Table of Contents

Introduction

WE WANT TO START by introducing you to the format of this book, to guide you on how to use each section for maximum benefit, and to empower you in beginning your own journey into project-based learning. There is a lot of information in this book to take in, process, and use, but we made sure that you will be well-prepared and supported as you plan your own projects.

Think of reading this book like taking on a project. A project begins with identifying a problem, question, or challenge. The educator, and sometimes student, then plans the project. This includes conducting any research into the history and resources available for that topic, as well as any knowledge or skills that may need to be frontloaded, or learned ahead of time, in order to be able to work on the project. Then the educator and student collaboratively apply what they have planned and learned to explore and address the project focus. Finally, the project concludes with documenting and presenting findings.

Project-Based Learning: Creating a Modern Education of Curiosity, Innovation, and Impact is split into three distinct parts and an appendix. Unit One focuses on the developmental science and academic evidence behind why project-based learning works so well for so many. This unit gives the foundation needed to build a modern education that prioritizes curiosity, innovation, and impact. It provides a clear view of how project-based learning, because of its many benefits, positively affects social impact and helps create the future of industry and economy. This is a substantial and complex unit in the book. It is written to explain, inspire and to help you build your own skill set so you are prepared to use project-based learning with your students.

Unit Two is a practical guide, detailing how to plan projects in any educational environment. The nine chapters in this unit cover everything you need to plan projects or adapt a planned project. It is a thorough examination of the process, taking into account years of research, experience, and observations. This unit anticipates and addresses the common challenges you will find in project-based learning, and offers creative solutions for moving forward, with many options for reaching both personal and academic goals.

Unit Three takes the information from Unit One and Unit Two and provides tangible examples of project-based learning through eight projects that were designed and facilitated successfully. In Unit Three, you can clearly see that any subject is ripe to be the basis of a project, and that by combining academic and vocational skills, the outcome of any project can be rich, complex, and impactful. These planned projects are ready to use as-is, or serve as examples when planning projects. We have also included workbooks, found in the Appendix, for educators and students to use when planning projects.

There are multiple ways to use this book. You may choose to read it all the way through, making notes as you go along. This is the way we wrote it, and it is a good idea to be familiar with the "why" and "how" of

project-based learning before jumping into a project. Alternatively, you may want to get started right away with planning a project or using one of the planned projects. If using this approach, be mindful that you can always go back to previous units or chapters for guidance.

The best advice we can give, and it permeates every section of this book, is that you can do this. You can artfully and successfully implement project-based learning. This is a book grounded in the deep and abiding belief that the best practice for a child's education is to focus on how subjects and skills are best-learned, and the best practice for teaching is to develop relationships with your students that pave the way for academic rigor and delight. This happens naturally when using project-based learning.

Project-based learning relies on your intention to devote yourself to the full experience, and model that dedication to your students.

> *Our job is not to shape our children's minds; it's to let those minds explore all the possibilities that the world allows. We can't make children learn, but we can let them learn. ~ Alison Gopnik, Ph.D.*

Unpacking the Definition of Project-Based Learning

The first step to creating a great year of project-based learning is to understand what project-based learning is, how it is defined, and how it is often mis-defined.

The Buck Institute for Education defines project-based learning this way:

> *Project-Based Learning is a learning method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an engaging and complex question, problem, or challenge.*

This working definition is a great place to start when considering project-based learning. To understand the method, it helps to break the definition into its component parts:

Project-Based Learning is a learning method.

The use of the word *learning* instead of *education* is key to the method itself. Project-based learning is a learner-centered pursuit of knowledge and skills through a collection of evidence, experience, and exhibition. It centers around the process (the journey), not the outcome (the destination). With a journey-centered approach, the focus is on raising individuals to be lifelong learners who understand the unique ways they each learn and the value of the personal skill set they each bring to the project. Project-based learning leads to a student who knows how to acquire and apply new skills that either improve on or add to those they already have. This is opposed to the common focus on a set of standards to complete that consistently leads to a box-checking mentality in education for educators, students, and parents.

