



Teachers Guide

Introduction and Purpose

It was the general idea of this guide to try and help new teachers and districts to have a successful first year. Here we will give you an overview of what is necessary for you to make a decision about participation and clearly understand what is required for success. You will find that the academic competitions are interesting and required at all level of competition (High School through Collegiate). Kart building on the other hand is a bit more of a lesson for all the first time thru. This should be helpful as you charge ahead with a true “hands on” STEM experience that they will cherish for a lifetime. Racing at the Indy 500!

The culminating event, which is held at the Indianapolis Motor Speedway, is a day to remember. The University and Collegiate Students are racing on the same track and they will all use the same pit area. This allows for coaching and mentoring from the Collegiate Teams. It clearly demonstrates to the High School students how the Collegiate Teams interact and compete.

This program will assist them with engineering and technical skills, project management, sales and marketing, design, fabrication, team work / team building and outreach into your community. Many of the items in the karting program fit well as relevant props for math and physics problems that students just cannot seem to get their hands around in the class room. College bound or not, this is one program that will give students a hand up with hands on!

Planning

Your school and district needs to decide how you are going to run your program. There are several options that can be taken. Please do not limit yourself to only these suggestions. As a groups take time to think outside the box and develop a plan that will work for your school corporation. Below are some suggestions of what has been success by other districts.

- 1) Make your program a class that meets on a regular basis. The class options are endless. Be creative and think what is best for your school and community. To be a successful program you will need to look at subject areas including marketing, technical documentation, graphic design, engineering design, fabrication, manufacturing, logistics, data collection, and physics. These can be taught as a single class or within multiple classes. Decide as a district what is best for you.
- 2) This class can meet as an after school club. Decide when to meet and how often to accomplish what it will take to be a successful program.

Gathering Interest

As a first year teacher in the program you will need to find a group of students who will join you. As you recruit students, look for those who excel in the areas mentioned above. You will need students strong in language and communication along with students who excel in engineering and hands on building. These students will need to work together to accomplish the goal of building a

kart and preparing for the racing season ahead. The first year we suggest 10 to 15 students involved in the program.

Financial Support

Your first year of the program will be your most expensive year. A new kit will cost around \$4,500 (for complete lists of major costs see our purchasing guide). The cost can drop if you decide to find used components or do some of the fabrication yourself. After the first year your school will only need to maintain the karts. This might include buying new batteries, motors, tires, fixing damage caused during racing, etc. To obtain the funds most schools are relying on the students to find local business sponsors. The students will develop a plan to reach to businesses to seek financial or in-kind donations. To help with the process take advantage of websites, social media, and other methods to promote your program. It is helpful to develop letters to send to potential sponsors that will inform them of your school and program.

Purchasing the Kart

After reviewing the purchasing guide, your district needs to decide which option you will be perusing. There are many factors that need to go into this decision. Take into account the lab space that you have to work in along with the equipment available. Look into the resources that your staff can provide along with your community partners. Besides your resources consider the amount of time that your students will be able to work on the kart. Make sure you are choosing an option that will bring success to your program.

Championship Series

The series will consist of races in the fall and spring. The final race will be the World Championships held at the Indianapolis Motor Speedway in May. Races will be located at tracks around the state. Besides the race there will be an academic challenge incorporated into the series. Race results and the results from the academic challenge will be used to determine the winning team.

Academic Competition

The competition is designed for learning not just racing. While the racing may be “cool” the learning is exceptional. This requires hands on skills, but to win, it will take many different students working together as a team, in the same way they would in a race team. The championship will be decided based on the following categories. Rubrics and detailed explanations of the categories will be in the Academic Challenge rule book.

Community Outreach 20%: The community outreach competition is one where the students will go into the community to promote the High School Karting Program and STEM. Your school can bring the community in, appear at teacher conferences, local events in your community or reach out and let people know about the MSTEM³ program. Make sure you document everything students do

in this category. They will be asked to put all their information together into a cool presentation for judging at the world finals at IMS.

This is all about communication, team work, leadership and soft skills.

