

**TITLE****PROJECT-BASED LEARNING****CURRICULUM TOPICS**

Next Generation Sunshine State Science Standards  
M/J Comprehensive Science 1/2/3, Physical Science, Biology, Earth Science, Ecology, Algebra,  
Geometry, Mathematics (6/7/8), Social Studies, Civics, Physical Education, ELA

**SCHOOL**

AcadeMir Charter School Middle, Miami, Florida

**PARTICIPANTS**

Name of educators	Position	Courses	Grade s
Erlan Cabrera	Dept. Chair / Science Teacher	Biology, Robotics, Science	6,7,8
Camilo Soares	Science Teacher	Physical Science, Science	6,7,8
Jessie Fernandez	Science Teacher	Forensics, Science	6, 7, 8
Paola Espinosa	ELA Coach / PD Liaison	ELA / Administration	K-8
Mark Viera	Social Studies Dept. Chair/ Teacher	Civics, Law studies	6,7,8
Dwayne Andrews	PE Teacher / Coach	Physical Education	6,7,8
Raquel Santiago	Science Teacher	Grade Science, Social Studies	5
Karla Rodriguez	Principal	AcadeMir Middle	6,7,8
Nabin Timilsina	Instructional Coach / Testing Chair	Science	K-8

**CONTACT INFORMATION OF 4 PARTICIPANTS**

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**NEXT GENERATION SUNSHINE STATE SCIENCE STANDARDS**

Standards	Description
SC.8.N.1.1	Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding; plan and carry out scientific investigations of various types, such as systematic observations or experiments; identify variables; collect and organize data; interpret data in charts, tables, and graphics; analyze information; make predictions; and defend conclusions.
SC.7.N.1.2	Differentiate replication (by others) from repetition (multiple trials).
SC.7.N.1.5	Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.
SC.6.N.2.2	Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.

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SC.7.N.3.1	Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.
SC.8.E.5.3	Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.
SC.8.E.5.5	Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).
SC.8.E.5.7	Compare and contrast the properties of objects in the Solar System, including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.
SC.7.E.6.4	Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.
SC.7.E.6.5	Explore the scientific theory of plate tectonics by describing how the movement of Earth’s crustal plates causes both slow and rapid changes in Earth’s surface, including volcanic eruptions, earthquakes, and mountain building.
SC.6.E.7.4	Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.
SC.6.E.7.5	Explain how energy provided by the Sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.
SC.8.P.8.4	Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured: for example, density; thermal or electrical conductivity; solubility; magnetic properties; melting and boiling points; and know that these properties are independent of the amount of the sample.
SC.8.P.8.5	Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.
SC.8.P.9.2	Differentiate between physical changes and chemical changes
SC.7.P.10.1	Illustrate that the Sun’s energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.
SC.7.P.10.3	Recognize that light waves, sound waves, and other waves move at different speeds in different materials.
SC.7.P.11.2	Investigate and describe the transformation of energy from one form to another.
SC.7.P.11.4	Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.
SC.6.P.13.1	Investigate and describe types of forces, including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.
SC.6.P.13.3	Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.
SC.6.L.14.1	Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.
SC.6.L.14.2	Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multicellular), all cells come from preexisting cells, and cells are the basic unit of life.
SC.6.L.15.1	Analyze and describe how and why organisms are classified according to shared characteristics, with emphasis on the Linnaean system combined with the concept of Domains.
SC.7.L.15.2	Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.
SC.7.L.16.1	Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another

SC.7.L.17. 2	Compare and contrast the relationships among organisms, such as mutualism, predation, parasitism, competition, and commensalism.
SC.8.L.18. 4	Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

### SUMMARY OF THE PROJECT

The goal of this professional development project was to provide strategies and skills and explore resources to ensure effective use of PBL. It was aimed at promoting learner-centered environment and fostering critical thinking, problem solving, creativity, innovation, and collaboration. PD also focused on strategies to sustain project-based learning in classrooms while adhering to the limitations set by the school administration, district, and state.