Too often what is called project-based learning is actually project-based education. Project-based education focuses on finishing, where the conclusion is already assumed. With project-based education, teachers choose a project that has the same start and finish for every student. The finish is determined by educators with minimal input from students. This approach generally results in unengaged students looking for the easiest path to get to the end.

With project-based learning the final result is much more unscripted. There is no assumption in the beginning about what the finished project will look like, because the project is centered on answering a question or solving a problem through the application of knowledge and skills as students collect information and experience. The end result will vary, even if goals are set, and even if you have tackled a similar subject before with another student.

of new applications, or using technology they are familiar with to create original works. These are critical skills for the future.

The proliferation of technology and online activity has made it easier to connect globally. This is a real benefit to grassroots efforts looking to enact social change. Many students find connections to social groups and causes through the Internet to increase the likelihood that their project will have social impact. Students who cannot find what they are looking for can create their own online group, as one student we know did in 2016 by building a Facebook page and website focused on the presidential candidate he supported. When students connect in this way it broadens the areas and ways that learned skills are applied, attaching more meaning and relevancy for students to those skills. This is how you build a modern education of curiosity, innovation and impact.

As parents and educators, we need to create a learning culture that encourages children to love the world before we ask them to save it. One of the most incredible benefits of project-based learning is self-awareness. Through the process of a project, students are able to connect to knowledge, skills, people, experience, and diversity that shapes their understanding of who they are and how they relate to others and to the natural world.

The social impact of self-knowledge is powerful. Students find themselves in their projects, which in turn creates communities of people who are more compassionate and open-minded, people who know how to use their abilities to not only help others, but to care for themselves as well. We are currently seeing unprecedented social movements towards awareness, education, and equity. Using project-based learning, students experience learning as personal and effective, and as a result are more likely to use what they have learned to solve the challenges that face our industry and economy. This is one of the best ways to support the dreams of our students, big and small.

Project-Based Learning and the Future of Industry and Economy

The world doesn't care what you know. What the world cares about is what you do with what you know. ~ Tony Wagner, Ed.D.

It is a radical, yet practical, act to teach in the way children learn best, encouraging them to be risk takers, change agents, and seers. The way in which we create a modern education should be based on the most effective delivery of essential knowledge and skills. The scope and speed at which digital, physical, and biological technology is being developed, used, and adapted is unprecedented. The line between the artificial and biological world is becoming increasingly blurred. We are becoming experts at curating and managing our personal ecosystems to be more productive and connected. After decades of conditioning to mass produce education along with our goods, as educators we can have the foresight and adaptability crucial to shaping and successfully navigating the new world we are in the midst of building. A willingness to look at the evidence and create an entirely new culture around learning is important to the future of industry and economy.

A culture that elevates standardized curriculum and tests suffocates innovation. In observations of and personal conversations with entrepreneurs and innovators who are on the leading edge of business and philanthropy, it is apparent that the things that making successful were not learned in a conventional

project and guide everyone involved toward the conclusion, whatever that may be. It's a lot like writing a mission statement; students and educators can use it as a benchmark for progress.

Your problem, question, or challenge should be written in a succinct statement that defines the purpose of the project. It should be as specific as possible, while still being open-ended enough to inspire possibility. Teach your learners to go back to this when they are stuck in order to re-focus. This does not mean other challenges or queries won't come up as you move through a project. They definitely will, but choosing a good core challenge initiates and guides the planning and sets a clear path forward.

