

**Sixth Grade Session 2**

**Craft and Structure**

* I can analyze an author’s word choices for meaning and tone.
* I can determine the meaning of unknown words.
* I can analyze how the structure of a text develops and contributes to meaning
* I can analyze a text for author’s purpose and perspective.

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**Lyrics to How Far I'll Go**

**Text 3**

Lyrics

Written by Lin-Manuel Miranda

**Lyrics**

1 I've been staring at the edge of the water   
2 Long as I can remember   
3 Never really knowing why

4 I wish I could be the perfect daughter   
5 But I come back to the water  
6 No matter how hard I try  
  
7 Every turn I take, every trail I track  
8 Every path I make, every road leads back  
9 To the place I know where I cannot go  
10 Where I long to be  
  
11 See the line where the sky meets the sea?  
12 It calls me  
13 And no one knows  
14 How far it goes  
  
15 If the wind in my sail on the sea stays behind me  
16 One day I'll know  
17 If I go there's just no telling how far I'll go  
  
18 I know everybody on this island seems so happy, on this island  
19 Everything is by design  
20 I know everybody on this island has a role, on this island  
21 So maybe I can roll with mine  
  
22 I can lead with pride, I can make us strong  
23 I'll be satisfied if I play along  
24 But the voice inside sings a different song  
25 What is wrong with me?

26 See the light as it shines on the sea?  
27 It's blinding  
28 But no one knows  
29 How deep it goes

30 And it seems like it's calling out to me  
31 So come find me  
32 And let me know  
33 What's beyond that line, will I cross that line?  
  
34 See the line where the sky meets the sea?  
35 It calls me  
36 And no one knows  
37 How far it goes  
  
38 If the wind in my sail on the sea stays behind me  
39 One day I'll know  
40 How far I'll go

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**Text 4**

**UCLA mathematicians bring ocean to life for Disney’s ‘Moana’**

**Article**

1 UCLA mathematics professor Joseph Teran, a Walt Disney consultant on animated movies since 2007, is under no illusion that artists want lengthy mathematics lessons, but many of them realize that the success of animated movies often depends on advanced mathematics.

2 “In general, the animators and artists at the studios want as little to do with mathematics and physics as possible, but the demands for realism in animated movies are so high,” Teran said. “Things are going to look fake if you don’t at least start with the correct physics and mathematics for many materials, such as water and snow. If the physics and mathematics are not simulated accurately, it will be very glaring that something is wrong with the animation of the material.”

3 Teran and his research team have helped infuse realism into several Disney movies, including "Frozen," where they used science to animate snow scenes. Most recently, they applied their knowledge of math, physics and computer science to enliven the new 3-D computer-animated hit, “Moana,” a tale about an adventurous teenage girl who is drawn to the ocean and is inspired to leave the safety of her island on a daring journey to save her people.

4 Alexey Stomakhin, a former UCLA doctoral student of Teran’s and Andrea Bertozzi’s, played an important role in the making of "Moana." After earning his Ph.D. in applied mathematics in 2013, he became a senior software engineer at Walt Disney Animation Studios. Working with Disney’s effects artists, technical directors and software developers, Stomakhin led the development of the code that was used to simulate the movement of water in “Moana,” enabling it to play a role as one of the characters in the film.

5 “The increased demand for realism and complexity in animated movies makes it preferable to get assistance from computers; this means we have to simulate the movement of the ocean surface and how the water splashes, for example, to make it look believable,” Stomakhin explained. “There is a lot of mathematics, physics and computer science under the hood. That’s what we do.”

6 “Moana” has been praised for its stunning visual effects in words the mathematicians love hearing. “Everything in the movie looks almost real, so the movement of the water has to look real too, and it does,” Teran said. “'Moana' has the best water effects I’ve ever seen, by far.”

7 Stomakhin said his job is fun and “super-interesting, especially when we cheat physics and step beyond physics. It’s almost like building your own universe with your own laws of physics and trying to simulate that universe.

8 "Disney movies are about magic, so magical things happen which do not exist in the real world," said the software engineer. "It’s our job to add some extra forces and other tricks to help create those effects. If you have an understanding of how the real physical laws work, you can push parameters beyond physical limits and change equations slightly; we can predict the consequences of that.”

