Using Comics for Assessment

Katie Hendrickson, Athens City Schools, Athens, OH,
Katie A Hendrickson@gmail.com
Hoyun Cho, Capital University, Columbus, OH,
hcho1416@capital.edu

Cartoons in Math Classroom

- Singapore: 9th grade students were able to engage more in learning algebra, and their motivation was increased in algebra lesson (Toh, 2009).
- Turkey: Teaching with cartoons lessened 7th grade students' mathematics anxiety (Sengul & Dereli, 2010)
- Australia: 6th and 7th grade students preferred learning with cartoons. Cartoons were a successful learning and teaching tool (Sexton, 2010)
- U.S.A: Cartoon activities acted to increase 7th grader's intrinsic motivation and interest of learning mathematics and decrease mathematics anxiety (Cho, 2012).
- U.S.A: College remedial math course students' negative math attitude changed to positive. They preferred learning with cartoons (Cho, 2013).

Why Cartoons

1. Catch Factor: Grab student attention (One characteristic of cartoon is 'Instant Enjoyment.')
2. Hold Factor: Encourage the student to invest time and effort in a learning activity over a period time.
3. Humor: Facilitate positive feelings and learning.
4. Positive feelings during a cartoon activity are likely to foster interest and engagement in learning.

The Project

- 6 classes, approximately 110 students
- 3 levels of classes:
  - Advanced Pre Algebra
  - Honors Pre Algebra
  - Pre Algebra

Assignment

- Create a comic strip that explains ***the thought process*** involved in two of the following:
  - Supplementary angles
  - Complementary angles
  - Vertical angles
  - Adjacent angles
- Remember, the comic strip should explain *how* you find the surface area or volume, and it should show an understanding of the process!
- Other requirements:
  - The comic must contain 8 panels
  - Comic strip should make sense and be neat
  - Proper spelling and conversational grammar should be used
  - You can use the blank comic or create your own characters
  - Illustrations should be neat and colorful
  - DON'T FORGET YOUR NAME!!!
  - **Hint**: When constructing your text bubbles – Write out the text first then put the bubble around it. If you do the bubble first, the text may not fit in it.

Assignment

- Create a comic strip that explains ***the thought process*** involved in one of the following:
  - Surface area
  - Volume
  - The relationship between surface area and volume
- Remember, the comic strip should explain *how* you find the surface area or volume, and it should show an understanding of the process!
- Other requirements:
  - The comic must contain 8 panels
  - Comic strip should make sense and be neat
  - Proper spelling and conversational grammar should be used
  - You can use the blank comic or create your own characters
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Rubric

	3	2	1
Thought Process	Displays an accurate description of how to find surface area or volume using effective illustrations	Displays a description and/ or illustration of how to find surface area or volume; However, an element of the description or illustration needs correction or developed	Description and illustration of how to find surface area or volume needs developed
Vocabulary	The description provides exceptional evidence of appropriate vocabulary used effectively	The description provides evidence of vocabulary; however, the use of vocabulary or the effectiveness could be developed	There is no evidence of math vocabulary used in the description
Illustration	Is neat, provides proper spelling of math vocabulary, and is colorful.	Is neat, provides proper spelling of math vocabulary and/or is colorful	Comic strip needs to develop spelling, neatness, and color

The project/data collection

- Attitudes Toward Mathematics Inventory Survey (Tapia, 1996)
  - Pre and Post survey
  - Four subcategories: Value, Enjoyment, Self-Confident, Motivation

- Cartoon Reflection:
  1. Did you enjoy the activity? Why? or why not?
     a. What was your favorite part?
     b. What was your least favorite part?
  2. Do you think that your mathematics in your cartoon is correct? Why or why not?
  3. How well do you understand finding angle measures (Surface area and Volume)?