How to Choose a Good Project Focus

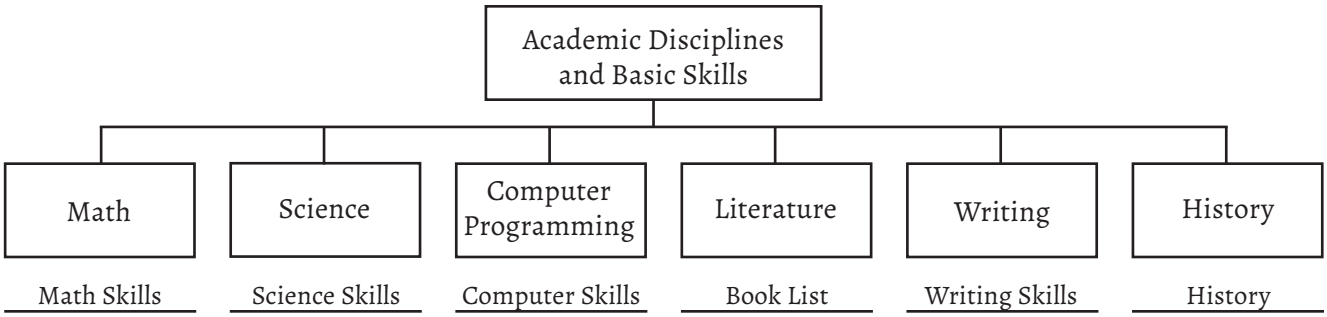
- Solutions to the problem, question, or challenge should be open-ended with a clear path forward.
- Choose a project that has an over-arching theme requiring multiple academic tasks and disciplines to answer it.
- Just the mention of the questions surrounding the project should be thought-provoking and meaningful.
- The project should be challenging with real-world applications.
- Make sure the project choice is grade and ability appropriate.
- Have plenty of resources, material, information, and activities for students to engage in surrounding the project.
- Projects should encourage confidence and independence while also building community.

The project should be open-ended with a clear path forward.

The inspiration for a problem, question, or challenge can come from anywhere. Solutions should be open-ended, allowing students to discover possibilities and opportunities as they unfold in their research and learning. Specifically, it is pivotal to the success of a project that there be no pre-determined conclusion. It is important that the problem, question, or challenge at the heart of the project is demanding without an obvious solution. Do not choose something that can be answered with a simple yes or no, or where there is only one answer. You also do not want to choose something that has a singular way to get started. There should, however, be a clear path forward. This means that there are multiple, straightforward avenues for students to take as they begin that lead them towards options around the trajectory of their project.

An example of a solid open-ended project question is: What is a solution for stopping or slowing global warming? Your students may consider whether the answer is policy, working for a science solution, education, or a combination of these. While experts, and your students, may not agree on the solution, there are many obvious paths to investigate this. There are also readily available sources of information on this subject to support research, interpretation, discussion, and action.

The best projects require information from and investigation of many sources. As with the previous example, a good project choice is open to interpretation, possibly with different students coming to different conclusions. A good choice requires research, evaluation, and the synthesis of ideas. A good choice benefits from discussion and collaboration, either with fellow students, mentors, or you, the teacher.



After you have made your chart, you might find that this list affects the project, scope, or topic and early modifications can be made. Note: Subjects would be fleshed out depending on the project, not the generic descriptions in this diagram. You will see how this is done in Unit 3 of this book.

Project-based learning excites students about topics and skills in ways other learning methodologies do not, and it looks different. Some educators feel, either through training or the educational culture that surrounds them, that they must adhere closely to the topics that "should" be included in a year of study. If you are someone who holds onto a more conventional notion of education, you are going to have to let go of the "how things are best taught" paradigm and embrace "how things are best learned." There are definitely specific topics and information most agree educated people should learn; however, there are many different timelines and approaches for how those are best learned, when they should be learned, and in what order.

In some cases, not all subject areas can be made to fit within the context of the project. These subjects will run concurrently outside of the project. For example, basic math and grammar often need to be taught outside of the project. Don't be discouraged if you find a particular subject won't fit into the plan. Teach it separately, or save it for another project.

