

**Active Learning in the Science Classroom**

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Professional Development Final Report

SCED 545 STEM Leadership Seminar

Adams State University

Professor Kristen Crawford

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**I. Title of Project:** Active Learning in the Science Classroom**II. Curriculum Topics, School Name(s), Number of Educators, Grade Level(s), Include the names and contact information of four educators who attended the PD.**

This PD will set out to change passive learning practices in the science classroom. Active learning and active learning activities were the main topic focus of the PD. First, I covered what active learning is, its benefits, and how to use it effectively in the classroom. After I was sure they understood what active learning actually is I covered active learning exercises such as drawing, singing, discussions, games, real-life data, and phenomena. I also included many resources and ways to intergrade technology. I had seven attendees ranging from 3rd-8th grade teachers currently teaching at my school. Our School is RISE Academy, a K-8th title one public charter school in Margate, Florida.

- |                      |                       |  |
|----------------------|-----------------------|--|
| 1. Lashandra Jarret  | Middle School STEM    | <a href="mailto:lajarrett@riseacademyschools.com">lajarrett@riseacademyschools.com</a> |
| 2. Elizabeth Fischer | 4 <sup>th</sup> Grade | <a href="mailto:efischer@riseacademyschools.com">efischer@riseacademyschools.com</a>   |
| 3. Jennifer Morton   | Middle School         | <a href="mailto:jjimenez@riseacademyschools.com">jjimenez@riseacademyschools.com</a>   |
| 4. Tammy Staszak     | 3 <sup>rd</sup> Grade | <a href="mailto:tstaszak@riseacademyschools.com">tstaszak@riseacademyschools.com</a>   |

**III. Standards Addressed. You must include the NGSS or your State Standards text, not just the number.**[CCSS.ELA-LITERACY.RST.6-8.7](#)

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

**In my PD:** Diagram, drawing, graphic Organizer

[CCSS.ELA-LITERACY.RST.6-8.9](#)

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

**In my PD:** Simulations such as Gizmos and PHet

[CCSS.ELA-LITERACY.RST.6-8.1](#)

Cite specific textual evidence to support analysis of science and technical texts.

**In my PD:** Discussions/table talk and word play

[CCSS.ELA-LITERACY.RST.6-8.2](#)

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

**In my PD:** Discussions/table talk and word play

[MS-ETS1-3 Engineering Design](#)

Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

**In my PD:** Analyzing real life data

[MS-ETS1-4 Engineering Design](#)

Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

**In my PD:** Place-based education and honorable mentions

#### **IV. Summary of Project**

I set out to change passive learning practices and help teachers understand how to engage their learners better. My end goal is for this engagement to create more significant neural links that will lead to long-term information storage and lifelong learners. First, teachers were introduced to the premise of active learning and active learning activities that engage and empower students to take charge of their own education. I did this with a PowerPoint presentation, provided resources (shared Google Docs), and multiple active learning activities for the teachers to try.

#### **V. Pre-questions Survey List – include questions about pedagogy and content.**

I used Survey Monkey to manage my survey. The before survey questions and results were the following:

- 1. Do you know what active learning is?**
  - Yes (4)
  - No (3)
  - Somewhat
- 2. Do you use active learning in your classroom currently?**
  - Yes (3)
  - No (4)
  - Somewhat
- 3. How often do you use active learning in your classroom?**
  - Daily (2)
  - Weekly (1)
  - Infrequent
  - Never (4)
- 4. If you use active learning in your classroom what are some of the activities you use? (open response)**
  - Brainstorming, peer discussion, qar,etc
  - Question and answer. concept checks
  - Reflect on learning process
  - N/A
  - N/A
  - N/A
- 5. Does this PD topic interest you?**
  - Yes (5)
  - No
  - Somewhat (2)

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

My PD was intended for teachers that want to implement active learning exercises into their science lessons. My PD was also meant to help teachers understand active learning, its benefits, and how to implement it. I used the platform Zoom to deliver my PD on google slides. I made the slides and a google doc of the resources available to all the teachers in attendance. I had four slides about information on active learning and nine slides on resources/activities. I asked teachers to fill out a survey before and after the presentation to collect data. After the PD, I asked the teachers to come to my room for coffee and collaboration so I could informally interview the teachers and get a better understanding of what they got out of or could add to the PD. I provided coffee and doughnuts for our coffee and collaboration time. I had the teachers take part in many exercises and provided loads of resources to them. I added my slides to the next few pages to show what my PD entailed.

## VII. Brief outline of the activities in the professional development session

### DRAWING:

- <https://www.storyboardthat.com/>
- <https://whiteboard.fi/>
- <https://www.tinkercad.com/>

Activity: The teachers diagramed photosynthesis on Whiteboard FI.

### SIMULATIONS:

- <https://phet.colorado.edu>
- <https://gizmos.explorelearning.com>
- <https://learn.concord.org/collections>
- <https://www.myphysicslab.com>
- <https://www.physicsclassroom.com/Physics-Interactives>
- <https://www.edumedia-sciences.com/en/>

Activity: The teachers did a front-loading activity with Gizmos about gravity and how much mass and distance can influence it with the gravity pitch activity.

