

## I. Title of Project

### 5E Model of Lesson Planning

## II. Curriculum Topics, School Name(s), Number of Educators, Grade Level(s)

The professional development took place at Minnequa Elementary. The school serves 336 students. The school is a Title 1 school, with approximately 94% of the population being from low-socio-economic households. The school is a 1:1 device for all scholars preschool through fifth grade. Teachers in the classroom are responsible for instructing all subject areas. Math, ELA, and Writing are a big focus. However, for the past two years, fourth and fifth grade have de-compartmentalized. The district has currently moved to remote learning for the remainder of 2020.

There were six participants for this professional development, two fourth grade teaches and the grade level's student teacher. Also attending were my teammates, two fifth-grade teachers, a para-professional, and a teacher assistant. Usually, this would be implemented school-wide; however, with the Covid-19 pandemic, others in the building are preparing to teach remotely while taking a Reading Training program through the Colorado Department of Education.

## III. Standards Addressed

The standards included in the professional development were the NGSS Standards and standards for the activity completed by participants, "The High Rise Challenge." The following are the standards addressed, K-2-ETS1 1-3 a. b. c. SWBAT follows questioning, developing, observing, exploring, testing, documenting, analyzing, interpreting, and problem-solving. I also found that this connects with the Common Core state standards RI 2.1, W.2.6, w.2.8, SL.2.5. These state the scholars expect to answer questions to demonstrate understanding, collaborate with peers to produce and publish writing, recall from experiences or gather information from provided sources to answer questions, and create a visual display of experiences to clarify ideas and thoughts.

## IV. Summary of Project

Here is a summary of professional development. The intention of this PD is for educators to gain new resources and support in the 5E Model of Lesson planning. Upon completing the PD activities, educators' expected outcome is to plan an age-appropriate lesson for their grade level. I will conduct follow-up interviews with each grade level team during an open PLC plan. These are to take place bi-weekly to check on successes, supports, and material or resources needed.

## V. Pre-questions Survey List

Pre-assessment survey questions asked participants to answer the following.

- How much do you know about the 5E model of lesson planning?
- What is the NGSS, and how can we utilize it in our planning?
- Do you implement STEM activities into your workweek? If yes, how often?
- Will implementing STEM into your workweek increase with the new information that you have learned today?

## VI. Brief Description of the Actual Professional Development Training

During the training, as the presenter, I began by introducing the day's schedule, the standards that would be met by attendees, and the objectives. Participants then viewed a brief video to pique interest and introduce them to

the 5E's lesson planning components. Following the video, the lesson's PowerPoint presentation began, and the participants received the paper packet of their resources. In the first step, participants took the time to look over the 5E Model of Lesson Instruction. The document gave them the definitions of the 5E's of lesson planning: to engage, explore, explain, elaborate, and evaluate. The form that participants reviewed also described behavior expectancies for both teachers and students. I mentioned the information in the lecture as the facilitator while participants looked at the document. There was also discourse regarding any questions that came up. Participants then looked at the next page of their packet for learning, the 5E Model of Lesson Planning Template. The lesson plan information participants heard through lecture, definition, and example. So the purpose for each of the 5E's explained in the lesson plan template supported users while completing their planning.

Participants now explored the NGSS standards and took time to explore alongside the usual state standards that are for the grade level. Participants made comparisons and realized that the standards are cohesive to one another. Next, participants looked over a completed 5E Lesson shared by myself entitled "The High Rise Challenge." I lectured, giving the expected time frame for the entire lesson. The participants received the materials, as well as the requirements and the constraints, for the engineering part of the task. They will follow the requirements and conditions as they plan, build, and test a high rise model. The structure must be 36 inches tall and hold a tennis ball's weight, withstanding the force of varying wind speeds. The participants worked in teams of two and were completed the activity with time to spare and time to revise if necessary.

## VII. Brief Outline of the Activities in the 5E Model of Lesson Planning

1. Full PowerPoint presentation with video and lecture approximately 50-minutes
2. Participants receive a paper packet of materials and links or hard copy handouts of all materials.
  - a. Participants completed online pre-assessment before training to assess knowledge and interest.
  - b. Participants explored the 5E model through video and resources. Participants explored the materials both independently and with some facilitation to support information on the components of the 5E Model and their importance.
    - i. Engage: YouTube video on the benefits of creating 5E Model lessons for students.
    - ii. Explore and Interact: Link to a database of NGSS standards, a document that defines the 5E's of the lesson model and describes teacher/student behavior expectancies during a lesson. A lesson template that shares with educators the purpose of each stage of the 5E's.
    - iii. Explain and apply: A copy of a completed 5E lesson for participants to look over as the lecture covers its details for the week long-expected learning. Finally, participants have the opportunity to pair up in groups of two and design, build and test a "High Rise" of their own.
    - iv. Evaluate: Introduce to quick ideas to have students evaluate their learning through writing pieces that have them describe their design, results of the test, and information of any revision needed to be successful with the requirements and constraints of the lesson.
  - v. Extend: Participants received links to online resources and hard copies of all materials during the PD. A small amount of time was allotted to participant teams to revise designs engineered for the High Rises to compete in the activity's extension.

c. Participants completed an online post-assessment through Google Forms upon completion of the PD. The information was used as feedback for the presenter on the PD. It also gives insight into the growth of the participants' knowledge of the training material and topic.

