

1. What is the title of your STEM professional development?

Inquiry-Based Learning: Incorporating The Design Process in any Context to Foster Meaning-Making
[Event Flyer](#)

2. Why did you select the topic?

I selected this topic because I think the design cycle attributes are essential for learning and fostering inquiry, which is a learning focus of my school. Students are provided with an opportunity to explore a question and test out multiple solutions to a problem. They learn about the specific processes as they go through iterations of a design and test, allowing them to recognize issues and make changes to reach a potentially more successful outcome to the main problem addressed.

As students progress through this process, they participate in meaning-making of the phenomena presented. They can practice solutions by testing out different variables as they work to understand the concepts explored. Students practice problem-solving skills, are encouraged to make mistakes, and build their knowledge through trial and error. They need to participate in metacognitive activities as they progress through the different stages of the design cycle. Beyond the real-world learning experiences that learners will encounter in engineering design, this process can also be incorporated across subject areas and grade levels. Activities can also be designed to meet individual learners' specific needs. Through scaffolding, learners can progress through the design process based on their skills and background knowledge as they design meaningful solutions to problems and further develop their understanding of target concepts.

3. How does your PD integrate NASA assets and/or content from the Endeavor courses?

This PD integrates content from the courses “The E in STEM: Meaningful Content for Engineering” and “Methods of STEM Education” I will share resources from NASA’s Jet Propulsion Laboratory, Design Squad, The Wonder of Science, and other applicable sites.

4. Who is your proposed audience? Which teachers will you serve with your PD and activities? What grades, subjects, and how many students do they teach?

My setting is The American International School of Johannesburg Pretoria Campus. It serves students from Early Years (4 year olds) to Grade 8. The campus has around 250 students total, with roughly 95 students in the Middle School (6-8). The population includes students from dozens of countries with varied cultural backgrounds with an educational philosophy of student-centered focusing on holistic education. The main campus in Johannesburg includes a population of around 650 students from Early Years through Grade 12. Class sizes can vary based on grade level and teacher specialization, but in general, there are between 12 and 25 students in a class.

5. What STEM concepts or learning goals will you and your materials address which can potentially replace other classroom activities? List NGSS and CCSS or your state standards.

I will share the NGSS 8 practices of science and engineering: “1. Asking questions (for science) and defining problems (for engineering) 2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations (for science) and designing solutions (for engineering) 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information” (*APPENDIX F -Science and Engineering Practices in the NGSS a Science Framework for K-12 Science Education*

Provides the Blueprint for Developing The, n.d.) I want to share how a Design Notebook can be utilized in other subject areas, so I will also explore some of the CCSS related to Math, English Language Arts. The eight mathematical practices in the CCSS would also be something else to share for students in general as what they will be able to accomplish and develop when incorporating Design Notebooks. I want to express to teachers that they can have a focus on something like a narrative writing and create an engineering design notebook that fits the standards for their grade level, for example in grade three the narrative writing standards are further broken down and each part could in turn become part of a designers notebook that relays some of the writing process. Due to the nature of providing a PD across grades and subject areas, it will be important to give time to teachers to explore how the concepts of a Design Notebook and science and engineering practices or the mathematical practices can be applied within a teacher's specific context.

6. How long will the session be? How will you recruit your audience? Where will you advertise your PD session?

I plan to hold a 60-90 minute PD session. I am still in the progress of finalizing the date of the PD. If I can use our weekly PGCT time, this would be a PD that all teaching and teaching support staff would attend. However, if this is not possible, I will arrange to hold my session at the end of the school day on a day where hopefully, most teachers will be able to attend. In either case, I plan to share a digital flyer about the PD so that I can provide teachers with a brief overview of the content and encourage them to attend. I will also share this flyer with our Johannesburg campus so teachers can arrange to join the session with their department heads. The flyer will be shared via email, in our Teaching and Learning portal and weekly updates, and our staff room.

7. To demonstrate that teachers have learned something new, you will generate a pre- and post-survey. What, in general, will your pre-survey and post-survey ask?

I plan to ask a pre-survey of participants about a week before the PD to gain what teachers may already know about STEM, the design process, and their level of ease incorporating the engineering design process in the classroom. I plan to pose the following questions to teachers: What do you know about STEM/STEAM? What do you know about the Design Process? Choose one area that you teach, and based on your knowledge of STEM/the Design Process, how have you tried to incorporate these into your lessons? Based on the session description, what are some strategies and concepts you hope to learn more about?

For my post-survey, I want to determine the usefulness of the session, what teachers have found that they can implement in the classroom, and ways I can continue to offer assistance as they implement what they have learned. Some questions I would like to pose include: Which area have you decided to explore incorporating the design process in your classroom? After today's session, what questions do you still have about implementing STEM or the Design Process in your classroom? Based on the resources shared and the information presented to you, what are challenges you feel you may encounter with including the Design Process in future lessons/units of study? Would you be interested in attending a follow-up session or scheduling time to assist you in further developing the Design Process in your classroom? When do you hope to teach the lesson/unit with the design process that you explored today?

8. What outcomes or expectations do you hope to see for your educators?

The outcomes that I hope to see with this PD are that teachers are more aware of how they can continue developing inquiry-based learning in their classrooms through the design process. I also want

teachers to recognize they can utilize the design process across subject areas. Participants will also leave with a structured plan for an upcoming lesson or unit where they can incorporate the design process.

9. How will you follow up with the teachers in attendance?

I will use information from the post-survey to connect with teachers to check with them on their progress with their plan for introducing the engineering design activity to their students. I will also reach out via email to individuals to ask if attendees would like to share how the activities are going in their classrooms.

10. What data collection methods (e.g., surveys, interviews) will you use to analyze the PD's success?

I will use the pre-survey and post-survey to determine what teachers have been able to learn from participation. I will also set up interviews/observations with teachers to determine how they are doing with exploring implementing the design process and design notebooks into their lessons and discuss the impact the use of the design process has on the learners. If possible, I will also ask students who have participated in an engineering design process/design notebook activity how they feel it impacted their learning.

References:

APPENDIX F -Science and Engineering Practices in the NGSS A Science Framework for K-12 Science

Education provides the blueprint for developing the. (n.d.).

<https://www.nextgenscience.org/sites/default/files/resource/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf>

Common Core State Standards Initiative. (2019). *Standards for Mathematical Practice | Common Core*

State Standards Initiative. Corestandards.org. <http://www.corestandards.org/Math/Practice/>