If you and your students want to include a subject but are struggling to do so, you can add to the original scope of the project. For example, when planning a project asking, "How to incorporate historical fashion into a modern wardrobe," you can include STEM topics in addition to history and humanities. As you work your way through the history of fashion, you can ask how fabric, materials, make-up, and jewelry manufacturing have changed (or not) from artisan crafting, to the machinery of the industrial revolution, to modern techniques using laser cutters, 3D printers, and alternative resources. Topics such as metallurgy, mining, the mechanization of farming cotton, synthetic versus natural fabrics, the problems with lead in makeup, and the use of mercury by hatters could be included in the project. With this much science, technology, and engineering in a project, it is not hard to bring math into it as well. The STEM concepts in this project will inform whatever outcome the student comes to just as much as the history and the humanities will. If you are stumped, reach out to people who are experts in the focus area of the project.

Write an overall outline of your vision for the project.

Next, make an outline detailing how these topics and skills will be woven through the project. Your outline of the project should help navigate by breaking the journey into smaller steps. Remember to leave it flexible, because as you start peeling back layers of information and finding new resources, the project may end up in a different place than you anticipated. Learners, including teachers, will discover that any topic is more complex than it seems.

Your outline is the place to plan for activities you want in the project. Recognize that there are multiple ways these activities can be completed. If, for example, students are asked to create a website as a part of the project, there are several ways they can do this. They could use WordPress or write HTML code. When you write the outline, include creating a website so that this skill is set as an expectation early on and students are prepared, but you can be open to how they complete it. Even if the outline only includes one way to complete an activity, it will benefit students if they get stuck or need a nudge to get started. Since you have already planned at least one possible scenario, you will be better prepared to guide students amidst distractions or disruptions.

The outline should also include how you will document the project. You will want a system for keeping your own running notes about the project, including the skills students work on individually and as a group. To do this, you can use the Educator Workbook, found in the Appendix of this book.

Students should create their own documentation throughout the project. We give examples of ways to do this in the following chapters. If students collaborate, make sure they collectively document their efforts as a group, in addition to their own individual progress. There are a lot of moving pieces, even for a short-term project with one student. Your evaluation will be more meaningful if you have documentation of student progress throughout the project.

Plan for multiple students based on environment, needs, and interests.

When you are working with one or two students, projects can easily be tailored to fit these students' needs and interests. Projects are manageable and can be the sole focus of your educational activities. If you are working with multiple students, however, there are special considerations when planning the project.

What kind of educational environment are you in?

If you have a flexible environment and opportunities for collaboration, your project planning may look different than if you are in a highly structured environment. The more mandatory standards you must meet, the less likely it is that working with each student individually will be possible. This isn't a criticism, but an acknowledgement that the plan will have more skills and knowledge that each child must include in their project. Alternatively, consider that a group project might be a better fit. Regardless of which approach you take, even when all students are responsible for the same knowledge and skills, how they articulate and apply what they have learned can be very personal and unique.

Are you responsible for managing all the projects, or are you working with a team of educators?

The answer to this makes a difference in how the project is approached and executed. If you are managing projects on your own, can you access other mentors and resources for specific skills to ease your load or are you solely responsible for every part of mentoring the projects? This may influence how you approach your planning and the scope of knowledge and skills you include. If you are collaborating with other educators, plan together from the very beginning. Your diagrams of subjects and skills should be a group effort, so that everyone can contribute, see the connections, and divide responsibilities. Have a clear plan of how each teacher will work with the students, individually and/or as a group, and what (if any) other mentors you need to complete the projects.

6

Academic and Vocational Knowledge and Skills—Then Project

Learning is creating a pattern in your brain. The more you practice, the stronger and more available it will be for you in the future. ~ Barbara Oakley, Ph.D.

AN ESSENTIAL PART OF applying skills is having those skills to apply. Some skills and knowledge will be learned as needed while engaged in the project. Others are best mastered before the project begins. Frontloading, remember, is the practice where some knowledge and skills are learned ahead of time in anticipation of the project. This is important because students should have some proficiency with the skills central to the project before beginning it. This saves time and helps students maintain focus.

