Professional Development Final Report:

STEAM Advancing Integration in the Elementary Grades

Developing Themes in the Content Areas

NASA Endeavor Project

STEM Leadership Seminar

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Abstract

How do we encourage teaching that creates stimulating and inspiring classrooms, where students engage in problem-solving and use their creativity and imagination to address interesting and important subjects, and where teachers push students to continue learning long after the exam is over? (Boykin & Noguera, 2011, p. 175) Every year educators stress over the limited time available to teach required skills and ideas. Unfortunately, too often there is little time possible to create, invent, and learn together. The goal of this workshop is to encourage teachers to make STEAM projects part of their classroom environment. Educators will have an opportunity to identify curriculum connections to STEAM activities. Time will be spent working collaboratively on creating exciting challenges that inspire learning. The NASA Endeavor program and excellent instructors provided me with the tools to share this vision.

Workshop Focus

The focus of this workshop was to align STEAM activities with grade level curriculum content through connecting themes. It began by discussing the issues that inhibit educators from introducing the design process to students. The most common problems involve the lack of time, funding, and the need for professional development. However, every participant wanted to bring STEAM to their students if possible. My goal was to increase their comfort level about STEAM and provide a hands-on learning experience. The program focused on incorporating key ideas and skills to design engaging STEAM projects. Every activity was aligned to the New York State Standards for kindergarten through fifth grade. The workshop included three "hands-on" experiences that incorporated science, mathematics, engineering, social studies, literacy, and the arts. Participants left the session with strategies and materials to add STEAM to their classrooms.

Participant Information

The Westchester Teacher Center sponsored a STEAM Conference on March 14, 2019, at Manhattanville College, Purchase, New York. The event began at 8:00 a.m. with a keynote speaker and ended at 3:00 p.m. with a closing discussion. The educators and administrators who attended were from Westchester County in New York. There were more teachers and administrators from elementary schools than high schools. Approximately one-hundred educators from ten districts sat at round tables and formed groups to complete design-based projects focused on social studies and literacy. Educators moved about the room sharing ideas and collecting materials.

Standards

NGSS

1-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

1-PS4-4 Waves and Their Applications in Technologies for Information Transfer

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

1-PS4 Waves and Their Applications in Technologies for Information Transfer

4-PS3-2 Energy Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4 Energy Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

4-PS4-3 Waves and Their Applications in Technologies for Information Transfer

5-ESS3-1 Earth and Human Activity

ESS-3 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

New York Social Studies Framework

1.8b Oral histories, biographies, and family time lines relate family histories.
2.2 People share similarities and differences with others in their own community and with other communities.

3.10b World communities have needs, wants, and limited resources. To meet their needs and

wants, communities trade with others. Technological developments in transportation and

communication have influenced trade.
4.6c Improved technology such, as the steam engine and the telegraph made transportation and

communication faster and easier. Later developments in transportation and communication

technology had an effect on communities, the State, and the world.

4.2 Native American[*] groups and the environment

5.1 Early peoples of the Americas

3.3 Geographic factors often influence where people settle and form communities.

2.8 Communities face different challenges in meeting their needs and wants.

K.9a A need is something that a person must have for health and survival, while a want is

something that a person would like to have.

2.1 By discussing different types of housing (apartment, single-family house, etc.) and the

proximity of houses to each other, students will understand the term "population density" and

how it applies to different communities.

3.9b People in communities have various ways of meeting their basic needs and earning a living.

4.2a Geographic factors often influenced locations of early settlements.

5.2b Complex societies and civilizations adapted to and modified their environment to meet the

needs of their people.

_____

[*]

Students will compare how the Mayas, Aztecs, and Incas adapted to and modified their environment to meet the needs of the people, examining the clothing, farming, shelter, and transportation systems for each.

Common Core State Standards for English Language Arts

1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or studied necessary material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

b. Follow agreed-upon rules for discussions and carry out assigned roles.

C. Ask and answer questions to demonstrate an understanding of a text, referring explicitly to the book as the basis for the answers.