#### VIII. What NASA data did you include?

The participants were directed to many sites provided by NASA, such as the NASA.gov/Stem site, the NASA eClip site, and the NASA Engineering Design. These are all beneficial to implementing stem in the classroom and creating lessons aligned to the NGSS standards and Common Core Standards.

#### IX. Follow-up Activities & Post-questions Survey List

The participants will receive a follow-up bi-weekly during the planned time for their PLC's. The participants' time will be utilized to follow up with any questions, concerns, support, or resources needed to complete lesson plans to continue implementing a 5E Stem lesson. The post-survey questionnaire was identical to the pre-assessment. These were collected and used to evaluate the learning acquired and the growth mindset of the teachers.

#### X. Outcomes. Final Data Collection and Analysis

The outcome was for the educators to walk away with a 5E Planned lesson and the fourth and fifth-grade team did that by combining efforts as they planned. The topic came about as they brainstormed a topic. The teachers began to speak of a Colorado Reader article on corn and its uses. The student-teacher who participated mentioned an extension activity that had to do with making and exploring bioplastic. The rest of the lesson came to light by stating that the students can then come up with extensions of their own by answering the essential question. How can bioplastic be utilized to solve a problem in the environment being used to reduce waste of some kind?

##### a. Survey Results/Comment on the content included in the project

The participants' overall survey comments about the content of adding STEM and 5E lesson planning to their classroom instruction were positive. The engagement and knowing it can be integrated with other content matter and subject they teach made them seem eager to implement faithfully.

##### b. Survey Results/Comment on the pedagogy in the project

The participants were optimistic about the pedagogical content of this activity. They liked how all of the 5e Model of lesson planning was similar to the See it, Name it, and Do it, Reflect model of observation that they experience when a leader observes their teaching. It was familiar, so it did not feel threatening.

##### c. Was your professional development successful? Why or Why Not?

I would say it was successful. It was productive for being two and ½ hours. Everyone was engaged and not bored. Time went by quickly, and everyone was having a lot of discourse around materials and ideas. If I could change anything, it would be my delivery. I feel that I was nervous and spoke fast.

##### d. How did this project relate to the readings? Cite two examples.

The readings that I felt this related to first was the article titled, A Primer on Effective Professional Development. This article was informative as I planned my PD was taking into consideration what an effective professional development must entail. Such as content focus, which my PD focused on the content of a 5E

Model of lesson planning that supports STEM lessons. Active learning, which my PD had throughout the entire PD. The PD I provided was also coherent with the school's and district's current goals and expected children's outcomes. The PD duration was quick, having shared and modeled a lot of valuable information in a short amount of time. The fourth and fifth-grade groups that participated worked as a cohesive unit sharing differentiated ideas for their abilities.

e. Will, the teacher do these activities again?

The teachers seem enthusiastic about the newly given information, hoping the follow-through is as optimistic.

f. Reflection

My self-reflection was that I was very nervous and anxious as I gave this to my peers. I believe that it was because I know how busy we are with the changes being given to us daily with a pandemic on our hands. I did not want to waste any of my colleagues' time because I know how valuable it is to maintain everything needed to run a classroom or three virtually at the spur of the moment.

Resources:

Desimone, L. M. (2011). A Primer on Effective Professional Development. *Phi Delta Kappan*, 92(6), 68.

NASA.gov <https://www.nasa.gov/> NASA.gov.education, NASA.gov/STEM, NASA.gov/eClip, NASA.gov/5E Model Lesson Plan.

# High Rise Challenge

**Theme:** Force~ Wind Effects on High Structures

**Time:** One Week

**Grade:** 2nd

## Standards

K-2 Engineering and design K-2-ETS1 1-3 a. b. c. these standards ask scholars to follow the process of questioning, developing, observing, exploring, testing, documenting, analyzing, interpreting, and problem-solving. Common Core state standards RI 2.1, W.2.6, W.2.8, SL.2.5. and 2.MD.A.1. In math, standard students will measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes The other standards state that scholars are expected to answer questions to demonstrate understanding, collaborate with peers to produce and or publish writing, recall from experiences or gather information from provided sources to answer questions, and create a visual display of experiences to clarify ideas and thoughts.

## LEARNING OBJECTIVES

- Students will research and design a tower that can withstand wind.
- Students will utilize the Engineering Design Process.
- Students will identify what a structure needs to withstand force.
- Students will measure with a yardstick to meet specific height criteria
- Students will test the structure against wind from a fan.
- Students will analyze data and draw conclusions based on evidence.
- Students will identify the scientific factors that affected the tower structure.
- Students will make revisions to structure after some reflection
- Students will present their structure to one another using a demonstration with a fan.

## ESSENTIAL QUESTION:

How can we as engineers design a tower that can support a tennis ball at least 18 inches off the ground while withstanding the wind from a fan?

