Dear Tucker High School Faculty,

The Tucker High School S.T.E.M. committee which consist of Julie Todd (science), Cory Booth (engineering and technology), and Will Greszes (math) is working on our students schedules for the 2016/2017 academic year. In order to insure each STEM teacher is fully engaged and excited about teaching students in this program, we would like to get an interest level from the staff. The current program curriculum is highlighted in the chart below. We have also prepared the attached STEM Teacher Guideline that highlights the overall requirements and expectations to teach in the program. Please review these guidelines and the curriculum to determine if you think you might be interested in teaching one of the STEM Cohort classes next year.

Once you have reviewed the information and determine this might be something you are interested in pursuing, please complete and submit the form using the link below. As you will note, many of the classes in the curriculum are AP classes but Mr. Jackson encourages teachers to pursue these certifications over the summer. The classes are typically paid for by the school and are great for building your content teaching skills.

https://docs.google.com/forms/d/1GeZsFs-2wO8oeGrHjz4JJ6YhhOnUpyegIvxW6wudFjg/edit

We look forward to hearing from you and thank you in advance for your interest. If you have any questions about teaching in the STEM program, please do not hesitate to speak with one of the committee members mentioned above.

Sincerely,

Tucker High School STEM Committee

S.T.E.M. Teacher Guidelines:

Tucker High School STEM Program Mission Statement:

Tucker High School's S.T.E.M. (science, technology, engineering and math) program will allow students to experience in-depth exploration and hands-on project based learning. The use of hands-on (kinesthetic) learning helps students to bridge the gap between concrete observable phenomena and the theoretical abstract concepts. In addition, hidden or unknown student talents are able to emerge and be identified.

Tucker High School STEM Curriculum:

Class Period	9th Grade/ Current Teacher	10th Grade/ Current Teacher	11th Grade/Teacher	12th Grade/Teacher Internship Track	12th Grade/Teacher Dual Enrollment Track
1st	World Geo/Civics Cooper	Engineering Concepts Booth	Accel US History	AP Stats	AP Stats
2nd	Literature Stan	Accel World or AP World Dericks/	Engineering Application	Engineering research (RDPM)	Engineering research (RDPM)
3rd	Foundations inTechnology Booth	World Literature McSwain	AP Calculus	AP Physics (Cal) elective	AP Physics or dual enrollment physics
4th	Accelerated Geometry Greszes	Pre-Calculus Milam	Accel. American Literature	British Lit	British Lit or Dual enrollment
5th	Biology Todd	AP Chemistry Willard	Accel. Physics	AP Econ	Dual Enrollment History
6th	Elective 1	Elective 1	Elective 1	Internship (WBL)	Dual Enrollment
7th	Elective 2	AP Environmental Science Voss	Elective 2	Internship(WBL)	Dual Enrollment

Tucker High School S.T.E.M. Teacher Qualifications and Requirements:

1. The STEM teacher is a facilitator not a lecturer or instructor
2. STEM teachers must use and incorporate the planning guidelines highlighted in this document in preparing and teaching the STEM class
3. STEM teachers will be required to co-plan after school at least 2 times per month
4. STEM teachers are required to collaboratively teach across contents throughout the year
5. STEM teachers will be required to incorporate the THS STEM project (Kelley Cofer Lake and Park) and visit the lake when required to execute the lesson
6. STEM teachers will be required to attend at least two evening parent meetings (1 fall and 1 spring)
7. STEM teachers will be required to assist in processing new applicants in scoring applications and conducting interviews
8. STEM teachers will be required to participate in a minimum of two professional development activities per academic year
9. STEM teachers will be required to serve as a coordinator or direct at least one these components of the program:
    a. **Business Partnership Chair**: Solicit, develop and maintain corporate partners for funding and internships
    b. **Post-Secondary Partnership Chair**: Develop and maintain post-secondary partnerships
    c. **Fundraising Chair:** (write grants, conduct fundraisers, etc)
    d. **Fieldtrip and Event Chair**: Plan and attend fieldtrips (4 per year)
    e. **Community Outreach and Service Chair**: Participate in community partnerships and activities (8 per year) and track and log each STEM student's participation
    f. **Content Planning Coordinator**: Coordinate and communicate cross-curricular planning, schedule and facilitate planning meetings
    g. **Student Information Data Base Chair**: Develop and manage student information database
    h. **Program Communication Chair**: (web master, newsletter, THS web site, newspapers, press, etc)
    i. **Vertical Integration Coordinator**: Feeder school (vertical integration) program coordinator is responsible for developing feeder school programs that align with the THS STEM program and communication of those activities