 1. Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

2. Determine the main idea of a text; recount the key details and explain how they support the main idea.

 3. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Summary of Project

The purpose of this project was to identify connecting themes within curriculum areas for the integration of STEAM projects. Throughout the year, educators are continuously trying to keep up with the demands of the Common Core Curriculum. It seems whenever curriculum

changes occur, the result is an increase in content. Between required curriculum and testing,

there is little time to integrate STEAM activities. Identifying STEAM activities to embed into

classroom curriculum provides students an opportunity for collaboration and problem-solving.

Students engage as active learners and connect content to real-world experiences. Today's

children must learn to think creatively, share ideas with peers, and work together to solve

problems. Therefore, bringing STEAM into the classroom is the perfect opportunity to teach and

practice these 21st-century skills.
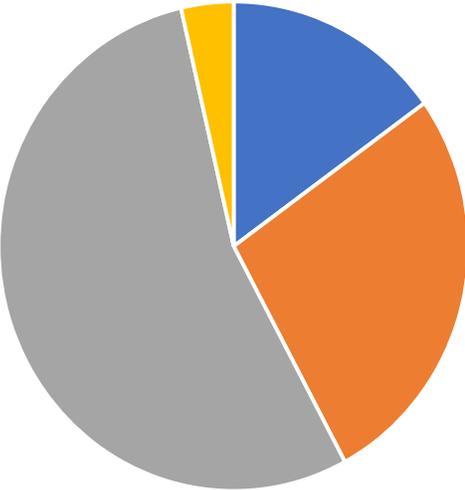
Pre-workshop Survey

1. Do you presently include STEAM activities in your class?

2. What subjects do you feel connect best with the design process? Circle your choice.

    Literacy   Social Studies   Mathematics   Science

3. Do you feel STEAM, STEM, or Makerspace can engage and promote student learning?

4. What do find is the most significant barrier to incorporating STEAM activities into your

    classroom?

5. What resources do you feel are needed to initiate STEAM activities with your students?

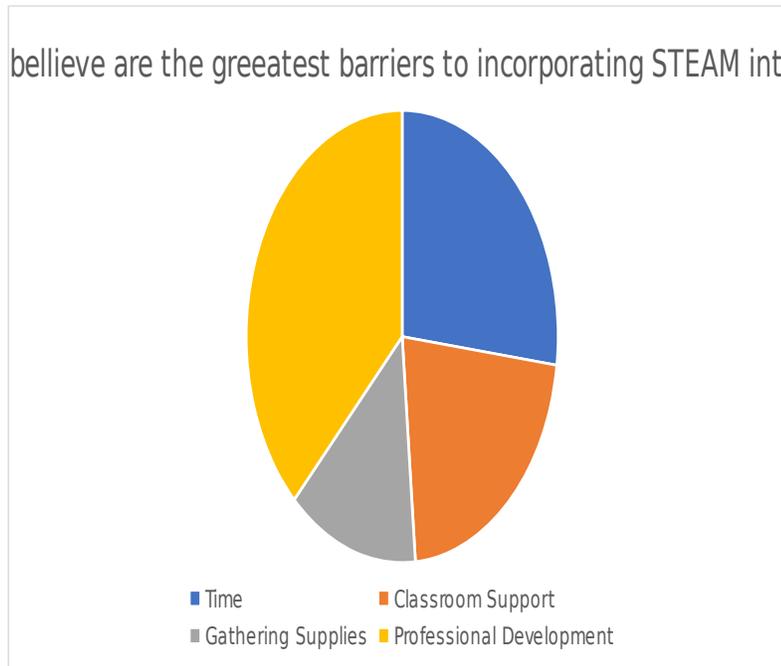## Do you presently include STEAM activities in your lessons?
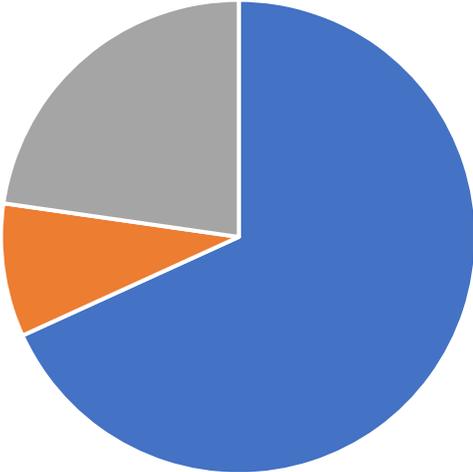
■ Yes ■ No ■ Sometimes

What subjects do believe connect best with the design process?

