

STEM Standard Narrative

Program Model

The STEM Program at Tucker High School is a cohort-style, problem-based learning model. Students are selected to join a one-class cohort in 9th grade where the students travel to their core STEM classes together, including Science, Math, Engineering, and Literature. This model is carried out over all 4 years of the program and the curriculum include accelerated, honors, gifted, or Advanced Placement courses. Each teacher involved with the program works together to institute a collaborative, integrated, and engaged environment where the students learn in an interdisciplinary and connected way. The program is also centered around one central theme and project, Kelley Cofer Lake. In conjunction with DeKalb Parks and Recreation and Friends of Kelley Cofer, the students work on various aquatic, biological, and marine engineering projects throughout the year. These projects are worked into the curriculum as problems where the students must develop solutions and institute the solutions at the lake and around the community.

STEM LEARNERS

ST1.1	Description of outreach program	4
	Examples of strategic enrollment and other goals for the STEM program	3
	List of outreach activities such as tours and informational sessions, activities for younger students to work with STEM students	4
	Data on the achievement of outreach and support goals	2

Standard Average: 3.25

Sustainability: The Tucker High School STEM program committee spent one year preparing the sustainable program components and application process. In order to insure sustainability the high school committee continuously works with Tucker Middle Schools STEM program to vertically sustain and grow both programs. Through this collaboration both programs are able to identify and nurture student's that represent more than 20 countries academic goals. The high school STEM committee conducts both students and parent information meetings at the middle school at least once per month and the VEX and TSA teams travels and compete in events together. These events allow for a vertically integrated program and peer modeling and mentoring to increase and sustain interest in the STEM curriculum.

Action Plan: In order to increase and maintain interest in the high school STEM program we have written a elementary school integration plan in which the high school STEM students will visit each feeder elementary school to teach them about sustainability through growing and releasing native frogs into Kelley Cofer Lake.

ST1.2 Examples of open-ended problems in the taught curriculum

3

Standard Average: 3.00

Sustainability: The Tucker High School STEM program curricular foundation is based on collecting data to help identify issues with Kelley Cofer Lake and park which is located one mile behind the school. Through these learning experiences students develop their own open ended questions that are locally relevant and intern expand to global awareness of the environmental consequences of their actions. Research and data collection combined with digital solution design allows the students “real world” experiences while giving back to our community.

Action Plan: In order to enhance the STEM experience, the program coordinators will implement student driven expansion of the program curriculum. This expansion will be designed to expand focus that will encompass interest to a broader group of students.

ST1.3 Examples of self-management and metacognition skills

3

Learning contracts

2

Computer assisted learning

3

Videos of teachers dialoguing with learners

1

Standard Average: 2.25

Sustainability: During frequent visits and volunteer days to the lake and park, students are empowered to identify issues and develop problem solving modules. The core STEM teachers integrate problem based learning in modules into their lessons as frequently as possible. The learning environment is set up for collaboration and self-direction. The projects identified through the lake focus lead students and facilitators to create new projects. The projects and teachers are the facilitators that guide the students to local and global discovery and solutions.

Action Plan: Through continued content integration, projects will become more of a focus throughout the STEM curriculum. Expansion to English Language Arts and Social Studies will be developed through cross curricular training and planning. Newly implemented curricular committees will include students and teachers. These committees will provide students opportunities to take ownership in the project focus and STEM experience.

ST1.4 List of post-secondary on-line or blended learning courses taken by students, MOOCs

1

Examples of instruction through mobile devices

3

Virtual and remote laboratories

4

Examples of Immersive learning environments such as game-based learning, simulation-based learning, and virtual 3D worlds

3

Standard Average: 2.75

Sustainability: Tucker High School STEM students utilize a wide variety of technology both in the classroom and data collection at Kelley Cofer Lake. Einstein Lab Mate Probes are being utilized to collect data on dissolved oxygen, pH, Ammonium, Nitrate and Chlorine during the class trips to the lake. The student designed web-site is used to communicate information concerning data collected to the community. Both desktop computers and iPads are utilized to collaborate on, conduct and communicate research for every project. Project design, digital portfolios and implementation processes are developed using 3D printer technology, Laser Engraving, CNC Routers, Auto CAD and . Digital collaboration and communication are achieved using technology like Google Doc and web chat.