You can start a project without frontloading skills and learn them throughout the process and many might see this as an intriguing part of the project itself. We have seen some kids successfully integrate skill building as they work through their project without any prior knowledge. But more often than not, this approach causes projects to start and stop and sometimes stall, which can be distracting and affect the trajectory. This integration is especially hard to manage with multiple students or in a classroom setting.

If you decide to begin the project without frontloading, and work on learning new skills during the project, it still makes sense in the planning stage to include the knowledge and skills you expect students to apply. That way, you are prepared with the necessary resources. If learning new skills during a project, plan to introduce them before they are needed. You can do this the week before, or at the start of each week. You can see an example of how to do this in the planned Climate Literacy and Making for Social Impact projects that are in Unit 3. If students or you decide to add a new element to the project, keep other parts of the project going as they gain those new skills to avoid stalling the project. Even for projects where there is substantial frontloading, new ideas and opportunities will come up during the course of a project, so having a strategy for acquiring new knowledge and skills during the project is pragmatic and smart.

Frontloading the knowledge and skills that students need leaves room during the project for the unexpected and spontaneous. If those core skills that are central to exploring a problem or challenge have been worked on ahead of time, then students will have the energy and ability to experiment with new ideas, explore related

rented from hardware stores, or used at the local makerspace, where you will also find high-end machinery like 3D printers and laser cutters.

More questions to ask:

- What do I already know?
- What kind of intellectual information do I need to collect?
- Who are experts in the world on the subjects I am interested in researching?
- Who locally can serve as a mentor for the information and/or skills I need?
- What technology or platforms will help me access and organize the resources I need?

How you choose to organize resources is entirely dependent on your environment, access to tools and space, the size of your group, and the age of your students. We recommend keeping all project-related materials and documents in a central location. It's easier to keep a project's momentum going when everything is in one place, organized and accessible.

For digital components of a project, Google Drive folders, Trello, and Dropbox are good choices to keep everything centrally located. These are shared between teacher and students. Include one folder in which you drop links, ideas, or resources you think are useful and are invitations for students to use. There should also be one folder for each student that only you and that student can access, for privacy. This sets up a pathway for successful documentation and sharing later, as everything students need will be in one place, already outlined, and ready to formalize for public use.

The final question to ask:

- Will there be a cost to this project? If yes, how will I find funding?

To begin, make three lists: what you absolutely need, what would be nice to have, and what you may need but are unsure of. Between these lists, note which materials and tools must be new and which can be used, as well as a price range. This helps determine your budget for the project, focusing the bulk of your funds on the materials and tools that must be new or are the most expensive. Not every project will need a lot of materials, but we've found that the more hands-on a project is, the more connected and productive the student becomes. Also note whether you will need to learn a new skill for any tools or materials and if that will cost money. While ideally, it's wonderful to find a mentor to teach these new skills, sometimes it's more practical or efficient for you, the educator, to take a class so that you can teach them to students.

Sourcing Materials and Tools

If your project includes building or making a product or presentation, you will need to source materials and tools and include them in the budget from the beginning. The most efficient and economical way to begin is to gather the materials or tools you already have and solicit donations from your immediate community for the rest. You can find materials from both individuals and retail donation programs. Granted, it can be a lot of work to solicit donations, but it's worth it if in the end you are able to do more than your budget allowed. This is a perfect opportunity to develop some financial acuity in your students. Whatever is left over that you

many kids, who had never taken a leadership role before, find that they had real, tangible skills to contribute and accepted the invitation to shine.

Mentors from the community also scaffold students. The dynamic between student and mentor can open doors of thought as students realize the potential of their project. While working on a project with a mentor, there is much more likelihood they will be captivated by and begin looking at the implications of the project to the larger world.