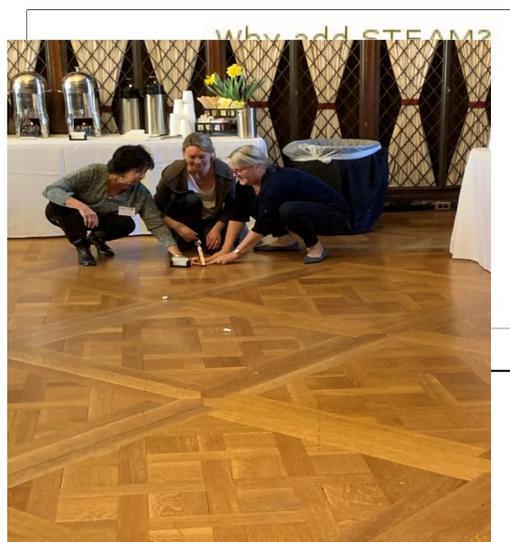■ Literacy ■ Mathematics ■ Science ■ Social Studies

What do you bellieve are the greeatest barriers to incorporating STEAM into you lessons?

- Time
- Classroom Support
- Gathering Supplies
- Professional Development

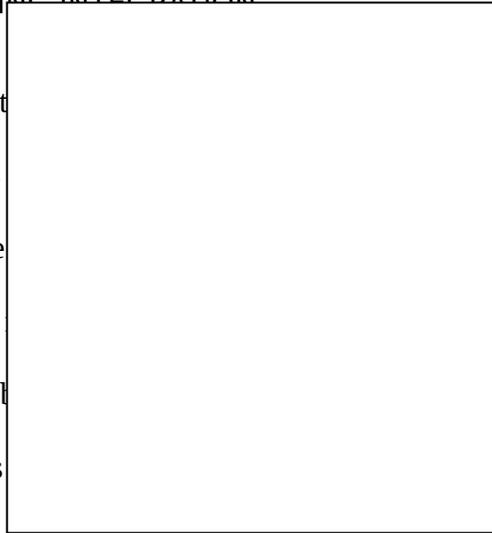## Description of Professional Development

The session began with a pre-workshop survey and brief discussion about bridging STEAM to the elementary classroom curriculum. It was interesting to hear that most teachers desired professional development and time to plan with their colleagues. My goal was to provide a workshop that established a comfort level and provided simple activities for the participants to begin a STEAM initiative in their schools. The first slide stated that STEAM benefits both teachers and students. Practicing STEAM requires creativity and innovation.

Participants listened to the book The Marshmallow Incident which linked literacy, social studies, mathematics, engineering, and science. After reading the story, groups formed to

identify curriculum connect   e. The "hands-on" experience

prompted great discussions   articipated in a Catapult

Challenge that reflected the   iscussed the potential of using

this project to teach simple   y. Literacy skills included

cause and effect, plot, vocal   itizenship, and supply and

demand were social studies

The Story of Jumping Mouse was the second book chosen for the workshop. This Native

American Legend bridged food webs, habitats, ecosystems, and landforms in a beautiful tale

about friendship. After reading the story, students had graphic organizers to create dialogue and

chose materials to design puppets. The participants learned how to construct a theater using

