7th Quality Matters Annual Conference

San Antonio Texas

Maximize Student Motivation and Engagement through Technology

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Nov 1-4, 2015

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What are Java Applets?

Java applets are computer applications designed for the Internet. They are platform-independent and can run on any operating system that has a Java Virtual Machine to translate applet bytecodes into appropriate platform-dependent instructions (Healy et al, 2002).

Benefits of Java Applets

1. They permit interactive exploration of math topics, encourage discovery learning, strengthen students' visual literacy skills, reveal students' misconceptions and learning difficulties and promote a deeper understanding of difficult mathematical concepts (Ahmad & Farnam, 2006).
2. Interact and engage with concepts (Healy et al. 2002).

3. Enhance the understanding of the concepts using visual illustrations (Lane and Peres, 2006).
4. Improve students understanding of concepts (Sosa et al. 2010).
5. Allows the user to dynamically change the concept involved.

Considering using Java Applets?

Rowell (2004) suggested nine questions:

1. Does the applet allow the student to work at his/her own pace?

2. Does the student have control over the amount of information presented?

3. Does the student have control over the applet's operation and repetition?

4. Does the student have the opportunity to make conjectures and then test them?

5. Are the graphics explained for the applet?

6. Does the applet provide information that is interesting and relevant to the student?

7. Can the student interpret the results?

8. Are the conclusions from the applet obvious to the students?

9. Does the applet promote learning or is it just a flashy novelty?

When to use Java Applets?

Wie and Na (1998) suggested that java applets can be used to: introduce a new concept, facilitate teaching a new concept and reinforce concept.

Description of the Course

This is a 3-credit hour course on Elementary Statistics. The course focuses on: Descriptive & inferential statistics, Elementary probability, Point and interval estimates, Hypothesis testing and simple linear regression.

Why Elementary Statistics is important?

It is an essential requirement for most college majors. Students should be able to analyze data in different majors such as health, laws, sports, education, business, art and social and natural sciences.

Why use Java Applets in an Elementary Statistics Course

1. Traditional teaching strategies have not been an effective in promoting students understanding of statistical concepts; teaching introductory statistics in a traditional way may not prepare students enough to collect, analyze and interpret data (Hassad, 2009).
2. Doing statistics is not equivalent to understanding statistics; Calculations should not be the center of attention in the classroom (Gail, 2002).

Source of Java Applets

We used an open online resource: Applets by S. Dorai-Taj, C. Anderson-Cook, T. Robinson, Virginia Tech – Department of Statistics. http://www.oercommons.org/courses/statistical-java/view

Why Open Educational Resources (OERs)?

1. They are free

2. Openly licensed

Java Applet assignment for Hypothesis Testing and Regression

There were 7 different applets: four are related to hypothesis testing and three are related to regression. For each applet the students had to answer several questions: What concept(s) did the applet help you learn? What steps or set of actions did you follow to learn the concept(s)? Include screen captures here and describe the screen captures. After working with the 7 different applets the students had to response to the following question: What are the advantages of Java Applets? Write a paragraph about each one of the following: It's engaging; it's entertaining; it's memorable; it's eye-catching; It sets the tone; anything else.

Examples of Student Responses

4. Applet # 4 (10 points):

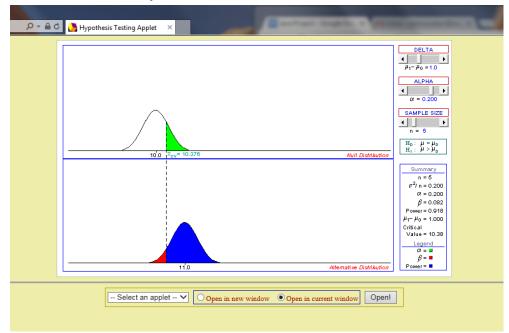https://www.causeweb.org/repository/statjava/HypoTest0Applet.html

a.   What concept or concepts?

On this applet, you can make your own delta, alpha, and sample size. This causes the graph to change. It makes it steeper or flatter.

b.   What steps and set of actions that you follow to learn the concepts?

When you move the delta scrollbar, the means changes. When you move the alpha scrollbar, it causes the line to move. When you move the sample size scrollbar, it makes the graph steep or flat.

c. **Include screen captures here:**

d. **Describe the screen captures.**

We made the delta 1.0 which means the mean is 11.0. We made the alpha 0.2, which makes alpha smaller than the power. We made the sample size 5 which makes it somewhat steeper. The power is 0.918 which is 1-beta. That makes beta 0.082 which means the probability of type II error is small….The difference in the means seemed to affect the significant level the most. Also increasing the sample size makes the probability of rejecting a possible true null hypothesis higher.

6. **Applet # 6 (10 points):**

https://www.causeweb.org/repository/statjava/CorrCreateApplet.html

 a. **What concept or concepts?**

This applet allows you to make your own linear correlation with any number sample size and correlation (x, y).

 b. **What steps and set of actions that you follow to learn the concepts?**

The more dots you put the larger the same size. The straighter you put the dots, the more linear it is. Also, you can make it positive or negative depending on which way you arrange the dots.

c.   Include screen captures here:

d.   Describe the screen captures.