Some students perform much better at academic tasks in the applied setting of project-based learning than they do in more traditional settings. Many students who struggle in the typical classroom thrive when there is an applied, multi-disciplinary approach. The need for scaffolding or tutoring might not be an issue. It is exciting to watch these students work independently at a high level when the environment is changed to support their needs. For this reason, project-based learning should be one of the first learning methodologies educators go to when working with students who underperform in the conventional classroom.

Project Management

As the project gets going, you will have to pay careful attention to your role as the teacher. It is important that the project balances independent work from students with collaboration from an instructor or mentor. It can be tempting to allow the project to become entirely student-led when students become engaged and increasingly drive the decisions for where to go next. Most students, however, do not have the insight or experience to oversee a large project, to keep it moving along, recognize the importance and benefits for choosing one path over another, and collecting documentation. As the teacher, you do not want to take over the project, but it is essential that you give consistent and unobtrusive guidance as the project progresses.

Even in short-term projects students can lose their way. There are a lot of moving pieces that often include multi-tasking. There are many strategies that can help you stay connected and keep students on track. Here are some examples we have used: We have given students a diagrammed version of the project plans, so they are familiar with all the parts and can make educated decisions based on the larger picture. We have scheduled regular individual and group meetings to discuss progress and solve challenges. We have shared digital resources (see Chapter Eight for some great examples) that allow for individual record keeping as well as group sharing. We have created large vision or Kanban boards to visually track projects that are accessible and available to everyone. Whatever works best for your environment, whether it's analog or digital, having your students keep a log of the work they are doing and checking in with you regularly is important. It does not need to be anything formal. It can be one or two sentences about their progress, including notes about any new ideas students have for the project. The point is to have regular communication so nothing gets lost and nobody gets left behind.

If you have ever watched footage from the control room at NASA during a launch, you know how important project management is. Including project management can enhance ownership of the project while developing a valuable skill. In addition to scaffolding the transition of academic skills from theoretical to applied, you should scaffold much of the project management. To do this, assign management jobs for parts of the project including planning and defining the scope of the project, activity planning and sequencing, resource management, budget, social media and website updates, documentation, and presentation. With

9

Finishing the Project

I am not a teacher, but an Awakener.~ Robert Frost

PROJECT-BASED LEARNING IS TRANSFORMATIVE for students and their teachers. In fact, we like to think of ourselves, and all of you, as Awakeners as stated by Robert Frost. In addition to being an Awakener, teachers who use project-based learning are partners, mentors, collaborators, instigators, and best of all, learners along with their students.

With project-based learning, much like the overall managing of the project, the ending is a balancing act. Often there is an arbitrary timeframe that determines the end date, such as the end of a semester set by the school. The thing is, once engaged, brains do not shut off just because the semester ends. For some students, they will have had closure with the outcome of their project, and use everything they have learned to springboard to the next one. Or, the project may have captured a student's interest, and they will want to continue working on it. Teachers should create a path for those students, one on which they can continue to work on the project, even if the class has ended or needs to move on.

It is important not to decide a priori on the ending, but it is also important that there is a meaningful conclusion to the project. For students who do not feel finished with their project, provide closure that serves as a milestone while still providing access for further engagement. After the project's conclusion, what has been learned in the process will be what alters the perspective of the learner, and what is applied in their future efforts.

Ending on a High Note

You know that feeling you get when you come to the end of a well-done project? The excitement and the feeling of accomplishment? You want students to feel the same way! One potential issue with timing the ending of the project is the open-ended nature of project-based learning. It is important to let the project come to a natural conclusion.

It is much easier to script the ending, including the timing of it, with project-based education, which is why some teachers will choose project-based education over project-based learning, but this is a mistake.

levels, because it creates fairness and possibility in academics. The evaluation should include a framework for looking at students' progress from the beginning of the project to the end. This sort of big picture, holistic evaluation greatly benefits all students, especially those who underperform on tests. How a student grows in knowledge and skill throughout the project, particularly when they are motivated by a project based on their own interests, also gives insight into a student's work ethic, an important component for future success.