PVC pipes and cardboard. The result was a collaborative work of art that encompassed writing,

readers theater, puppetry, engineering, and technology. The group shared other opportunities

where stories can spark ideas, connect curriculum, and engage learners.
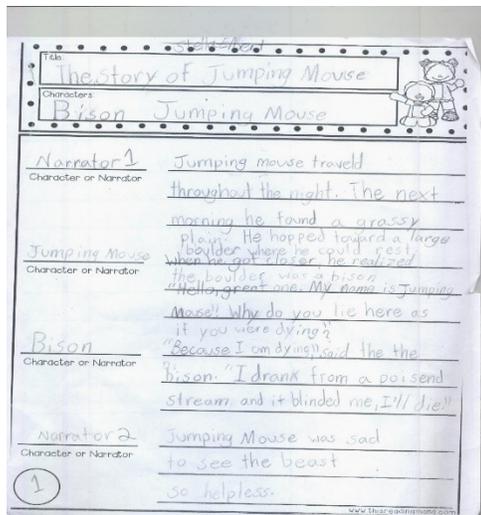
Post- Conference Survey

1. Do you feel better prepared to introduce STEAM to your students?

2. Did you get any new ideas from this workshop?

3. Which curriculum area would you feel confident in embedding a STEAM activity?

4. What other STEAM areas would you like addressed in future workshops?

5. Would you be interested in joining a STEAM Professional Learning Community?

What did you find most interesting in the workshop?

Legend: Growth Mindset, Using Technology, Building Collaboration, Adding Art
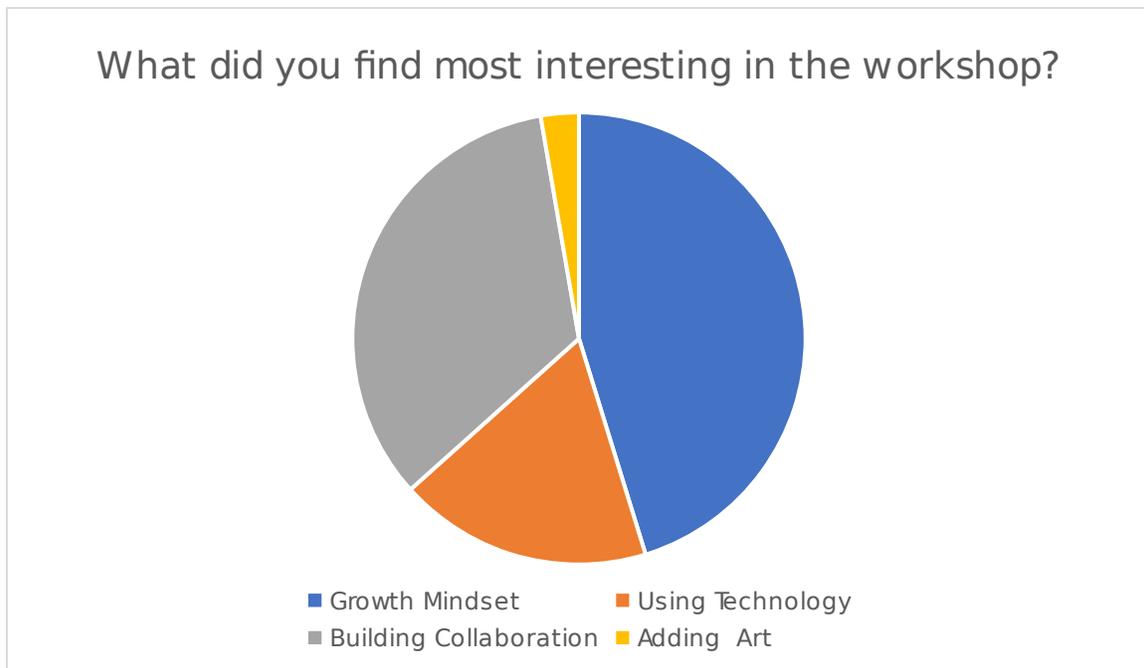
The results of the first post-conference question interested me because it showed an unexpected effect. The workshop began with a short video explaining the difference between a Growth and Fixed Mindset. https://www.bing.com/videos/search?q=what+is+a+growth+mindset+turtle&&view=detail&mid=C97D86F802978BE30ABBC97D86F802978BE30ABB&&FORM=VRDGAR

It is a short animation film showing the race between the tortoise and the hare. Those who have a growth mindset embrace obstacles as an opportunity to improve. After the video, the group discussed the need to praise our students' efforts rather than the product. It is important to realize that if you are not good at something this moment, with additional effort and practice, you may be good at it in the future.