We used 20 dots meaning our sample size is 20. Our correlation ended up being -0.9749 which means it's a strong negative correlation. It's a strong correlation because it's closer to -1.

Question 4: Describe the screen captures.

This is a right tailed curve, and in the H_o the green area is the alpha which means to reject the H_o. I made the H_1 mean one greater than the H_o mean, which shifted the curve to the right while the critical value stayed the same. This increased the area of the alpha in H_1 the blue area. This represents a higher probability of rejecting a null hypothesis that might be true. The Red area represents the new area where the null hypothesis should not be rejected.

3 of the screen captures have a sample size of 45. In the screen capture to the left, I made the graph with no linear correlation at all. Its correlation value is .0025. In the middle screen capture, I made a strong negative linear correlation. Its value is -.9931. In the screen capture to the left, I made a strong positive linear correlation. Its value is .9891

Final Question – Part 1: It's engaging:

Java applets are very engaging. These applets allow the students to work tactically with statistics. Java applets give a clear view on the cause and effect relationship among statistical concepts. I found these applets helped me better understand the meaning of the rules that were learned in statistics, by allowing me to see these rules in an animated form.

The Java Applets make doing the work more engaging because the student has to interact with the activity. By moving the scroll bar back and forth, the student is controlling which elements change and what they want to observe. It gives the student the power to examine whatever situation they would like to because they control the applet.

Final Question – Part 2: It's entertaining

There were several times I caught myself "playing" with the Java Applets when I was supposed to be working on my assignment. Obviously, the purpose on Java Applets is to be used as a teaching tool, however I found that the applets had a secondary role as educational entertainment. I wish I had had tools such as Java Applets when I was first learning mathematical concepts. I believe if I had I would have been more interested in mathematics.

The Java Applets are entertaining because they are interactive and the student isn't just listening to someone talk about the subject that is being taught. The applet allows the student to engage and be involved— which is much more entertaining than sitting quietly while someone instructs them. The applets keep students entertained because it gives them something to do with their hands while also giving a visual representation of concepts.

Final Question – Part 3: It's memorable

Java applets are very memorable. I found, thought the course, it was difficult for me to remember the relationship between formulas, but as the practically, of the formulas, is viewed and interacted with using java applets, I noticed it was easier for me to remember the relationships among parts of a formula. Java Applets are an excellent study tool because you remember what you learn

Because the applets provide a visual representation of the situations and concepts being taught, the student is more likely to remember what they learned because of the

visualization. Lecturing and homework can only take a student so far. Providing them with concrete images and interactive models, the material is better represented and therefore, more memorable than standard notes.

Final Question – Part 4 it's eye-catching:

The graphs on Java Applets are very visually stimulating. I liked the way the colors corresponded with different aspects of the graph, and remained consistent throughout the applet. This aspect on Java applets helped me remember what each thing resented as the graph changed. Because of this, I did not have to spend time learning how to read the graph, rather I could focus on understanding the concepts of the graph.

Java applets are eye-catching because of the

Many different colors, graphs, and models that are used. When students are accustomed to viewing these things on regular paper or on the board, the applets really stand out and catch their attention because of the different view that is presented. All of the colors and graphs really add a new element to the material and make it more understandable.

Final Question – Part 5 it sets the tone:

Java Applets set the tone for learning and gets me in the mood to learn statistics. The applets accomplish this by creating friendly environment that allows someone to learn at his or her own pace. Java applets also give the student the opportunity to teach themselves a concept, which in my option, is the best way to ensure the concept is never forgotten.

Java applets set the tone of the material and let the *students know that the material can actually be fun and interactive. When the students are presented with a way of learning such as this, they realize that the material is more than just numbers on a board. Doing these applets also sets the tone of the material as something that can be learned in a different way, making it seem like a much easier task.*
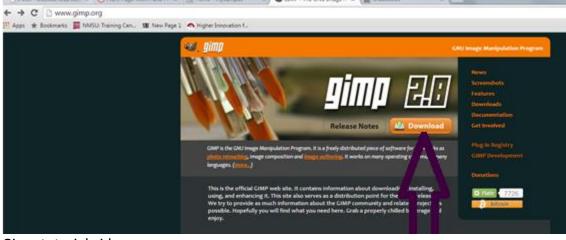
Final Question – Part 6 Anything else:

I really enjoy learning how to use Java Applets. This was the first time I have ever used these teaching tools. I found that these applets helped me become more proficient in the last two chapters of this statistics course. In the future, if I have to take anymore math courses, I will be sure to ask my instructor about Java Applet options. Thank you for introducing me to Java applets in this course.

All of the qualities mentioned about the Java Applets work together to make it an easy, interactive way for students to learn. It's entertaining because it is engaging, and it is

memorable because it is eye-catching and interactive. The system as a whole presents a very effective way for students to learn.

Creating animated GIFs Using GIMP 2.8.14

1. Go to the home page at http://www.gimp.org/
2. Click the Download link and download GIMP 2.8.14 directly into your computer.

3. Gimp tutorial videos
   https://www.youtube.com/watch?v=HYrzt4hJNJs