<https://gizmos.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=648>

### AUTHENTIC DATA (NASA):

- <https://mynasadata.larc.nasa.gov>
- <https://www.ncei.noaa.gov/resources/educatio>

- <https://science.nasa.gov/national-space-science-data-center>
- Activity: The teachers looked at an urban heat index that compares the heat index of certain areas during the day vs. night. Talking points focused on why a city may experience much warmer temperatures than in nearby rural areas. Also, why does the heat index fluctuate so little around water?  
<https://mynasadata.larc.nasa.gov/phenomenon/creation-of-urban-heat-islands>

#### SINGING:

- <https://www.songsforteaching.com/sciencesongs.htm>  
Activity: The teachers sang a song and danced to a song about plate boundaries, all to the Adams Family's beat.  
<https://www.youtube.com/watch?v=NWLryWZUy-Q>

#### PLACE BASED LEARNING:

- <https://www.tetonscience.org/about/place-based-education/>
- <https://www.cfbroward.org/issues-that-matter/eco-broward>  
Activity: I gave an example of a past project on beach renourishment in Broward.

#### PHENOMENA:

- <https://www.ngssphenomena.com>
- <https://thewonderofscience.com/phenomenal>  
Activity: Teachers viewed a picture of a half-covered plant in a plastic bag, and the bag was filled with condensation. Teachers needed to use their photosynthesis and water cycle skills to identify evapotranspiration.



#### WORDPLAY:

- <https://www.popplet.com>

Activity: I showed an example of using a Popplet to mind map.

### **VIII. What NASA mission data or Endeavor resource did you include?**

I used resources that I used in my physics in sports class, intro to STEM, and intro to coding classes. I also used some resources and information from my classes at Adams State, especially the engaging creative and innovative/entrepreneur learners' class. In my Physics class, we focused on using simulations to hook, monitor understanding, and assess within our classrooms. We often used Phet, Gizmos, and My physics classroom. In the Intro to STEM class, we used NASA and NOAA often to use real-life data to connect within our classroom and how to use scientific phenomena. My intro to robotics class left me with many resources such as whiteboard FI, scratch, Tiinkercad, and storyboard That. Finally, Adams State helped me truly understand the foundation and benefits of active learning and place-based education.

### **IX. Follow-up activities & post- survey questions**

After the survey was completed, I asked the teachers to fill out another survey on Survey Monkey, and I asked them to come to my room for coffee and doughnuts so we could discuss, in depth, more about the PD. The follow-up questions given, and results obtained were as follows:

#### **1. Did you learn something from this PD?**

Yes (7)

Somewhat

No

#### **2. Do you feel like you fully understand active learning now?**

Yes (7)

Somewhat

No

#### **3. Do you think you will incorporate any of these activities into your classroom?**

Yes (7)

Maybe

No

#### **4. If any what activities mentioned today will/would you incorporate into your classroom? (Open Response)**

- Simulations, Place Based Edu, Phenomena.
- Drawing, word play, simulations.
- The drawing and movement-based learning.

- Roleplaying, interactive whiteboard and edpuzzle.
- I will incorporate checking comprehension with drawing using whiteboard, storyboard, and possibly Flipgrid.
- whiteboard.fi, gizmos
- Whiteboard

#### **5. Did you enjoy this PD?**

Yes (7)

Somewhat

No

#### **6. What parts of the PD did you enjoy? What parts would you change or leave out? (Open Response)**

- I liked it all, it was helpful
- Resources and examples
- Everything, very informative. I would change nothing
- Drawing on whiteboard
- I enjoyed it all!
- I love your enthusiasm, I love real teacher stuff, and that all resources are free
- Interactive activities resources are student centered

**Coffee and collabo main points:** All the teachers said they were relieved to do a PD that was not about a program we would be expected to use. They also all loved the Whiteboard FI resource and said they are least likely to use authentic data. They said they do not feel confident enough to use authentic data and would not be sure how to implement it into their class correctly. I almost did not include my 3rd-grade teachers, but they may have enjoyed the training the most. Also, many of the teachers admitted they had not done anything outside of technology since Covid started. It made them feel good perfect their skills again. They also loved having collaboration time after.