### **JUSTIFICATION:**

This lesson will be introduced as a STEM lesson. This lesson will develop students' understanding of structures, their stability, and the effects of the wind on those structures. Students will make real-world connections by engaging in several experiences throughout this activity.

### **PRIOR KNOWLEDGE: Day One a.m.**

Begin with asking the students a question, "What do you know about wind force?" Have a brief discussion creating an ongoing anchor chart of student responses.

KWQL= What we know, What we want to know, What questions do we have, and What did we learn.

Show brief video clip 1:53 min.

Nye, B (8 April 2009) Bill Nye the Science Guy <https://www.youtube.com/watch?v=uBqohRu2RRk>

### **Engage:**

Introduce scholars to the idea of the force of the wind on a tall tower through phenomenon.

~ "The Former Astro Tower Swaying in the Wind" Bruce Sherman (May 2013) [www.youtube.com/watch?v=ILVb9cQ-7JM](http://www.youtube.com/watch?v=ILVb9cQ-7JM)

### **Explanation:**

Begin with the 25:15 min. video to introduce the stability of structures.

Nye, B. (published on YouTube 2016) "Bill Nye the Science Guy Structures"

[https://www.youtube.com/watch?v=fp1bVWHYE\\_I](https://www.youtube.com/watch?v=fp1bVWHYE_I)

Why is it important to build a stable structure?

\*Turn and Talk - Students will share responses with partners.

Students will take a Brain Break and go outdoors to observe the effects of wind on trees, electric poles, etc. Teacher will facilitate their outdoor exploration by asking

“How does wind affect the movement of the tall structures around us?”

**Interpretation:**

**Day One p.m.**

Next, begin with “The Former Astro Tower Swaying in the Wind” Bruce Sherman (May 2013) [www.youtube.com/watch?v=ILVb9cQ-7JM](http://www.youtube.com/watch?v=ILVb9cQ-7JM) and then begin the lesson.

Turn and Talk- What are the effects of force on tall structures?

**VOCABULARY:**

Students will be introduced to vocabulary thru discourse. Student task to create a Four Square of to include word and a drawing of the meaning after discussion of the following words.

stability-the state of being stable (firm)

force- an interaction that causes a push or pulls that changes the motion of something else

tower- a tall narrow building or a freestanding structure

Wind- the natural movement of air in a particular direction.

**Application: Day Two a.m.**

Briefly discuss what was learned the day before. Have scholars complete a Stand, Share, Sit.

Each student of the group has an opportunity to speak about one thing they remember from the prior day’s learning objectives.

Divide into teams of two or three. Before you begin designing, brainstorm answers to the following questions.

- How can we use our materials to make a tower that’s at least 18 inches tall?
- How can we use flexible materials, such as paper and string, to make a tower that is strong enough to hold up a tennis ball?

- How can we keep our tower from tipping over?
- How will we design our tower to resist the push of the wind and the pull of gravity?

Record and sketch your ideas in your design notebook.

Answer the following written responses in your notebooks:

*My design idea is...*

*My group decided on...*

As you brainstorm designs for your tower, think about other structures and how they stand up. For example, a tent combines flexible and rigid materials to make a frame and covering that can stand on its own.

**Day Two: p.m.**

**BUILD, TEST, REVISE**

**Students will be given time to begin building their tower using the following materials.**

**The only constraint is the tower must be 18 inches tall and hold a tennis ball while withstanding the wind from a fan.**

- **Building surface (hardwood floor)**
- **Electric fan**
- **Paper (copier paper and/or newspaper)**
- **Straws**
- **String**
- **Tape (masking or duct)**
- **Tennis ball**
- **Popsicle sticks**

Once you've got a tower to test, put it one foot away from the fan. (If your tower is hard to move, bring the fan over to the tower.) See how your tower responds when you turn the fan speed on low. When we made ours, we had to debug some problems. For example, our tower tipped over, our tennis ball kept falling off, and the weight of the tennis ball bent our tower. If any of these things happen to you, figure out a way to fix the problem so that your tower works as expected.

### **Perspective-**

Students will discuss and share out responses regarding the following question.

What are the strengths and weaknesses of your tower?

Students will give a written response to the prompt...

*Through my observation, my tower can/can't...*

Students will have time to brainstorm a possible solution and to revise their structure for a retest.

The scholars will use various speeds of the fan to complete observations and testing purposes for a variety of data.

### **EXTENDED ACTIVITIES:**

- Strengthen your tower so it can support a tennis ball when the fan speed is set to high.
  
- Build a tower that can support a baseball, softball, or soccer ball instead of a tennis ball.
  
- Make a tower that can support a tennis ball that's 36 inches off the ground.

RESOURCES:

WGBH Ed. Foundation (2007) Design Squad: High Rise Challenge

[https://pbskids.org/designsquad/pdf/parentseducators/ds\\_pe\\_event\\_guide\\_high\\_rise.pdf](https://pbskids.org/designsquad/pdf/parentseducators/ds_pe_event_guide_high_rise.pdf)

MCTighe, J. and Wiggins, G. (2004) UbD Professional Development Workbook