

STORYTELLING AND CREATIVITY

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Attendance Policy

Only one more exception for an absence may be used under emergency situations, such as reservist training, hospitalization, a company interview, or a funeral service during the semester, pending an **official** document. Before using this additional exception, you should talk to me about your situation **in advance**.

Why should a story be used in learning and teaching?

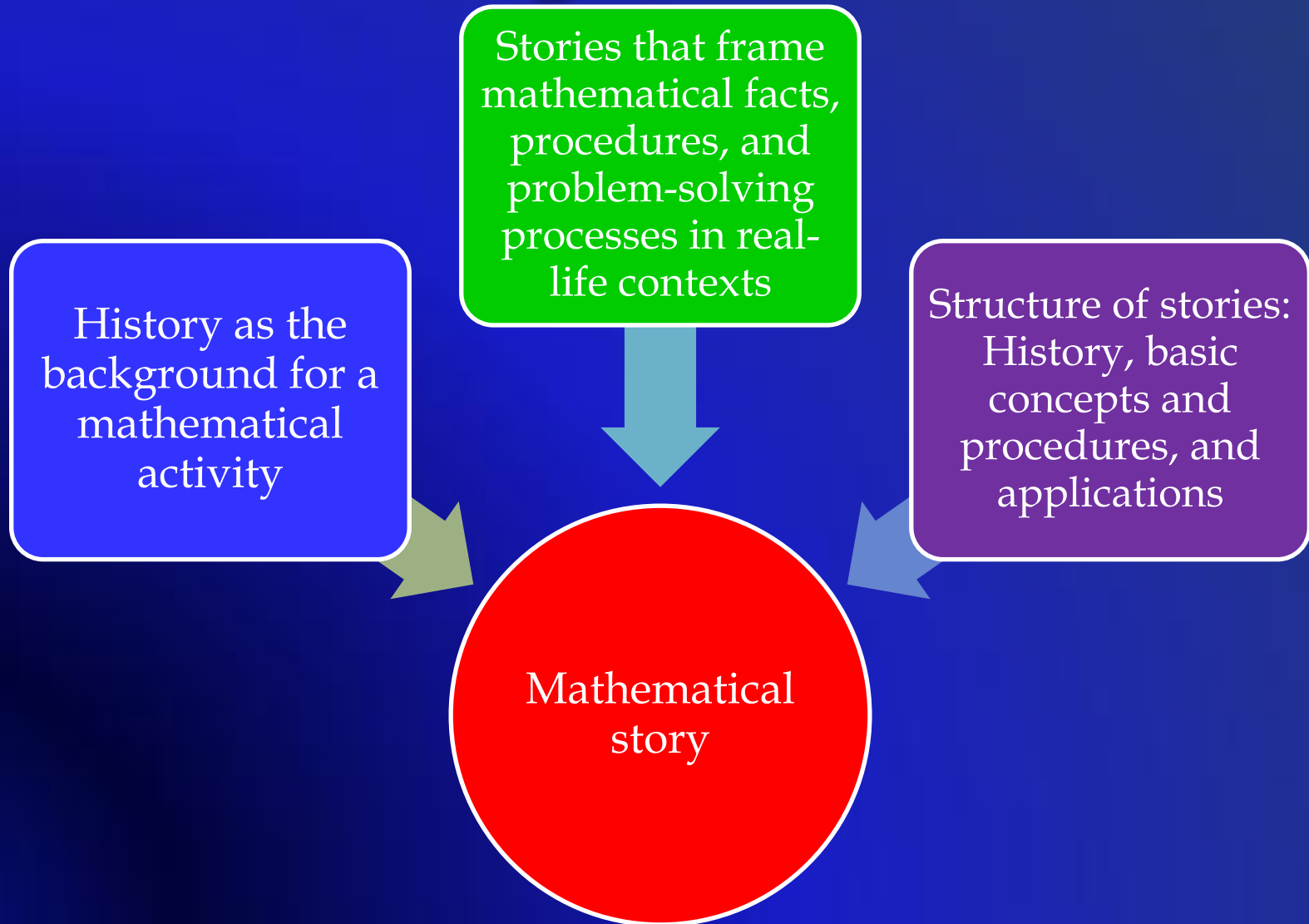
Faculty Learning Community

- **We are story** (Cho et al., 2013)

Why should a mathematical story be used in the teaching and learning of mathematics?

