# OPPORTUNITY X - CURRICULUM

The Opportunity X curriculum is designed to take students who have no prior experience to a level where they have the proficiency and skills to complete an independent or team science research project and present it at a science fair. This course follows two timelines, one that fits into the school year and would take 20 meetings and another that extends to summer workshops that would cover 25 meetings.

## 20 WEEK CURRICULUM

1. introduction to course
2. introduction to scientific method
3. discuss variables/constants & start collaborative brainstorming ideas
4. bring 3 ideas to class & discuss in class
5. final idea due & introduction to procedures
6. working period on procedures & peer sharing/editing
7. procedures due & introduction to the application
8. application work period & introduction to workshops
9. workshop #1 (stem cell research)
10. workshop #2 (discussions of climate change)
11. workshop #3 (aeronautics) & progress presentation
12. workshop #4 (student interests) & data presentations
13. workshop #5 (Raspberry Pi/web development pt 1)
14. workshop #6 (Raspberry Pi/web development pt 2) & progress presentation
15. student-led workshops
16. all data due & progress presentation
17. introduction to board presentations
18. introduction to writing presentation scripts & in-class writing time
19. finish working on board & writing presentation outline
20. class presentations

**Week 1** This meeting will introduce the course. By the end of this first session, the students will have an understanding of the agenda for the year, the instructors of the course, the value of science fairs, and will have a new take on science. The students will be called to have a conversation about science and technology and how it shapes the world we live in. The students will be introduced to how science fairs can play a role in a path to gaining a better perspective on science. Students will be given an interests survey for the instructors to learn more about the students.

**Week 2** This meeting will be mainly focused on stepping through the scientific method. Students will look through examples of science fair projects and identify the steps of the scientific method within them. They will start to think about things they see they do not understand and/or identify problems they see in their environment. They will be given opportunities to talk about these ideas in groups.

**Week 3** Students will learn about the differences between science and engineering projects. They will learn what independent variables, dependent variables, constants, and controls are. They will learn the engineering design process. For a large part of the class, they will engage in a collaborative discussion on observations they have made over the last week. They will share their insights on each other's ideas.

**Week 4** Students will bring three potential project ideas to class and exchange them with one another to get feedback on them. Students will get large groups and discuss these ideas with one another. Students will get feedback from the instructors and will be able to ask questions. Students will have the opportunity to identify peers with shared interests

and potentially decide to work together in a team.

**Week 5** Students will report their final ideas and, if applicable, team members. They will be introduced to procedures and the specific way of writing procedures that will minimize chance of error. They will be shown how the variables, constants, and control fit into the procedure. They will look at examples of procedures and identify flaws, strengths, variables, control, and constants in the procedures. Students will have the opportunity to start working on their procedures.

**Week 6** Students will have the time to work on their procedures. Initial drafts will be exchanged between pairs for peer editing. They will have the opportunities to ask the instructors any questions and doubts they may have. Students will investigate the Synopsys website and will be able to navigate to the application easily.

**Week 7** The final procedures are due to the instructors for review. Instructors will walk through the application to the students. Students will be able to start the application in class.

**Week 8** Students will have the time to work through their applications and get help from instructors and peers. Instructors will be looking over what the students have done by that point. Students will be introduced to the flow of the next few weeks, which will include workshops that specialize in different areas.

**Week 9** This first workshop will introduce students to stem cell research. Students will get a general rundown of how organisms develop and how stem cells are being used currently and the goals of stem cell research today. Instructors will show a short documentary on the power of current research. Students will discuss the ethics of stem cell research.

**Week 10** The second workshop will focus on climate change. Students will look at evidence of climate change, the effects on our society today, what is being done, and what they can do. They will engage in a discussion about their own takes on climate change and how it affects the world today. Based on these discussions, groups of students will develop and propose potential plans for addressing the problem.

**Week 11** The third workshop will introduce students to aeronautics and airplane design. Students will look into existing bird wing and airplane designs to identify stronger structures and features. Using this knowledge, students will attempt to construct stronger airplane designs. In addition to the workshop, this session will include a progress presentation. In this, students each say what work they have achieved on their project over the last three weeks.

**Week 12** Based on the student interest surveys from the first week and from the instructors' understanding of the students, the fourth workshop will be geared specifically to a complex scientific idea that students will be able to understand, apply in their life, and engage their minds in thought-provoking ways. Apart from the workshop, students will have a data presentation. The instructors will review the data that each student has collected so far. Data will not

necessarily be complete at this point. After the data presentation, instructors will inform students about the student-led workshops that will be occurring three weeks from that point.

**Week 13** The topic of the fifth and sixth workshops will be dependent on availability of supplies. If internet connection and computers are available, students will learn web development with the languages HTML, CSS, and JS. They will use the codecademy platform, accelerated by instructors. If these resources are not available, students will get into smaller groups and play around with the Raspberry Pi tool. (If fundraising is successful, interested students may be able to take home their own Raspberry Pi kits.)

**Week 14** The sixth workshop will be a continuation of the fifth workshop. If students are learning about web development, students will be introduced to HTML5 Up, which provides robust website templates with good UI. In addition, they will engage in the second progress presentation which is a 1-2 sentence verbal report of the development of their project. If students wish to lead a short 10-15 minute workshop next class, they should bring their plans to class for review.

**Week 15** This class will give students an opportunity to share their knowledge on a topic of their interest in short 10-15 minute informal workshops. Students will not only gain knowledge on their topic but also will develop confidence in their ideas and speaking abilities. These workshops should include both presentation of information and activities/discussions for peers to engage in. After student workshops, students will have an opportunity to discuss and revisit any workshops they were interested in and/or have questions on, as well as any questions they have for their projects.

**Week 16** All data is due for review by the instructors. Students will give another progress presentation. This progress presentation will be slightly longer, and students will need to prepare for this. The goal of these continuous progress presentations is to get the students to be comfortable talking about their projects to allow them to both know their project better and to help them gain confidence.

**Week 17** Students are introduced to board presentations. They will watch sample presentations and learn conduct. They will learn a general structure of the board. They will have time to start planning what sections they will include in the board and what information they will put in each section. Students will have opportunities to consult instructors.

**Week 18** Students will be introduced to presentation scripts. They will learn the general breakdown of the presentations of several past science fair participants. They will have an opportunity to start their general outlines and practice with peers.

**Week 19** Students will finish their work on the board and writing their presentation outlines. Again, they will have opportunities to share with their peers and instructors. Students can bring pictures of their progress on their project boards to class for consultation.

**Week 20** Students will bring their final board to class with their script and entire presentation ready to go. They will have a mini-fair where they will present to the entire class and get feedback from their peers and instructors.