real world situation what would happen to the entire lizard population over time? What features would remain and what features would disappear? Your paper should be at a minimum of one typed page, double spaced, font size of 10 and margins no greater than one inch on all four sides. This paper will be due Wednesday of next week.

**Final Paper Rubric**

<table>
<thead>
<tr>
<th>Points Awarded</th>
<th>Content (10 Points)</th>
<th>Spelling/Grammar (5 Points)</th>
<th>Minimum Length (5 points)</th>
<th>Future Generation Improvements (10 Points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Points</td>
<td>Paper is thoughtful and shows a true understanding of natural selection and evolution concepts</td>
<td>2 or less spelling/grammar errors</td>
<td>One page with appropriate font size and margins</td>
<td>Discusses 5 or more improvements</td>
</tr>
<tr>
<td>-2</td>
<td>Paper shows an understanding of natural selection and evolution concepts</td>
<td>3 - 4 spelling/grammar errors</td>
<td>¼ page with appropriate font size and margins</td>
<td>Discusses 4 improvements</td>
</tr>
<tr>
<td>-4</td>
<td>Paper answers just the questions listed in criteria handed out</td>
<td>4-5 spelling/grammar errors</td>
<td>Full page with larger than 10 font and larger than 1 inch margins</td>
<td>Discusses 3 improvements</td>
</tr>
<tr>
<td>-6</td>
<td>Paper shows some thought but there is some misunderstanding of concepts</td>
<td>0 Points awards for more than 5 spelling/grammar errors</td>
<td>0 points for ½ page or less with appropriate font size and margins</td>
<td>Discusses 2 improvements</td>
</tr>
<tr>
<td>-8</td>
<td>Paper shows little effort or thought</td>
<td></td>
<td></td>
<td>1 improvements discussed</td>
</tr>
<tr>
<td>-10</td>
<td>No paper</td>
<td></td>
<td></td>
<td>No improvements discussed</td>
</tr>
</tbody>
</table>