Action Plan: Newly developed relationships with Georgia Tech, Kennesaw State, Mercer and Georgia State will be formalized to create vertical learning programs that promote the STEM experience. Students will also participate monthly in on-line STEM learning programs like discovery live and MIT OPEN Courseware. STEM based fieldtrips to Costa Rica, local power plants and Six Flags math and science day have already been planned.

ST1.5	Exhibitions	3
	Investigations	3
	Demonstrations	3
	Written and oral responses	4
	Journals	4
	Portfolios	4

Standard Average: 3.50

Sustainability: Students are charged with developing written responses for every project we embark upon. Written responses are communicated both digitally and manually. All STEM students are required to maintain an engineering log/journal in which all projects are documented and diagrammed. Prototypes for each solution design are fabricated either using 3D print technology and/or scaled models. Every STEM project is initiated through self-guided investigations that lead students to develop problems then solutions. This process allows students to expand critical thinking skills through exploration. STEM educators are encouraged to promote creativity and allow multiple opportunities to elaborate and defend thought processes used in developing solutions.

Action Plan: On-line portfolios associated with the Tucker High School STEM website will be implemented. Self-produced project rubrics will become part of the process as we move forward. In order to help prepare students for oral presentations, Tucker Business Alliance and Civic association have invited students to present at their meetings quarterly. Standardized educator rubrics and cross curricular lesson plans have been created and will be implemented for the 2016/2017 academic year.

ST1.6	List of cross-cutting competencies that the school/program has identified as high priorities	3
	Written curriculum	3

Standard Average: 3.33

Sustainability: Every major task, project, and initiative that the STEM program undertakes has direct relevance to real world issues, both on the local and global level. These projects are developed and evaluated through a cross-curricular lens; the STEM team ensures that every activity can be elaborated upon in each of a student's classes, especially science, math, and engineering. The curriculum is designed to be open-ended, as well. Students develop skills engaging with real world problems due to their freedom to hypothesize, take intellectual risks, experiment, and learn from failure. The STEM team has also developed a list of ideal characteristics and philosophies for learners and facilitators that informs each activity we take part in.

Action Plan: Further engagement with immediate real world issues. Development of a formalized curriculum detailing and synthesizing upcoming projects, STEM standards, and content standards. Creation and maintenance of a method of tracking adherence to and mastery of targeted STEM competencies, for both students and facilitators.

ST1.7	Examples of student work reviewed with examples of action taken in response	3
	Schedules of interdisciplinary team meetings	3
	Meeting agendas for interdisciplinary teams meetings	3
	Meeting minutes of interdisciplinary team meetings	3
	List of attendees to interdisciplinary meetings	3

Standard Average: 3.00

Sustainability: The STEM committee shares a common planning period during which they collaborate, plan, discuss data, and reflect upon student outcomes. Student work is also reviewed during this time. Constant communication among the entire STEM team and stakeholders is maintained through email, phone, and in-person meetings throughout the year.

Action Plan: Ensure common planning for more STEM teachers than the three heads of cohorts. Establishment of regular (monthly) meetings involving all STEM teachers. Establishment of agendas and a more formalized structure for all meetings, including collaboration during planning periods. Involvement of students and/or student representatives in appropriate STEM team meetings.

ST1.8	Portfolio assessments	3
	List of indicators of STEM literacy as defined by the school/program	2
	Local qualitative and quantitative assessments demonstrating STEM literacy	3
	Data on students' achievement of cross-cutting 21st century skills/competencies	2
	Data on students' achievement of content specific skills	3
	Standardized test results in STEM disciplines	4

Standard Average: 2.83

Sustainability: Consistent coordination with the Tucker Middle School STEM program helps ensure continuity for students. STEM performance indicators and standardized test results are regularly updated and accessible to the STEM team. Student levels regarding STEM literacy and strategies for further growth are reflected upon among STEM team members constantly.