Overview:

- STEM is more than just a grouping of subject areas.
- It is a movement to develop the deep mathematical and scientific underpinnings students need to be competitive in the 21st-century workforce.

The Tucker high School STEM program goes far beyond preparing students for specific jobs. STEM develops:

- critical thinking skills
- reasoning
- teamwork
- investigative learning process
- creative processing skills that students can use in all areas of their lives.

STEM isn't a standalone class—it's a way to intentionally incorporate different subjects across an existing curriculum.

STEM should always incorporate:

1. Student-centered learning
2. Problem serves as the catalyst for learning
3. Self-directed learning
4. Collaborative learning in groups
5. Group discussions focused around an ill-structured problem
6. Instructor serving as the facilitator of student inquiry, rather than the main source of knowledge.

Here's a quick rundown of the STEM acronym:

Science: The study of the natural world.

Technology: One surprise—the STEM definition for technology includes any product made by humans to meet a want or need. (So much for all technology being digital.) A chair is technology; so is a pencil. Any product kids create to solve a problem can be regarded as technology.

Engineering: The design process kids use to solve problems.

Math: The language of numbers, shapes, and quantities that seems so irrelevant to many students.

STEM lessons often seem similar to science lessons and experiments, and in some ways, they are. After all, genuine science experiences are hands-on and inquiry-based. But if you look at the basics of an "ideal" STEM lesson, you'll see some substantial differences.

Here are six characteristics of a great STEM lesson. I hope you'll use these guidelines to collaborate with other teachers and create lessons that apply technology to what students are learning in science and math (and other subjects as well).

1. **STEM lessons focus on real-world issues and problems.** In STEM lessons, students address real social, economic, and environmental problems and seek to develop solutions. My biggest "aha" STEM moment came when I moved to a new position and faced a class of science students who had given up on school. I had the class identify a **real-world problem** right there on campus, and suddenly we found ourselves head over heels in a STEM project—before the familiar acronym had even burst onto the scene. There are web sites created to correlate your lesson with **Real World STEM Problems**.

2. **STEM lessons are guided by the engineering design process.** The EDP provides a flexible process that takes students from identifying a problem—or a design challenge—to creating and developing a solution. If you search for "engineering design process images" online, you'll find many charts to guide you, but most have the same basic steps. In this process, students define problems, conduct background research, develop multiple ideas for solutions, develop and create a prototype, and then test, evaluate, and redesign them. This sounds a little like the scientific method—but during the EDP, teams of students try their own research-based ideas, take different approaches, make mistakes, accept and learn from them, and try again. Their focus is on developing solutions.

3. **STEM lessons immerse students in hands-on inquiry and open-ended exploration.** In STEM lessons, the path to learning is open ended, within constraints. (Constraints generally involve things like available materials.) The students' work is hands-on and collaborative, and decisions about solutions are student-generated. Students communicate to share ideas and redesign their prototypes as needed. They control their own ideas and design their own investigations.

4. **STEM lessons involve students in productive teamwork.** Helping students work together as a productive team is never an easy job. It becomes exponentially easier if all STEM teachers at a school work together to implement teamwork, using the same language, procedures, and expectations for students. If you want a jumpstart on building specific student-teamwork skills. This is a Level IV teaching process –where we are all striving to be.

5. **STEM lessons apply rigorous math and science content your students are learning.** In your STEM lessons, you should purposely connect and integrate content from math and science courses. Plan to collaborate with other math and/or science teachers to gain insight into how course objectives can be interwoven in a given lesson. Students can then begin to see that science and math are not isolated subjects, but work together to solve problems. This adds relevance to their math and science learning. In STEM, students also use technology in appropriate ways and design their own products (and also technologies).