- ▣ Make mathematics more accessible to students
- ▣ Potential for students' better understanding of the material of the math curriculum
- ▣ Promote students' interest in it
- ▣ Enhance its attractiveness to students
- ▣ Make mathematics more sensible
- ▣ Make students perceive mathematics to be more persuasive
- ▣ Improve students' creativity in learning mathematics

How to use stories with teaching and learning of mathematics



Creative Writing in Trigonometry

(Barnes, 1999)

- ▣ How to model data with a cosine curve?
- ▣ Alleviate students' fears by assigning interesting problems
- ▣ A great way to exercise students' creativity

The Problem (Barnes, 1999)

- ▣ Simon is a farmer who loves taking afternoon naps outside in his hammock. He is very good at sneaking away for his naps without his wife Sarah's knowing about it, but unfortunately he snores.
- ▣ According to Sarah, she can hear him snoring without even going outside because it is so loud, but Simon keeps insisting that she hears the pigs snoring, not him. Sarah decided to end all arguments by finding out for herself whether or not Simon snores like a pig.
- ▣ She loves playing with electronic equipment, and she devised an instrument that registers, on a scale from -10 to 10, the sounds emitted while someone snores.

The Problem (Barnes, 1999)

- ▣ The positive values occur when air is sucked in, and the negative values occur when air is blown out.
- ▣ She recorded both her husband and the pigs snoring one night, and she discovered the following:
 - a) The loudest that Simon snored on this scale is 7, and he spends the same amount of time breathing in as he does breathing out. In one minute, he snored the same number of times as the largest last digit of anyone's Social Security number in your group.
 - b) The pigs also breathe in as much as they breathe out, and the smallest number registered for them is -6. Between any two consecutive snores, the pigs take as many seconds as the smallest nonzero last digit of anyone's Social Security number in your group.

Group Project

- ▣ Assume that you also know that both sets of information can be approximated by the equation $y=a \cdot \cos(bt)$ to fit the data. Write a conversation between Sarah and Simon, in which Sarah explains her findings to Simon. Your script must include:
 - a) The amplitude of both the pigs' snores and Simon's snore
 - b) The period of both snores-decimal approximations are fine
 - c) Equations of the form $y=a \cdot \cos(bt)$ with the values of a and b filled in for each
 - d) An explanation of how you obtained your equations
 - e) A sketch of both equations on the same axis, and
 - f) A comparison between the two-one snores louder, one breathes slower.

One excellent student paper



Simon enters the farmhouse from the left looking somewhat drowsy, having just awakened from an afternoon nap outside in the hammock.



Sarah is sitting at the kitchen table drinking a cup of coffee.



Simon, could you sit down? I need to talk to you about something

Okay dear, what is it?





I know that you
have been
asleep. I could
hear you snoring
all the way inside



Sarah, we have been
through this. I have
been working on the
fence in the pasture. It
is the pigs that you hear
snoring



Simon, I can prove that it was not the pigs. I have devised an instrument that will register the sounds of a snore. Last night, I recorded you and the pigs snoring. I would like to show you my findings



a) Simon, your snores measured up to γ on my instrument, meaning the amplitude of your snores was γ . The smallest number registered for the pigs was $a - b$, and since they breathe in as much as they breathe out, the amplitude of their snores was b .



