AdvancED[®] STEM Certification

Executive Summary Questions

Use these prompts to inform the STEM Review Team with additional information about your school's STEM program. Provide responses to both writing prompts. Save this document in Word and submit to your school's STEM Lead Reviewer.

1) Provide a general description of the learning experiences in which the STEM students were most successful. Additionally, generally describe the learning experiences that need improvement for greater student success.

The Ronald E. McNair Discovery Learning Academy is an elementary school located in Decatur, GA, east of Atlanta, GA. The historic school, named for the late astronaut Dr. Ronald E. McNair, opened its doors to 870 students in the fall of 2008. The academy currently serves more than 900 predominately African-American students from Pre-K through fifth grade, who all receive free or reduced lunch. McNair Academy serves a very diverse student-learning population ranging from students who read two or more grade levels below their current grade level to students who read at the 10th grade level. We have a waiting list of students from across the DeKalb County School District applying for available seats for the 2016-2017 school year.

McNair Academy believes that our students were born to do incredible things and help change the world. The vision is as follows:

• The vision of Ronald E. McNair Discovery Learning Academy is to become an internationally recognized school of excellence in science, technology, engineering, and math.

Oliver Wendell Holmes once stated, "Man's mind, once stretched by a new idea, never regains its original dimension". At McNair Academy, we agree with this concept and do not want our students' minds to maintain their original dimension but to have their minds stretched with new visions and new directions. A STEM program is the cornerstone foundation we are using to stretch our students' minds and increase student achievement.

In 2012, we realized that many of our advanced and higher performing students were leaving after the third grade to attend other higher performing schools in the area due to a lack of rigor and challenge in our curriculum. It is of a major concern and growing. Our belief is that bringing an advanced and competitive program to McNair Academy would allow us to retain

our third through fifth grade students and we can cultivate an even more influential school of highly skilled students.

The vision of the STEM program at McNair Academy includes recruiting a talented team of teachers (grades K-5) from McNair who would plan collaboratively to bring real-world problemsolving skills to high performing students. We want to prepare our students to perform exceptionally high in order to compete with students globally. We want our teachers to prepare our students with the "end in mind" as author Stephen R. Covey stresses, preparing our students early for college and industry success.

Our curriculum consists of intense critical thinking, metacognitive processes, collaboration, problem solving, and extensive use of the engineering design process. The STEM Academy teachers utilize a collaborative planning model that allows them to challenge our students with some of the most advanced engineering design builds of any elementary school in the state of Georgia.

As a result of this shift in redesigning our educational goals, McNair Academy experienced a spike in students on the waiting lists, increases in our STAR Reading and Math assessments, and increases in the percentage of students scoring at the proficient or distinguished category on the CRCT and GA Milestones Assessment exams. The following outlines the categorized increases:

- Math Increased 15%
- Science increased 20%
- Social Studies increased 15%
- Language Arts increased 20%

In addition, we had two students design creative projects that allowed them to place in the district technology fair. The implementation of the STEM Academy has largely impacted the culture and school climate, academic achievement, parent involvement, and provided our students with opportunities to connect and partner with students from different countries.

The continued growth and development of our students prompted an increase in applications and acceptance to McNair Academy. Expanding the curriculum and increasing hands-on learning opportunities was inevitable. As a result, the academy's curriculum was enhanced to provide our students with a learning experience that many middle and some high school students would not experience. The formation of STEM Labs is our next major innovation and implementation.

Within the past four years, our addition of STEM Labs, with a goal to increase the love of science and math, has exposed our students, especially the kindergarten students, to animals

and advanced learning opportunities. Our idea to hook them early, makes learning easy and prepares them early on for future STEM jobs. According to the 2001 research, STEM jobs will continue to outpace and outperform non-STEM jobs.

In 2013, the initial year of implementation, teachers were trained on how to put into action the STEM curriculum and create and design new lessons in the science lab.