Methods of Evaluation

There are different methods for assessing and evaluating projects, as well as a few things to keep in mind with regard to documentation and technology. A key consideration to make early on is how you are going to evaluate the project: self- or group-assessment, a set standard or rubric, portfolios, or a combination of these. All methods have strengths and weaknesses depending on the project, timeframe, teacher, and students. In addition, the methods can be combined for a multi-tiered approach. For example, guided self-assessment, a portfolio, and a rubric can all be components of the same evaluation.

Collect Documentation

All documentation, in whatever form, should be collected and used for assessments. By the time you are ready to evaluate your students' projects, you will have a substantial body of documentation that serves as a meaningful and revealing part of the evaluation process. Save dated work samples from each student from every subject and skill area the project focuses on while frontloading, in the middle, and at the completion of the project. Use these samples to gauge the improvement of skills.

Some students will choose more challenging projects. This can lead to an end-product that looks less complex than other students' projects, but was harder and more work to complete. If you have work samples reflecting the improvement in quality from the start, it is easier to monitor progress of every project without having to worry about the difficulty level of each student's choice.

Evaluating Technology

Technology is important to incorporate into every project. Because technology changes rapidly, and can be used in a variety of ways, you may want to rethink how you assess your students' progress using it. It is important that students be evaluated on their understanding of the role technology plays in their own personal ecosystem, and in the larger society and economy. Technology is open-ended and meaningful, often in a very subjective way, so your criteria should reflect those nuances. Beyond whether or not your students are able to learn the skills and apply them to the project, look at whether they played and experimented using technology for their projects, how they addressed problems or failures, and how they connected the technology to solving their original problem, question, or challenge.

Rubrics

Rubrics are useful tools for teachers and students. A rubric is the set of criteria that establishes the expectations of a project and defines how a project will be assessed and evaluated. Rubrics can be designed by the instructor or be a collaboration between the student and teacher. If you are in an environment that does not give grades, rubrics are useful for setting up a framework for guidance as you move through the project.

11

Project-Based Learning in Every Environment

PROJECT-BASED LEARNING CAN BE used in any environment. The key to adapting projects to your situation lies in the answers to three questions:

- What is the over-arching mission of my school (including homeschooling) or organization and how can this project incorporate those values?
- What are the specific challenges and goals of this project, and how do they relate back to the larger educational mission?
- Who are the children with whom I will use this? What are their needs and interests, and how do those relate to both the challenges and goals of the project as well as the larger educational mission?

What follows is an explanation for using project-based learning in every environment. Feel free to skip to the sections that focus specifically on your situation.

Elementary School Age Environments

When children are small, they are naturally curious. They seek out new skills and information based on their needs and desires. Much of what they learn is through trial, error, and play. Children of elementary school age are still developing their ability to think both abstractly and logically. At this age, they tend to think more concretely. Their knowledge is based on tangible, real experiences more than imagination, which dominated their younger years. The structure of project-based learning is perfect fit for this developmental stage.

Planning a project for elementary students requires the teacher to classify goals and detail how students can achieve these goals. The process of a project inevitably instigates growth for the learner. Project-based learning encourages the recognition of order, patterns, and sequences, and the prediction of cause and effect. Students also develop memory strategies for retention of knowledge and skills which occur naturally

Introduction to the Planned Projects

BY NOW, YOU SHOULD understand why project-based learning is profound and meaningful, and have a good sense of the process, from start to outcome. It can seem daunting, though, to use a new learning methodology. The following chapters contain planned projects that have been successfully implemented. These can be used to help you get started with project-based learning right away, or as a guide for creating your own projects. Each project is based on a problem, question, or challenge that drives the process and influences the outcome. These planned projects were chosen to show the diversity and range of possibilities.