Design Review 20%: This is the competition that would require a student to be able to utilize engineering software. There are several free options for schools needing CAD software. This will require a presentation of a different nature. This is one where the lead engineering or technology skilled student will present the design concept and what sets their schools kart apart from the rest of the field. You must utilize some type of CAD or annotated drawings to be competitive.

This competition assures you that the student team will have to be creative but also know how to communicate to a group of evaluators. Imagine trying to convince the crew on a race team of their latest idea and why it will make the race car go faster.

Energy Efficiency 20%: This competition is very engineering based and requires a bit of testing on track or on a dynamometer to see if you have it correct. The idea is to be the fastest and finish very well but use the least amount of energy to do so. Many factors come into play including gear ratios, kart set up, tires size / pressure and the human factor of course. Energy will be measured before and after the race thru a black box system used by timing and scoring.

Race Results 40%: This category is based on your placement in the race. You will receive points according to your placement. The more races you compete in the better chance to earn more points. There will be multiple events throughout the year to compete in with the finals being held at the Indianapolis Motor Speedway in May.

Championship Winner: The winner will be the school/team that scores the most points according the guidelines set out in the Academic Challenge rule book. This will be decided at the end of the World Finals held at the Indianapolis Motor Speedway in May.

To Be Successful

The first thing to remember is you are not alone. Our goal is to create a network of support for all schools. Do not be afraid to reach out to community partners, past teachers, or local professionals for advice. Here are some options that will be available for you throughout the year:

Purdue Outreach: Purdue University has hired Kenny Owens as a resource for all schools involved in the program. Kenny has been with the program since the beginning. His job is to provide you with the service you need to be successful. Feel free to contact him to for help. Another option is the Purdue Extension Offices around the State. They will be available to assist in most of the urban and extreme rural communities.

Teacher Input: Teacher input is one of the best methods of growing a program. Great communication between the teachers, coaches /mentors and our MSTEM³ academic team will make things progress at a much higher rate. Please share with all of us to help grow our program.

Teacher Coaches: There are a couple very valuable High School Teachers that were in the early pilot program and are willing to lend a hand with some guidance and help you get through. They see the value of the program and what it has done for their students. They are great consultants and coaches.

Workshops: There will be workshops throughout the school year and summer. These workshops will give you the chance to get answers to you questions in both electrical and mechanical areas of you kart. Karting experts will be on hand at the workshops to help you understand how to tune the frame of your kart when testing. We will have a break out session on how to establish a testing log book and how to use the data when setting up the kart.

Coaches and Mentors: There are coaches and mentors available in most communities. In some areas our Municipal Firefighters have stepped forward and agreed to coach a few after school teams. It takes a village and these Firefighters are an example role model in the urban school district and serve in that capacity as well. With the correct Coach and structure, after school programs can work effectively. However, the academic advantage cannot be fully recognized in the after school application without a skilled high school teacher. In many rural communities it could be the local car dealership mechanic and a farmer who are the coaches for the team. It all works.

Karting Build Manual

Each team will be supplied with a complete kart build manual. Please refer to the manual for all questions regarding the assembly of the kart. If you are having difficulties, please contact Kenny Owens for further assistance.

Motorsport Safety

Motorsports safety is the most important mission of the sport. An Indy Car can safely run down a straight away at 240mph and a Top Fuel Dragster can exceed 300mph and both do so safely. That is exactly why safety is so important. We would not all be here racing today if it were not for strong safety programs in Indy Car, NHRA and WKA (World Karting Association).

NFPA 610 Compliant: All race and testing activities will be NFPA 610 compliant. Enforcement is WKA's responsibility but training and implementing is all of our responsibilities. Keeping our students safe is the highest of priorities. A great safety system assures that.

Practice and Testing: Any operation of the racing kart outside of a sanctioned track is *strongly discouraged*. It is highly recommended that you utilize a designed race course or one set up with Purdue or WKA supervision and over sight.

Indoor Tracks for Practice and possible Winter Months Race: We are currently working with an Indoor Karting Facility to utilize their course during the colder “off season” winter months for testing.

Call if you have any questions:

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Websites: www.purdue.edu/mstem3 for class room curriculum and resources
www.evgrandprix.org for racing and series information