Teachers realized they too must have a growth mindset when introducing STEAM to their students. If a student knows more than us, we must celebrate and share their expertise.

Do you feel better prepared to introduce STEAM to your students?

■ Yes ■ No ■ Somewhat
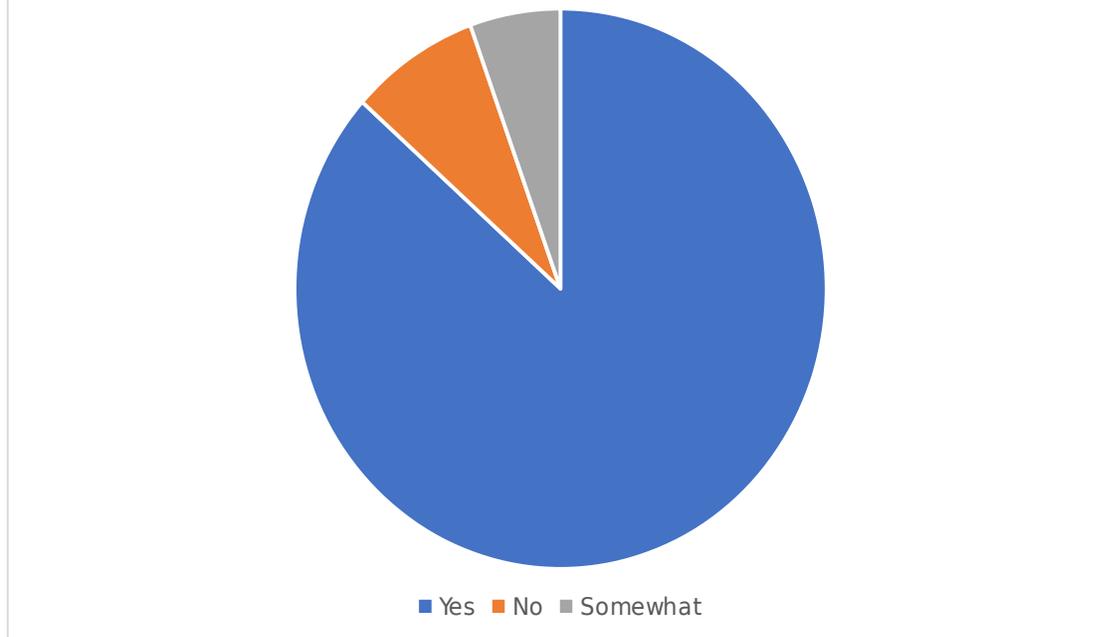
The outcome of the second post-conference question was inspiring. After the workshop, the majority of educators felt more comfortable incorporating STEAM into their classroom. Many requested additional professional development opportunities that provides "hands-on" learning in STEAM. Teachers were excited to identify connections for activities within their content areas. The majority were going to begin adding the design process to social studies with activities practiced during the workshop. They enjoyed the fact that literature introduced science, math, and social studies concepts and was comfortable beginning with simple challenges.

Would like to participate in a STEAM Learning Community?