Survey results

- No significant changes on students' attitude

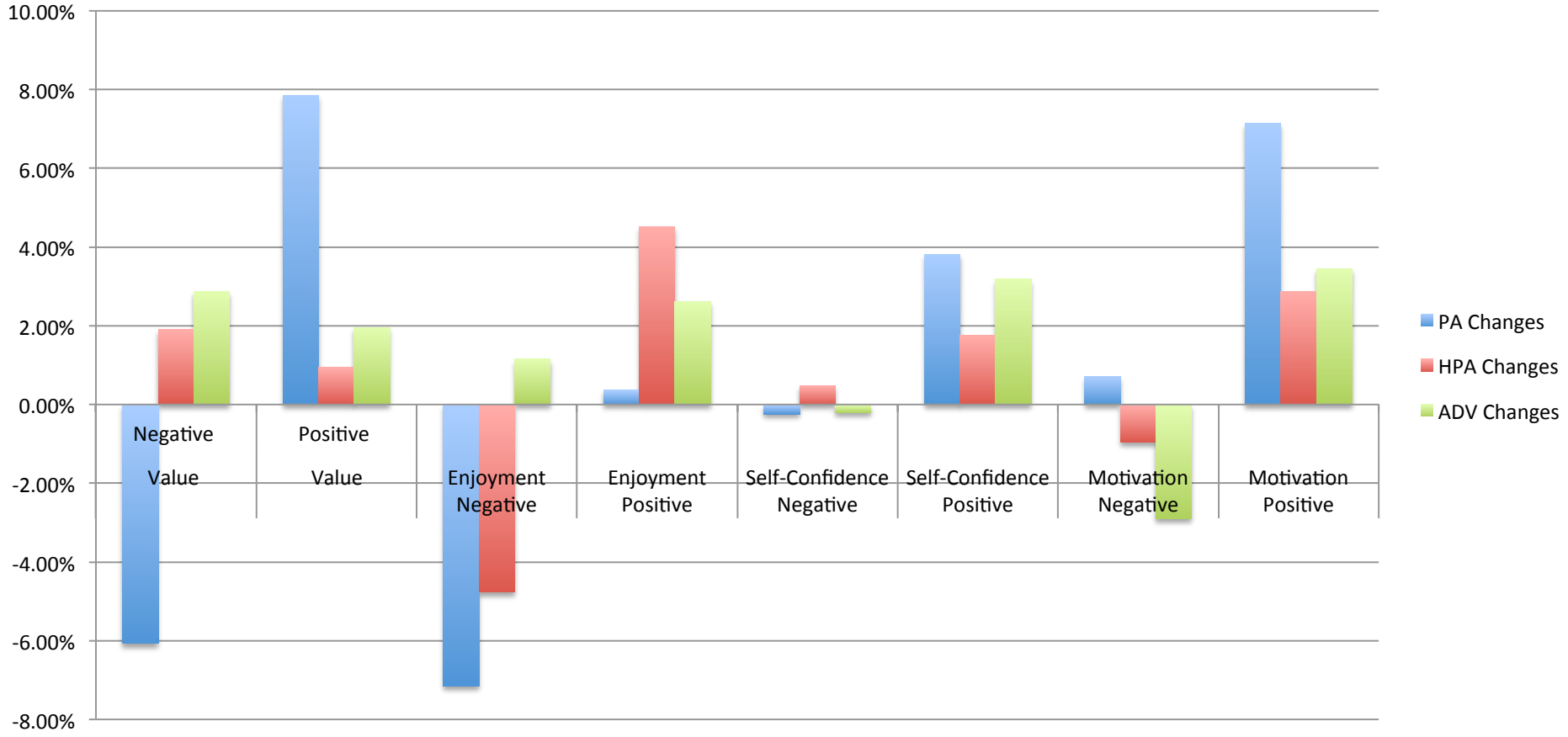
	n	Composite Mean	Composite SD	T-test p-value
PA Pre	28	3.172	1.524	0.85
PA Post	28	3.241	1.355	
Changes		0.069		

	n	Composite Mean	Composite SD	T-test p-value
HPA Pre	42	3.259	1.279	0.92
HPA Post	42	3.284	1.277	
Changes		0.025		

	n	Composite Mean	Composite SD	T-test p-value
ADPA Pre	47	3.442	1.178	0.86
ADPA Post	44	3.442	1.193	
Changes		0		

Survey results

- Frequency (%) Changes



Did you enjoy the activity? Why/why not?