2014, brought the robotics lab to give students hands-on learning opportunities. The students excelled in Lego Robotics as our robotics team competed against middle and high school students. Our students won the award for Gracious Professionalism in their first year of competition. In addition, we received a partnership with the Navy and added a SeaPerch Robotics Team.

The Aquaponics lab was added in 2015 to give students hands-on learning opportunities in growing fish and plants. We are currently partnering with a school for the deaf in Jamaica to help them develop an Aquaponics system that will help sustain their economy.

As we continue to provide our students with the very best in 21st century learning experiences, McNair Academy has equipped every STEM classroom with a Promethean Board. The students are allowed to design and test their inventions in the STEM outdoor courtyard or grow vegetables in our STEM organic garden. Our students get to perform real-world learning experiences by using the following labs and equipment:

- Science Lab
- Robotics Lab
- Aquaponics Lab
- Coding Lab
- Technology Lab
- 3D Printers
- Mackey Makers
- SeaPerch Robot
- Science integration kit

Our third grade students being challenged to design a habitat for hermit crabs, learning about their needs for survival, the physical dimensions of the habitat, and its space requirements is a great example of implementation in our STEM labs. Students had to choose construction materials and plan ways to build the habitat. During the research phase, students had to observe the hermit crabs, collect data, and use that information to revise their design. They used drawings and written descriptions in their plans and presented their results to their classmates.

In order to practice math skills, students were given a budget to purchase materials to construct their designs. They used addition and subtraction algorithms to explore money and decimals in a real-life context. Students also measured the height and width of the hermit crabs. This information was used when they constructed the huts and hideaways for the hermit crabs. To introduce area, students compared the different size bases of the habitats. Color tiles were used to explore this space and arrays were formulated. As students compared the areas of their habitats, they also had to use subtraction to show the differences between the areas.

Working with their teams, students researched facts about hermit crabs and their needs. After gathering enough information to assist with understanding the needs of hermit crabs, each student was responsible for creating a PowerPoint presentation. The final slides centered on the focus questions, how the project related to their science standards, math standards, and engineering? Students also used information from the Smithsonian National Zoo's website to design a panda habitat. They learned about the wellbeing of the pandas, behavior, and the needs of the zoo keepers who care for them. Students had to determine which region in Georgia hermit crabs would be found as well as using the Interactive Sites for Education, students had to learn about animal adaptations. To apply this information leaned, students had to determine what adaptations the hermit crabs would need to survive in the other regions of Georgia.

In order to advance our students to the next level, there are learning experiences in dire need of improvement for greater student success - the expansion of our business partners and their involvement in real-world connection problem solving opportunities. Although we currently have as our business partners, The Center for Disease Control, Walmart, CHM2Hill, 100 Black Men of Atlanta, The U.S. Navy, Lockheed Martin, and the Edwards Group, more partners are needed to help us address the growing needs of McNair STEM Academy. Expanding the STEM program will enable us to design a greater system to coordinate the various schedules of our numerous partners who have tremendously busy schedules during the peak hours of the day, also our school hours.

We are working aggressively to design an after school "STEM Think Tank Session" to accommodate the diversity of schedules. In addition, we are working on a creative and unique collaborative format that will allow us to plan on-site activities with our business partners to enhance meaningful real-world business connections.

2) Provide examples of how the STEM educators and facilitators implement and sustain the core tenets of an effective and age-appropriate STEM curriculum.

Professional learning and collaborative planning are two foundational pillars of the core tenets of our effective age-appropriate STEM curriculum. Professional learning provides our teachers with the opportunity to learn new ideas and stay relevant with the expanse of the STEM curriculum. We believe:

- Professional learning is critical for student and teacher growth.
- Intense professional learning will sustain the program for years to come.
- Professional learning provides rigor, relevance, and real world meaningful connections to our STEM curriculum.