Legend: ■ Yes ■ No ■ Maybe ■
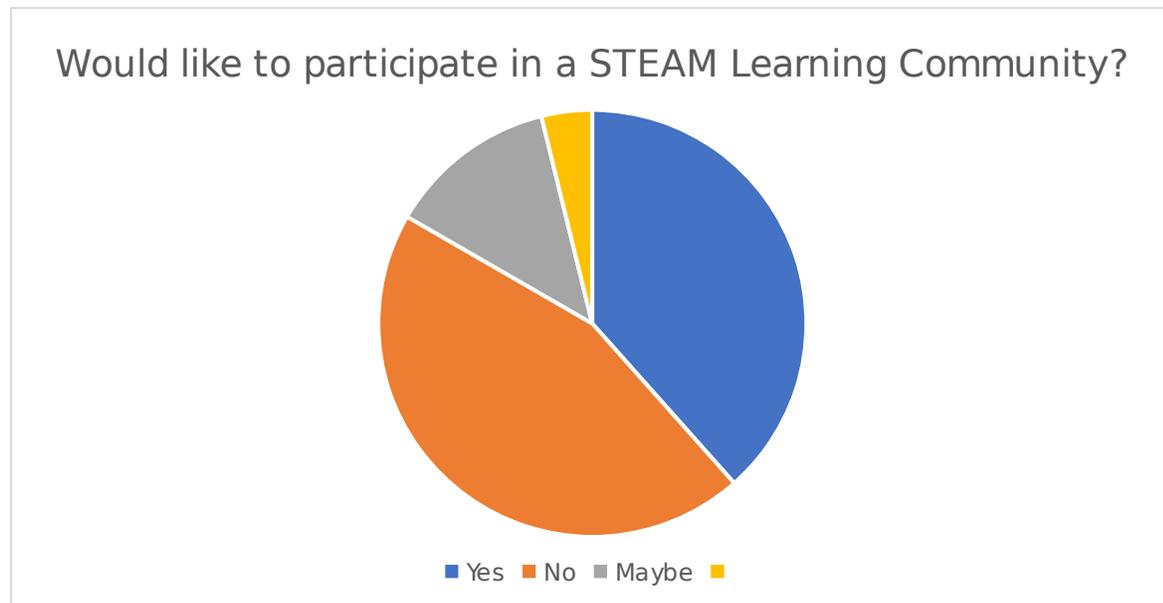
The results and comments from the third question reflected the lack of time and many obligations teachers experience in their schools. Nevertheless, a good number would like to participate in a STEAM Professional Learning Community. Keeping the activities fun, uncomplicated, and less costly, inspired the participants to bring STEAM to their students. There are never enough hours in a day, however, we must be continuous learners and work together to stay current.

Analyzing data from the workshop, convinced The Central Westchester Teachers' Center to continue building a STEAM initiative in Westchester County. As a result, The Central Westchester Teachers' Center requested me to coordinate a Professional Learning Community which will focus on a STEAM initiative at the elementary level. A majority of the educators provided contact information indicating their interest to participate in a STEAM Professional Learning Community. This was a positive and inspiring result from the workshop.

Survey Results and Pedagogy

While walking around the room, it was apparent the teachers were engaged and having fun learning together. There was a sense of collegiality, communication, and collaboration among the groups. Everyone was motivated to complete the challenges and share their success. Teams reflected on what did not work with their designs and revised the final products.

Teachers discussed time management, lack of funds, and need for training. Throughout the program questions and concerns were discussed and addressed. It was explained that it is okay if there is not enough time to complete an activity. In addition, rubrics, evaluations, and grades are not always necessary, and many materials can be supplied by the students. Collecting paper towel rolls, string, tape, pipe cleaners, newspaper, and glue guns are a great way to start. The internet has excellent resources for locating STEAM ideas and suggestions. Finally, if an activity does not achieve what you planned, you can always improve it.

NASA Resources

The workshop began with the NASA clip *Introduction to Engineering*. The video explained that engineers start with a question and think of ways to find solutions. They plan and focus on what they are making. Once they build a product, it is tested and improved. The short video was a proper introduction to the workshop.

https://www.bing.com/videos/search?

q=nasa+what+is+an+engineer+video+kids&&view=detail&mid=3DC4EB5551C0504977D83D

C4EB5551C0504977D8&&FORM=VRDGAR

https://www.youtube.com/watch?v=wE-z_TJyziI
Nasa- Introduction to Engineering
The power has gone out and we need to send a message to another classroom. We have been asked to stay in our classrooms. Your job is to work with your partner to design a device that will help us communicate with another classroom.

Here is a question I want you and your turn and talk partner to talk about: "What questions do we need to answer before we can design and build something that will allow us to communicate with another classroom?" Go ahead and share some

Nasa for Educators was an incredible website to use as a reference throughout the program. The site addressed a multitude of topics that were relevant to teachers and students at every grade level.