- Many students enjoyed the **novelty** of the activity:
  - Yes, because it was a **small vacation from learning**
  - Yes, because we could be **creative** and **weren't stuck doing the same thing**.
- Several students mentioned **explaining math was difficult**, but many enjoyed it:
  - Yes, I enjoyed drawing and making up ways for me to **explain the process**.
  - It was okay. I thought it was fun to make a comic strip but it was **kinda hard to make it about angles**.
  - Yeah because you got to **use your knowledge of angles** to make a comic.
  - I enjoyed it because **I love art and math** so put together it = AWESOME.
  - Yes because you had to **use your brain** to come up with something to explain it, and it was fun.
- A few students would have preferred **more traditional** math work. **[None of the pre-algebra students said this.]**
  - No, because **I don't feel like it was very mathematical** and what we were measured on were other things than math, like coloring or creativity.

What was your favorite part?

- Often, the favorite part was **drawing or being creative**. Some students mentioned the specific **characters** they created as their favorite part.
  - **Drawing my cartoon** and **incorporating humor** while practicing math.
  - **Coming up with the idea** in my head then seeing it on paper.
- **Few** students mentioned **math**:
  - Knowing the volume formula **off the top of my head**.

What was your least favorite part?

- A common answer included **math** and the difficulty incorporating it into a comic
  - I thought it was a little **difficult incorporating math** into a comic form.
  - My least favorite part was **having to explain the math** because it was difficult and confusing
  - Trying to **explain** the angles.
  - Having to use a **math term**.
- **Exception was Advanced students:** very few said that their least favorite part was math-related.
- Despite this, overall, **students enjoyed** the activity.

Do you think that your math in the cartoon is correct? Why or why not?

- Most students said yes.
- The most popular reason was that **they checked in the book.**
- Fewer PA students than Honors or Adv mentioned **checking their work**.
- Many students said that they **used an easy problem**:
  - Yes, because I used a **really easy problem** that would be **really hard for me to mess up**.
  - Yes, I kept it **simple and easy to understand and entertaining.**
  - Yes, because I did it in the **most basic way** I could think of
  - Yes, I did **simple numbers** to get the point across.

How well do you understand __? Why do you think this?

- Many students (at all 3 levels) said it was **easy**.
- Many **honors and advanced** students said they learned angles in **previous years**.
- One student mentioned **not needing to use the book:**
  - I understand finding angle measurements because I **didn't use the book to understand** what to do.
- My favorite responses:
  - Well, because you taught it to us! ☺
  - Pretty well because I have really cool teachers who taught it to me very well.

Overall Observations

- Students seemed to like the **novelty**. They liked it less after the second assignment.
- A greater proportion of **advanced students disliked it** than honors or pre algebra.
- Many students liked having the **template** or at least **having the choice**.
- Some students had **difficulty putting math and humor together**, but others really enjoyed the challenge.

The Cartoons!

Observations

- Almost all of the students' **math was correct**.
- When given the choice, more students used the **template** than creating their own (60-70%)
- Cartoons on **SA/Vol had more applications** than angles cartoons. Was it because of the content or because I didn't provide the template?
- The students in PA who created a story (beyond explaining homework) ended up with **little math** application or explanation.

- Angles cartoons: most students (60-80%) chose to provide a **definition of a vocabulary word**.
- SA/Vol: more **explanations of the process**.
  - Only students in the PA class chose to provide a definition. Most students (appx 62%) in HPA and Adv explained how to solve a problem
- Overall, students who **defined a vocabulary word had incorrect math** (mixing up formulas, defining vertical angles incorrectly, etc), whereas students who solved problems typically were correct. This suggests to me that students **didn't really understand the process**.
- Very few students (1 PA, 1 HPA, 3 AdvPA) incorporated a **deeper conceptual understanding** in their SA/vol cartoons

If I taught this again….

- Rubric: more points, more specific about math that I'm looking for, explain the grading system.
- Larger text bubbles in the template, larger boxes for freehand.
- Selection of template options to choose from.
- Pixton - http://www.pixton.com
- ToonDoo - http://www.toondoo.com
- MakeBeliefs - http://www.makebeliefscomix.com/Comix/
- BitStrips - http://www.bitstrips.com