Appendix C

Student survey – blank document

Please rate the following statements on a scale from 1-5.

<table>
<thead>
<tr>
<th>I write essays well.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I try to improve my essay writing abilities in APES</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I am proud of the essays I write in APES</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I spend time practicing writing my essays before a test.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I review my notes before a test.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I make an outline of the essay before a test.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I like using graphic organizers in class.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Using graphic organizers helps me to organize my thoughts.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Creating graphic organizers in class helps me to write my essays on the test.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When I review my notes at home, I do well on my essays.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have made a graphic organizer at home to review for an essay.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I plan on creating a graphic organizer at home to review for an essay.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>When we use a thinking map to explain a concept in class, I understand that concept better.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I think using graphic organizers could help me prepare my essays.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Explain your thoughts on graphic organizers or the use of “Thinking Maps” in the classroom in the space below.

Describe how you prepare for your essays in the space below.
Appendix D

AP Environmental Science Essay Prompts

Essay 1:

The residents of a house in the Midwestern US decide to supplement the heating of the house by adding solar panels to the roof of the house. Describe 2 benefits and 2 problems with solar panels in relation to using traditional natural gas powered heat.

Essay 2

Developing countries have different air pollution problems than developed countries. Provide examples of two air pollution problems that exist in developing nations that do not exist at the same level in developed nations. Then, give two reasons why it is more difficult to solve air pollution problems in developing nations than it is in developed nations.
Appendix E

Field Notes

From March 3 through March 19, exam on March 20 and 21

**March 3**

Students learned their essay scores from the first essay. They were resigned to having low scores. Many scored well. No questions. We went over what was the “best” answer and why certain answers are accepted.

Students were given new study guide questions with four types of concept maps in the questions. I taught students a tree map, a double bubble map, a multi-flow map, and a flow map. Many students were engaged and taking notes. A few students, many who think that they do not need to practice this information for the class and their grades are suffering, were laughing and not paying attention. Most students didn’t really know what Thinking Maps were or that they could use them at home.

Many students seemed like they would try it because they want to succeed in class. They will need more teaching of the used of maps and help with linking specific ideas.

**March 7/March 10**

Checked study guide questions 1-5. Question 1, a tree map of the atmosphere, had little or no questions about it. Most students pulled the answers from their notes easily. Question 2 asked students to create a double bubble map of the air pollution in developed and developing countries. We created the entire map on the board, with individual students shouting out answers and the teacher writing them on the board. I had to help them with the problems with cleaning up air pollution and show them the differences. However, many students added to the map and shouted out answers. There was a lot of participation in second period.

Question 3 asked students to make a tree map of the respiratory system. We discussed that problem and most students understood the ideas. Question four was not discussed because a video on the topic was being shown and it would be discussed later. Question 5 was about primary pollutants vs secondary pollutants. We went through the definitions and examples. Students need to review the chemical reactions of pollution.

**March 10**

Same format as March 7, but this class has less participation. Question 2 stumped them and the class was very quiet. Many students were nodding their heads when I put points on the board, but there was not a lot of sharing of answers. Some students were spaced out, but most looked like they understood.

Discussions and levels of participation are a clear indication of understanding. This is something that all teachers struggle with: how to increase student participation.

With Thinking Maps, you can call on specific students to share one part of the answer, increasing participation.

I found that I was doing a lot more work with Maps than with regular study guide questions. This may show that students were more passive. Or, this may show that providing visual cues for students to see what is going on and what their though process should be is something they have been lacking and I am making a difference here.
March 12
Notes on ppt and video. We created a multi-flow map for the causes and effects of global warming today. Instead of writing it out myself, I had students discuss ideas in groups and then each group added one part to the map. This helped my 3rd period participate and encouraged a lot of thinking. As we made our multi-flow we found some feedback loops that could help students answer the next study guide questions.

March 13
We were supposed to go over study guide questions 6-10 today, but it was a minimum day and we ran out of time. I will not be able to go through them until March 19.

March 14
Went through study guide questions 6-10. Many students had used the feedback loops we had discussed during the previous class for their answer on question 6. However, students were unclear about positive and negative feedback loops. We put them on the board to go through the difference and clarified what the difference was. After 2 or 3 examples, most students were nodding their heads in understanding.

Question 7 asked about the causes and effects of acid deposition and most students had a very clear understanding of this question. Most students feel that a multi-flow map is their favorite map because it clearly delineates causes and effects.

Question 8 asked students to create a double bubble map that compares and contrasts methods for removing pollutants from energy plants and industrial plants. Most students had a lot of trouble with this question. They have difficulty when they are being asked one thing in reference to another. They could not pull out that they were comparing industrial plants to energy plants. We spent a long time on this question, but in the end, I think most students had a good understanding of the differences.

Question 9 was very straightforward and most students got it easily.

Question 10 was also very straightforward and the class just discussed the answer.

March 13, 14
We also went through the essay topic today and discussed the answers. I did not create any maps while going through the topic, but I did point out that part c of the question was the same as study guide question 2 and that we had created a map.

March 19
We created a multi-flow of the global warming which was very helpful and fun for most students. Then, we went through the study guide questions.

The process was very similar to that on March 14. However, students were not as comfortable with their answers because of the time delay between when the questions were due and when we went over them.
Appendix F

Study Guide Questions using Thinking Maps

Study Guide Questions (SGQs)

1. Create a tree map that categorizes the parts of the atmosphere by composition and structure; provide the characteristics of each part of the atmosphere within the tree map and include a detailed graph of altitude vs. temperature.

2. Create a double bubble map comparing and contrasting urban air pollution problems in developed countries with those in developing countries. Then, discuss why it is easier to solve air pollution problems in the developed world.

3. Create a tree map that describes the major features of the human respiratory system. Then, add the effects of various air pollutants on the components of the human respiratory system.

4. Create a multi-flow map showing the causes of global warming and its effects.

5. Create a double bubble map that compares and contrasts between primary and secondary pollutants; within your map, include descriptions of two examples of each.

6. Create a flow map of one example of a negative feedback loop that could occur in the process of global warming. Create a second flow map of one example of a positive feedback loop that could occur.

7. Create a multi-flow map that shows the causes of acid deposition and the effects it has on the environment.

8. Create a double bubble map that compares and contrasts methods for removing particulates from the exhaust gases of electric power and industrial plants. Include descriptions of each method in your map.

9. Radon gas is nontoxic and nonreactive, however, once radon gas enters homes, it poses a threat to human health. Create a flow map that shows how radon enters homes; then, explain the process that makes radon a health threat even though it is only a weak radiation emitter.

10. Create a tree map that categorizes three significant indoor air pollutants other than radon. For each, identify its source, the effect it has on human health, and a method for reducing or eliminating its presence.