9 To make animated movies these days, movie studios need to solve, or nearly solve, partial differential equations. Stomakhin, Teran and their colleagues build the code that solves the partial differential equations. More accurately, they write algorithms that closely approximate the partial differential equations because they cannot be solved perfectly. “We try to come up with new algorithms that have the highest-quality metrics in all possible categories, including preserving angular momentum perfectly and preserving energy perfectly. Many algorithms don’t have these properties,” Teran said.

10 The movement of water was precisely choreographed by mathematicians who applied principles of physics and mathematics to the task.

11 “It’s easy to simulate a boat traveling through a static lake, but a boat on waves is much more challenging to simulate,” Stomakhin said. “We simulated the fluid around the boat; the challenge was to blend that fluid with the rest of the ocean. It can’t look like the boat is splashing in a little swimming pool — the blend needs to be seamless.”

12 Stomakhin spent more than a year developing the code and understanding the physics that allowed him to achieve this effect.

13 “It’s nice to see the great visual effect, something you couldn’t have achieved if you hadn’t designed the algorithm to solve physics accurately,” said Teran, who has taught an undergraduate course on scientific computing for the visual-effects industry.

14 While Teran loves spectacular visual effects, he said the research has many other scientific applications as well. It could be used to simulate plasmas, simulate 3-D printing or for surgical simulation, for example. Teran is using a related algorithm to build virtual livers to substitute for the animal livers that surgeons train on. He is also using the algorithm to study traumatic leg injuries.

**6th Grade Session 2: Craft and Structure**

1. Read the sentence from the article below.

*If the physics and mathematics are not simulated accurately, it will be* ***very glaring*** *that something is wrong with the animation of the material.”*

The author uses the phrase ***very glaring*** to indicate that

A. any mistake will be obvious to viewers

B. animation is a complex problem

C. physics and math are challenging

D. accuracy is not that important

1. This question has two parts. First, answer Part A. Then, answer Part B.

**Part A**: Read the sentence from the article below.

*“It’s easy to simulate a boat traveling through a* ***static*** *lake, but a boat on waves is much more challenging to simulate,” Stomakhin said.*

What does the word ***static*** mean as used in the sentence above?

A. rippling

B. floating

C. streaming

D. unmoving

**Part B:** Select the word or phrase from the sentence that helped you to infer the meaning.

1. This question has two parts. First, answer Part A. Then, answer Part B.

**Part A**: What is Teron’s tone toward the role of math and science in animation?

A. frustrated by the complicated mathematical algorithms, but excited about the results

B. admiring of the results of the effects and hopeful about additional possibilities

C. focused on the challenges involved and critical of the on-screen special effects

D. awestruck by the realistic simulations, but disappointed in how difficult is to create

**Part B:** Select the sentence from the article that best supports your answer for

1. UCLA mathematics professor Joseph Teran, a Walt Disney consultant on

animated movies since 2007, is under no illusion that artists want lengthy mathematics lessons, but many of them realize that the success of animated movies often depends on advanced mathematics.

B. The movement of water was precisely choreographed by mathematicians

who applied principles of physics and mathematics to the task.

1. It’s our job to add some extra forces and other tricks to help create those effects.

D. While Teran loves spectacular visual effects, he said the research has many other scientific applications as well.

1. Read this sentence from the article.

*Teran and his research team have helped infuse realism into several Disney movies, including "Frozen," where they used science to animate snow scenes.*

How does this sentence help the author develop the central idea?

A. It explains how researchers were able to create the snow scenes in “*Frozen*”.

B. It compares the techniques used to create animates scenes in different movies.

C. It gives an example of a movie that used science to create realistic animation.

D. It shows how important math and science are to realistic animation.

1. What does paragraph 14 contribute to the overall article?

A. It shows how the math that was used to create realistic animation can be used to solve real-world problems.

B. It explains additional algorithms that researchers are working on for special effects in animated movies.

C. It compares the research that Teran and his colleagues are working on to those of other scientists.

D. It describes several new advances in science that can help people who have various health conditions.