### PRE-QUESTIONS SURVEY LIST

1. How would you rate use of PBL in your school?
2. Does your school prioritize PBL?
3. How much effective was your last PBL with your students?
4. Would you like to attend a PD on PBL?
5. Have you noticed increase in student engagement when you using PBL model?
6. Does using PBL model help you with classroom management?
7. Has implementing a PBL model helped you know your students better?
8. On a scale of 1-5, how much helpful was your recent PD?
9. Would you like to learn more about PBL?
10. Have you attended any district or school sponsored PD on Project-Based Learning?

### BRIEF DESCRIPTION OF THE PROFESSIONAL DEVELOPMENT TRAINING

This professional development was on Project-Based Learning (PBL). The objective of this professional development was to discuss and learn strategies to transform a traditional classroom into a PBL classroom. The philosophy of PBL model was reviewed and all the participants had the opportunity to share their ideas, opinions, and experiences. This PD provided an in-depth understanding of a learner-centered learning environment and how this instructional model can help teachers accomplish their goals of producing critical thinkers and problem solvers. PD also provided ample examples of PBL activities and participants had the opportunity to ask questions or contribute their ideas and experiences after the explanation was provided by the facilitator. PD also discussed the challenges of implementing PBL in classrooms and strategies to overcome those challenges. Golden circle was also integrated in the PD to explain how PBL serves as the ‘how’ of this model.

This PD also focused on 21<sup>st</sup> century learning skills. Discussion among participants about these skills lead to the type of instruction mostly seen in their school. Educators were able to relate discussions to things that would have been done differently in the past few years. AcadeMir Charter School Middle science department was able to form a tentative plan of action to implement next years in order to make instruction engaging using project-based learning design.

## ACTIVITIES

Professional developed session used several activities throughout the session. It started with brief introduction of each participant. Most common activity was reflecting on their experiences and sharing ideas and opinions. This professional development session presented several opportunities to review cases and provide feedback. Since content of the PD was directly related to the daily work of participants, they were able to make instant connection. This resulted in intense engagement and discussions. Participants were given time to look at some resources. They took a few minutes to explore given resources from the websites. They took notes, and all of them shared their ideas and thoughts.

Think-Pair-Share was one of the commonly used activity during the session. Participants also had few opportunities in which they had to choose a word and talk about that in relation to project-based learning. Interaction between the facilitator and participants and among the participants through the use varied form of graphic organizers, diagrams, illustrations, and examples pertaining to the professional development.

## NASA RESOURCES

Ample NASA resources were used this PD. The main idea of this project-based learning professional development was to introduce activities that foster student-learning environment. NASA and Endeavor resources were very handy in this regard. I was able to integrate all the resources I had previously used as a classroom teacher. I used those as examples to explain how certain activities can help students gain 21<sup>st</sup> century skills. I used a few in-class and out-of-class activities from NASA JPL to show how those activities can foster collaboration, critical thinking, and problem solving. We discussed all the possible resources NASA has made free to all educators, students, and public. I was able to share the plethora of data that is available on NASA's official website. We explored ways to integrate this data into our lesson. In our think-share activity, everyone reflected their thoughts and ideas. We also discussed several professional development opportunities that can be offered by NASA Langley. We also looked five different activities from JPL Educator page and discussed how those activities were tight to Next Generation Florida State Science Standards, and how we could implement those in our middle school curriculum.

## FOLLOW-UP ACTIVITIES & POST- SURVEY QUESTIONS

Participants were asked to respond to the following items by choosing a number from 1-4  
1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree

Objectives were very clear	1	2	3	4
Professional Development was relevant	1	2	3	4
Professional development provided new knowledge and skills	1	2	3	4
Professional Development cleared my misconceptions regarding PBL	1	2	3	4
Presentation was engaging	1	2	3	4