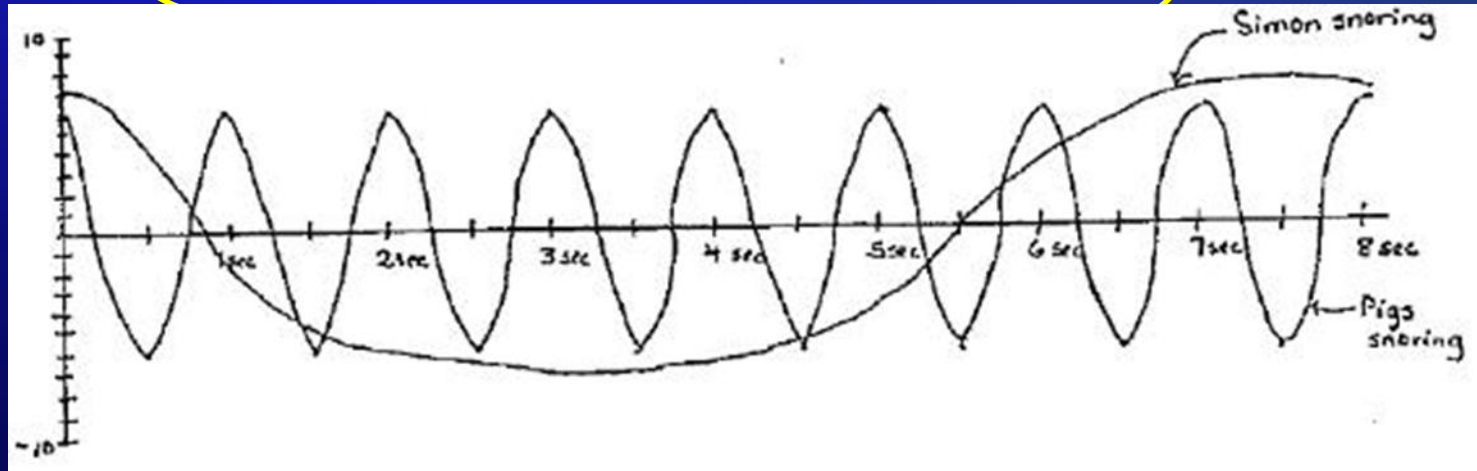
b) (the largest last digit of anyone's Social Security number in our group is 8) Simon, you snored eight times in one minute. If I divided 60 seconds by 8, the period of your snores is 7.5 seconds. (the smallest nonzero last digit on anyone's Social Security number in our group is 1.) The pigs snored 1 time in 1 second; therefore, the period would be 1 second for the pigs



c and d) Simon, I put the data in the form of the equation $y = a \cdot \cos(bt)$. The equation for your snoring is $y = 7 \cdot \cos((4\pi/15)t)$. The a value comes from the amplitude of 7. I got the b value by using $2\pi/b = 7.5$, since 7.5 is the period. The b comes out to be $4\pi/15$. The equation for the pigs' snoring is $y = b \cdot \cos(2\pi t)$. The a value comes from the amplitude of b . I got the b value by using $2\pi/b = 1$, since 1 is the period. The b comes out to 2π .



e) (Sarah hands Simon a piece of paper) Simon, look at this sketch of the equations of both your snore and the pigs' snores.





f) Simon, the larger amplitude shows that you snore louder than the pigs. The different periods and the sketches of the equations show that you and the pigs have very different snoring patterns. You snore much slower with deeper breaths. The pigs take shorter, faster breaths. The snoring I am hearing from outside is slow and loud, not at all like the pigs' snore. However, it is very much like your snoring.



I GIVE UP!!!



(Looking somewhat stunned) This is very interesting, Sarah. You have proved to me it isn't the pigs snoring. It could be that dog.

Storytelling and creativity

- ▣ **History of math**: how have mathematical concepts developed? How have current mathematical structures appeared? What is an issue in the history of math?
- ▣ Combinations of **historical and psychological** perspectives
(e.g., Gagne's inductive leap vs. qualitatively special)
- ▣ Stories about **applications** of math to real-life contexts (e.g., modeling process)
- ▣ **Structural stories** by using several unit plans through a simultaneous use of both history of math and its applications to real-life contexts

Reference

- ▣ Barnes, J. (1999). Creative writing in trigonometry. *The Mathematics Teacher*, 92 (6), 498-503.

Q&A