We believe professional learning is one of the core tenets and is at the heart of continued success for our STEM Academy program. Our goal at McNair Academy is to ensure all instruction provided to our students is rigorous and of the highest caliber. To ensure all teachers met these goals, the instructional team completed a focus walk of the classrooms and evaluated instructional practices. After this review, a plan was devised to support teachers by providing them with the training needed to move toward STEM implementation. We had to start with basic foundations to ensure cohesion and buy in from teacher and administrators. Strategic adjustments were made based on the needs and application of strategies by the teachers. At the end of each year, a needs assessment is given to STEM teachers to provide a roadmap of professional learning for the upcoming school year.

The Professional learning plan is developed utilizing the information provided by the teachers, instructional observations, and feedback from business partners.

Professional learning provides direction and continued purpose of our STEM vision. McNair Academy teachers are required to stretch themselves in new and creative ways in the field of education. We have tremendous business partners who provide us with real world and unique learning opportunities. This year, we expanded our curriculum with the installation of an Aquaponics Lab. Two of our STEM teachers traveled almost two hours to experience a threeday, overnight, certified Aquaponics STEM camp. During the camp, teachers were exposed to an advanced science curriculum, pitched tents, fished, canoed, and used power tools to build aquaponics filters. In addition, teachers learned to build all parts and components of an aquaponics system. The importance of water regulation and the type of plants for each system were also presented in collaborative work sessions.

Our professional learning helps our teachers provide intense and academically enriching STEM challenges. The STEM challenges offer a contextual, intrinsically motivating opportunity for our students to engage in reflective problem solving and critical thinking. Following the engineering design process of planning, modeling, testing, analysis, and presentation of results, allows our students the opportunity to apply and synthesize their subject matter knowledge. STEM challenges allow teachers the opportunity to capture mathematical and scientific moments that are naturally embedded in design problems. Our professional learning equips our teachers with strategies for creating unit plans that show math and science concepts taught through the

integration of technology. For example, our students studied electricity and magnetism and were able to create real world applications:

In the students' electricity and magnetism unit, the following standards in science were studied:

S5P3. Students will investigate the electricity, magnetism, and their relationship.

a. Investigate static electricity.

b. Determine the necessary components for completing an electric circuit.

c. Investigate common materials to determine if they are insulators or conductors of electricity.

d. Compare a bar magnet to an electromagnet.

And in math:

MCC5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

The students' knowledge and understanding of the engineering design process was used to create an alarm circuit. In this activity, our students used wiring, miniature light bulbs, buzzers, rulers, cups, a connector for the bulb and wires, weights, and tape. The teachers integrated this electricity lesson unit by providing students with word problems that infused multiplication word problems with fractions and mixed numbers. Teachers would ask students a higher level question similar to this one: A lamp operates at 115 volts with a current of 0.25 ampere. What is the lamp's resistance? The integration provided the students an opportunity to see the real-world application of their content.

Our professional learning also focuses on helping to understand the obstacles that impoverished children experience. Many of our students are from challenging backgrounds as evident by the 100% free and reduced lunch and very transient population. At McNair Academy we use this challenge as an opportunity to push our students to unprecedented levels of creativity and problem solving. We teach our students the "Problems to Profits" philosophy. We believe that in the midst of every problem there is an amazing opportunity to turn that problem into a profit and help other people. This philosophy provides our students with unique real-world problem solving opportunities, enhanced with the collaborative efforts of our business partners.

We realize, according to several research studies, that children from high-poverty environments often do not have parents or other sibling who attend or graduated from college. At McNair Academy we do not make excuses or allow our staff to believe what statistics state regarding children from high-poverty. We ensure that our students will not be part of this statistic by providing them with opportunities to take college tours both locally and nationally. Our STEM Academy students participate in college tours and career exploration opportunities. We also have STEM Academy Parent Nights to allow our students an opportunity to help strengthen their understanding by educating their parents with hands-on learning opportunities. As mentioned earlier, our business partners play a vital role in enhancing our curriculum by providing real-world relevant learning opportunities. We will continue to engage in quality professional learning that will help our students "Soar into Greatness!"