There were ample activities	1	2	3	4
PD norms were established and followed	1	2	3	4
Presenter was respectful and professional	1	2	3	3
All activities were clear and organized	1	2	3	3
State standards were used to explain concepts	1	2	3	3
NASA Resources were used and made available	1	2	3	3
Presenter had excellent knowledge of the topic	1	2	3	3
Presenter was confident and well prepared	1	2	3	3
Expectations of the PD were clear	1	2	3	3
Discussions were aligned with the learning objectives of the PD	1	2	3	3

### Questions –

1. Were you able to create any SMART goal related to PBL? If yes, what is your SMART goal?
2. Would you be interested in attending another professional development session facilitated by the same presenter? If yes, what topic would you like?
3. What new strategies and skills did you acquire from this professional development session?
4. Do you plan on implementing any changes in your instruction and planning?
5. Will you use any of the resources acquired from this professional development?

As a science curriculum/instructional coach and testing chair myself, I will ensure that PBL is being implemented in our school. I am responsible to evaluate lesson plans and provide feedback, so use of project-based learning activities would be our school wide priority. I will continue taking feedback and suggestions from the teachers and work together to ensure that we are implementing these learner-centered models to ensure we give 21<sup>st</sup> century knowledge and skills to our students.

## **OUTCOMES, FINAL DATA COLLECTION, AND ANALYSIS**

### **Survey Results/Comment on the content included in the project**

This professional development on project-based learning mainly included science content. It considered several middle school standards of Florida state. This PD utilized content from courses - M/J comprehensive science 1, M/J Comprehensive science 2, M/J comprehensive science 3, Biology, and physical science.

### **Survey Results/Comment on the pedagogy in the project**

This PD took into consideration a few instructional frameworks that could go alongside project-based learning. PD addressed Gradual Release of Responsibility, 5-E lesson plan, and understanding by design. Participants were already very familiar with these models because of recent on-site trainings. I was able to facilitate discussions on how we can use these models and PBL to achieve the goal of producing critical thinkers, problem solvers, independent learners, and collaborators.

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

Yes, I really think that my professional development was very successful. It was very encouraging to hear participants say amazing things about the professional development in the feedback videos. Department head of science at AcadeMir Charter School Middle share how he was able to distinguish between a traditional classroom and a PBL classroom after the PD. He shared that while he was already doing most of those activities in the classroom, he shared that there is certainly more that needs to be done. He applauded on the correlation between PBL and the Golden circle of Why, What, and How. Another teacher shared that it really made sense using Golden Circle to understand why project-learning model is so important and powerful.

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

It is a known fact that reading, and science go hand on hand. Earlier this year when I took the position of science coach at our miller campuses, one of the changes I made was making sure there's collaboration among science, math, and ELA teachers at all grade levels. It was very convenient for me to making references to reading because of this awareness among teachers. One example how this project related to reading was that research and study is one of the key component of project-based learning, and students need to, especially in science, do their independent research and study in order to complete their work. Another example how this project related to readings is that we talked about how we can collaborate with ELA department to get project-based learning designs accomplished.

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

Yes, participants were very positive about implementing PBL in their classroom in the upcoming year.

**Reflection**

Watching feedback videos from participants and their enthusiasm of using resources presented in the professional development was very encouraging and satisfying. Use of NASA resources was something new to the teachers. They were very excited to learn that NASA JPL had so many activities that can be used to teach Florida standards. I displayed some of the NASA activities I had done as a science teacher, teachers were very much convinced of feasibility and effectiveness of presented activities. Being able to implement project-based learning in classroom will require teachers to have in-depth understanding of content of middle school science. I strongly believe this this professional development on project-based learning will help both teachers and students tremendously in a way that there is much study, research, collaboration, feedback, and assessment involved with this process. It is a time-consuming process but certainly engaging and highly productive. I would like to follow up with the teachers when we return after summer and make a plan to see how project-based learning is taking place in the classrooms. I will develop surveys including follow up questions and collect data to see if further assistance is needed in terms of PBL application. As a science coach of the school, it will also be my responsibility to ensure that I am working with the teachers and consistently supporting them in their classroom activities and lessons.