Action Plan: Establishment and maintenance of individual student portfolios beyond their engineering notebooks. Collection and tracking of data detailing the cohort's STEM literacy. Development of a database for students' post-secondary experiences. Development of qualitative assessments of STEM literacy. Development of a list of 21st century competencies with the input of students and stakeholders, and a method of assessment.

ST1.9	Schedules of STEM professional learning	3
	Survey and other data on teachers' STEM learning needs	2
	STEM Professional Learning Plan (school and/or individual)	3
	Survey and other data on teachers' STEM learning needs	2

Standard Average: 2.50

Sustainability: The STEM Committee members (Julie Todd, Cory Booth, and William Greszes) have common planning and work together to create the projects and problems for the STEM program cohorts. This enables us to develop the projects and then share to our peers for them to add material and institute the projects in their classes so we can integrate all of our content. Additionally, we participate in multiple professional development opportunities throughout the year with STEM in mind. When only one or two attend, we bring back the resources and content to share with the rest of the teachers in the program.

Action Plan: Moving forward, we will be creating site-based professional development for every teacher in the program so that everyone receives the same content on how to teach STEM classes and how to integrate content between teachers. Additionally, we will create a profession learning plan for each teacher to attend local, regional, and national conferences to receive extra training for their content area to specialize in STEM practices.

STEM EDUCATORS

ST1.10	Names and positions of STEM partners	3
	Dates of STEM stakeholder meetings	4
	Minutes of STEM stakeholder meetings	3

List of STEM board goals	1
Description of STEM resources secured by STEM partners	4

Standard Average: 3.00

Sustainability: Over the last three years, we have generated several beneficial relationships with business and community partners. Friends of Kelley Cofer Lake, DeKalb County Parks and Recreation and Lowe’s grant have been critical to the creation and development of the Tucker STEM Program. Without these partners, we would not be able to have a long-term project with the lake. This sustainable project has enabled us to bring in multiple aspects of biology, environmental science and engineering to create an exciting and engaging program for the students. These three initial partners and grant opportunities have enabled us to reach out to more partners including Second Story Gardens, Olgethorpe Power, and Georgia Transmission Corporation, all of which are partnerships in their infancy and will continue to grow tremendously over the next 2 years.

Action Plan: Throughout the entire process of creating and maintaining the STEM program, we have had input from various stakeholders. However, this has not necessarily all taken place at the same time with everyone in the same room. Moving forward, we will have a minimum of two meetings per year with stakeholders and our advisory board to ensure we are meeting goals and milestones as well as taking input from those who will be employing and educating our students after high school.

ST1.11	Clubs, programs, competitions in which STEM students are engaged	4
	Description of mentorship, apprenticeship, internship, research, and job shadowing programs	2
	List of partners	4
	Student work/products from apprenticeships, internships, research with partners	3
	Calendar of student activities with partners	3
	Schedules of student mentorships, apprenticeships, internships, research, and job shadowing	2

Standard Average: 3.00

Sustainability: Students are required in the program to participate in at least one club, program, or competition per year. This way all students are contributing to the overall success of the program in some fashion. In general, almost all of the students participate in more than one activity per year and continue to add more to their plate every year. Over the last two years, we have increased participation with the STEM students in each of the activities, ranging from VEX Robotics to lake cleanups, providing multiple opportunities to represent the school and serve the local community. By doing these things, we have also increased awareness of our program in the community and have consequently assisted us in developing new partnerships and relationships.

Action Plan: Because of infancy of the program and minimum age requirements, we have not completely instituted full apprenticeship or internship programs. Through several of our partners, we are securing internships for the summer and for the Junior and Senior years of our first cohort. As we continue in the program, we will work with the Work Based Learning Coordinator to generate more internships and apprenticeships for each student to have the opportunity to complete one during their high school career.