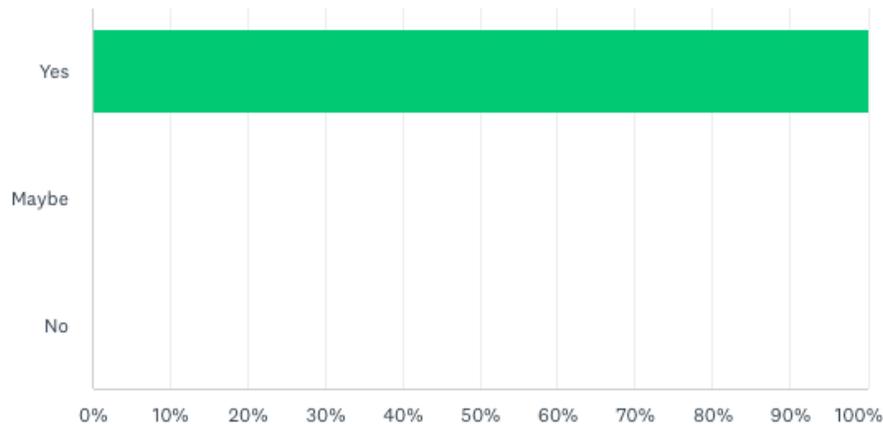
#### **X. Outcomes. Final Data Collection and Analysis (address each point below) • Survey Results/Comment on the content included in the project**

All results are listed above in section IX. Initially, I did not think my 3rd-grade teachers would benefit, but they left me the best reviews in my survey and were most excited during our coffee and collabo time. My survey showed that only 4 of the 7 participants knew what active learning was before the PD, and only three said they used active learning in their classrooms. The after-PD survey data showed that all seven teachers indicated they understood active learning, and all seven said they wanted to incorporate active learning exercises into their

classroom routines. Finally, they all indicated on the survey that they enjoyed the PD and would most likely use the drawing activities, Whiteboard FI, and would least likely use the authentic data.

Do you think you will incorporate any of these activities into your classroom?

Answered: 7 Skipped: 0



• **Was your professional development successful? Why or Why Not?**

My personal feelings and data showed the training to be a great success. Even though I took a little over an hour of their time during our last planning day, all the teachers thanked me. They all said they were happy to finally have the training to help them be better teachers for their students during our coffee and collabo time. We are all burnt out on trainings about new programs that we have been forced to use, or about tech in general. They said they felt excited to finish the year with a new tool in their toolbox. All of them indicated that they were going to apply active learning and breaks into their lecturing moving forward. Lastly, they loved the idea of coffee and collabo time and want to make it a regular thing.

• **How did this project relate to the readings? Cite two examples.**

The two articles that related the most to my professional development were Effective teacher professional development and “Not Another Inservice!” TEACHING Exceptional Children.

On P. 7 of the Effective Teacher Professional Development, they address active learning and how PDs should include active learning to teach teachers. The article states the following about active learning “The design of PD experiences must address how teachers learn, as well as what teachers learn.” (Jenkins & Yoshimura (n.d.) p.7) In my

PD, I cover what active learning entails and complete active learning exercises with the participants. This gave the opportunity “for teachers to engage in the same learning activities they are designing for their students is often utilized as a form of active learning.” (Jenkins & Yoshimura (n.d.) p.8)

These different active learning activities will provide teachers with some possible tools for ESE and ELL students to differentiate their instruction. In Jenkins and Yoshimura’s article, they highlight the need for meeting the special education professional development needs of general educators. If teachers follow the I do, we do, and you do scaffold aspect and timed breaks of active learning this would easily help ESE and ELL students. I believe active learning to be the answer to “Today’s teachers face many challenges, and one of their most challenging tasks is to meet the needs of and support the success of a diverse group of students, including those with disabilities.” (Darling and Hammond et al. (2017) p.2)

• **Will the teacher do these activities again?**

After the training, I held a coffee and collabo meeting in my room to pick the teacher’s brains about the training and what they would like to use from it. All of them really enjoyed the idea of adding drawing and Whiteboard FI to their teaching repertoire. They also like the idea of hooking/front loading with simulations. I was surprised how many teachers did not understand active learning and how to apply it in their classrooms. I was so happy to hear that they all want to incorporate more active learning into their lessons in general. My only real disappointment was that they all mentioned that using real-life data was the one they still felt the most uncomfortable with and would not likely use.

**Resources:**

1. Oakley, B. A., Rogowsky, B., & Sejnowski, T. J. (2021). *Uncommon sense teaching: Practical insights in brain science to help students learn*. TarcherPerigee, an imprint of Penguin Random House LLC.
2. Wu, S. P., Van Veen, B., & Rau, M. A. (2020). *How drawing prompts can increase cognitive engagement in an active learning engineering course*. *Journal of Engineering Education*, 109(4), 723-742.
3. Terada, Y. (2019, March 14). *The Science of Drawing and Memory*. Edutopia. Retrieved March 27, 2022, from <https://www.edutopia.org/article/science-drawing-and-memory>
4. Darling-Hammond, L., Hyler, M., & Gardner, M. (2017). *Effective teacher professional development*. <https://doi.org/10.54300/122.311>
5. Jenkins, Amelia A., and Jodi Yoshimura. "Not Another Inservice!" *TEACHING Exceptional Children*, no. 5, SAGE Publications, May 2010, pp. 36–43. Crossref, doi:10.1177/004005991004200504.
6. Doyle, L. (2021, December 1). *The benefits of active learning in higher education*. Northeastern University Graduate Programs. Retrieved March 27, 2022, from <https://www.northeastern.edu/graduate/blog/active-learning-higher-education/>