Note: In a best case scenario: Involve an art teacher as well. Art plays a critical role in product design. Teams will want their products to be attractive, appealing, and marketable.

6. **STEM lessons allow for multiple right answers and reframe failure as a necessary part of learning.** (We strive to produce risk takers) Science labs are traditionally designed so that all teams can replicate the same results or verify or refute a hypothesis. Students study specific science content and the whole idea is to provide insight into cause and effect by manipulating variables.

STEM classes, by contrast, always provide opportunity for multiple right answers and approaches. The STEM environment offers rich possibilities for creative solutions. When designing and testing prototypes, teams may flounder and fail to solve the problem. That's okay and should be anticipated. They are expected to learn from what went wrong, and try again. Failure is considered a positive step on the way to discovering and designing solutions.

Tips for Creating STEM lessons

Starting points for STEM lessons can be found on line. Search "STEM lessons" and there are many results. A word of caution, however: Not everything that claims to be STEM is actually STEM. If it doesn't meet the criteria described previously, you may want to move on.

The following sites are good starting points:

Design Squad Nation

NASA STEM lesson

National Geographic Education,STEMWorks,

TeachEngineering

The Air Force Collaboratory.

Discoveryed

Twelve key steps to Tucker High School STEM lesson:

1. Prepare the STEM lesson around Kelley Cofer Lake, its surrounding ecosystem, the Tucker High School Hatchery or the greenhouse. .

2. Connect your curriculum topic to real world issues that focus on one of these aspects of our projects

3. Clearly define the STEM challenge and the goal and its association with the project to the curricular goals

4. Decide what success looks like in the project – encourage the students to pre-set goals for the project.

5. Collaborate with Mr. Booth to incorporate the engineering design process for planning.

6. Facilitate the process where the students identify the challenge and become invested in the project.

7. Involve students (in teams) in researching the content and developing reports for the challenge. Research can be hands on or inquiry based.

8. Encourage teams to develop their own ideas about how to solve the problem and communicate solutions/problem to applicable group.

This is extremely important: Let students generate multiple ideas for solving their problem. One thing they need to learn is that there are usually multiple solutions for problems – not "one right answer." This is the step that separates real STEM learning from cookie cutter lab experiments.

9. Guide teams to choose one idea to test and then create their prototype.

10. Facilitate the process of prototype testing and evaluation.

11. Involve teams in communicating their findings to school administrators, DeKalb Parks and Recreation Groups, etc.

12. Redesign if there's time.

1. Does my STEM lesson use an engineering approach as a framework for the lesson?
2. Does my STEM lesson apply actual math and science content through authentic experiences?
3. Does my STEM lesson deal with real world issues and problems?
4. Do my STEM lessons immerse students in hands-on inquiry and open-ended exploration?
5. Do my STEM lessons allow for multiple right answers?
6. Do my STEM lessons engage students in working in teams?
7. Do I have a scenario to introduce the problem – especially for elementary and middle school students?
8. Does my lesson place teachers in a facilitator role rather than a lecture/discussion role?
9. Do my STEM lessons engage students in communicating during and following the project?.
10. Do my STEM lessons remove the fear of failure?
11. Are my STEM lessons designed to appeal equally to boys and girls?
12. Do my STEM lessons promote authentic assessments in determining student and team success?

The key take-aways:

- Provide lots of guidance but few instructions.
- Mistakes and design failures are good methods of learning.
- The STEM process is not linear – the sequence of events may change.
- Students work in teams to solve STEM challenges.
- Work with colleagues to write and implement STEM lessons. If it's not possible, then go for it anyway!

Also remember that the lesson should start with the course objectives, come up with a real world challenge, and write your own lesson. When designing your lesson ask yourself the following questions:

Thank you for all you do to facilitate this great learning process to not just the THS STEM students but to all of your classes. It really does work, and believe it or not is not only rewarding when implemented but it is FUN as well!