The material was initially produced for NASA by the National Institute of Aerospace as part of the NASA eClips™ activity. The packet for Educators and Students, Grades K-5, is available in electronic format at the NASA eClips ™.

www.nasa.gov/nasaeclips.

https://www.nasa.gov/pdf/716282main_EDC_Design_Packet_K-5.pdf

The NASA Educator Resource Center provides educators with materials, lessons, videos, and activities to use with their students. There is such an abundance of great resources that teachers were advised to visit the site and search for materials that will enhance the curriculum.

https://www.nasa.gov/audience/foreducators/best/edp.html

https://www.nasa.gov/audience/foreducators/k-4/index.html

NASA Sci Files consists of one-hour instructional programs for students in grades 3 through 5. Teachers were impressed with the series because it integrates mathematics, science, and technology through Problem-Base Learning. Creating PBL lessons is a goal of educators who want to bring their students 21st-century skills. The resource is free and organized by subject, topic, and grade level. Each video can be saved in Google Classroom, assigned to students, and connected to assignments.

https://www.knowitall.org/series/nasa-scifiles

Nasa Kids' Club is a site that provides games for children pre-k through grade 4. The games support standards in science, technology, engineering, and mathematics.

On this site, you will find games of various skill levels for children pre-K through grade 4. The games are related to NASA activities and focus on Earth, space, and rockets. They support national education standards in science, technology, engineering, and mathematics. https://www.nasa.gov/kidsclub/text/extras/Game_Descriptions_National_Standards.html

Impact of the NASA Endeavor STEM Certificate Program

There are too many valuable pieces to each course that it would take another paper to share my experience. Extending from *Methods in STEM* to the final project, the instructors have been supportive, knowledgeable, and experts in their fields. It has been a privilege to communicate and collaborate with dedicated educators along this path. As continuous learners, our students are fortunate to have dedicated teachers who want to bring best practices to their classrooms.

Each course has been inspiring, the readings informative, resources excellent, and content impressive. Creating 5 E units has become a priority when planning lessons. Beginning each class with an engaging experience and asking questions have inspired my students and generated excitement for learning.

Reciprocal Teaching is practiced daily through social studies, science, and literacy. My students rotate being Clarifiers, Questioners, Predictors, and Summarizers. As a result, they read more carefully, work cooperatively, support group members, and communicate with a purpose. This strategy has helped me turn my classroom from a teacher-centered environment to one that is student center. Adding STEAM, STEM, and Makerspace to fourth grade has established a growth mindset for the students and helped them become successful problem-solvers. Ultimately, my goal is to develop a STEM Professional Learning Community for K-5 educators in my school district. Thank you for a valued learning experience.

Readings

There are many readings that inspired me throughout the program. However, two have struck a chord and inspired me to connect curriculum and change my classroom to a student-centered learning environment.

Reading *Observing Literacy Practices in History Classrooms* by Jeffrey D. Nokes (2010), made me realize that literature has a place in the social studies classroom. Therefore, identifying the literature connection, STEAM would be easily linked. My goal became to create lessons that focused on making connections, engaged students and encourage inquiry. The use of textbooks for information and notetaking was no longer considered a best practice.

Reading and Writing to Learn: Literacy and Science Integration in 4th Grade Classrooms (Flushman 2016) was an excellent article. According to Flushman, "Students benefit from more extended periods of reading and writing while engaging in the scientific investigations to help them grapple with these new conceptual understandings. With the addition of   STEAM activities to language arts, social studies, and mathematics, lessons became relevant and stimulated student learning. Allowing for extra time on task built stamina, increased interest, and promoted in-depth problem solving. .

Adding STEAM to Social Studies

Conclusion

The workshop was a success on many levels. The participants were inspired to incorporate STEAM into their curriculum content. Teachers relaxed about introducing STEAM to their students; however, some concerns were funding and a lack of professional development opportunities. Collegiality was evident through the many great conversations, and exchange of ideas among the participants. At each table, teams were heard discussing the benefits of STEAM, and how it could enhance their curriculum.

After the workshop completed, teachers continued to brainstorm opportunities where STEAM activities would enrich their lessons. It was apparent through the closing discussion and great questions the group thought the learning experience was valuable and were excited to share activities with their students. It is my opinion that many will introduce STEAM to their classes upon in the near future.

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Workshop Slide Summary

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