The planned projects do not include step-by-step instructions for conducting them. Instructions like those, that have a very specific, pre-determined process and conclusion lead to project-based education. As stated earlier, there is nothing wrong with project-based education, but this is a book devoted to project-based learning, and the structure of the planned projects reflect that. Some of the planned projects do include materials for frontloading knowledge and skills that are project-based education. None of these materials, however, determine the outcome of the project. Written the way we have, even if you mimic the following planned projects, the outcome will be determined by your students.

There are eight planned projects. They are ordered based on the length of time they take to complete. If you are interested in a project that does not include your student's age range, you should look over the project. Project-based learning is so flexible, that with a little re-planning, any of these projects can be modified for any age group.

Project Title	Grade Range	Recommended Length
Research Bootcamp	ES/MS/HS	1-3 Days
The Paper Airplane Challenge	ES/MS/HS	1-Day
Climate Literacy	ES (late)/HS	Short-Term
Inclusivity in Historical Memorialization	MS/HS	Short-Term
Making for Social Impact	MS/HS	Mid-Term
The Art of Storytelling	ES	Mid-Term
The History of Fashion and the Modern Wardrobe	MS/HS	Long-Term
Our Year Studying Politics	HS	Long-Term

The projects are written using the Educator Workbook, located in the Appendix, and gives you eight examples for how to use it. The planned projects serve as a kind of frontloading for educators, so they have the knowledge and skills needed for planning projects.

If you already have a question, problem, or challenge, you might want to skip over the planned projects and go straight to the Educator Workbook and start planning. This is your project, do whatever works and make it your own. Once you have done the initial work, introduce your learners to the Student Workbook, also located in the Appendix, so they can add their vision and begin their own journey with project-based learning. The Student Workbook is included, but can be considered optional. There is an example of a completed Student Workbook in the planned project Inclusivity in Historical Memorialization, in case you decide to have students use it.

In the following sections, there are notes and special considerations for each of the planned projects. Each project is unique, chosen with care, to show the range and diversity of topics and approaches. Just as we created and modified each project to serve the students in front of us, you should use these projects as an inspirational springboard towards planning your own, either based on these examples, or on a topic you and your students are interested in. Even if you do not use any of these planned projects, the notes on frontloading, process, and resources in this chapter give important information for understanding project-based learning as a whole.

Research Bootcamp

EDUCATORS WILL APPRECIATE RESEARCH Bootcamp, because it greatly increases the quality of resources students recognize as credible and useful. Some of the best moments of this project come from the two main activities. Kids love the gamification of learning when searching for images, facts, and ideas in the information treasure hunts. Then, putting all those tools to use in the flash research sessions, students dive deeply into finding out more than they anticipated about their favorite topics.

Research Bootcamp is a stand-alone project requiring students to research and analyze sources. Students will use critical thinking, analyzation, and resource management, skills that are essential in the information age. It is important for students to be able to tell fact from opinion and determine which sources are credible and which are not. Expect this project to transform how kids see their own power in networking, accessing resources, and extracting truth. Students begin to see there isn't anything they can't learn, document, and find credible sources for if they have these skills.

There is a lot of information to cover in this project, but we assure you it can be completed it in a day. Alternatively, you might choose to spend more time on Research Bootcamp and do it over the course of several days. Regardless of how much time you allocate for this project, it will set a successful foundation for every other project you embark on.

Research Bootcamp is incorporated at the start of several other planned projects, as a part of frontloading for those projects. Keep in mind that you can use smaller projects to build knowledge and skills within larger projects. This emphasizes the philosophy of how learning best happens, as you move to a culture that

promotes the intellectual engagement of students in a way that creates ownership. Smaller projects within a larger project can keep the project fresh and interesting, decreasing the chance of a project stalling or losing direction. However, if you don't have a smaller project to incorporate into a larger project, as we have discussed previously, if needed, there are other ways re-engage students. Finally, if choosing to start project-based learning with a longer-term project, a short project like Research Bootcamp or the Paper Airplane Challenge can help teachers and students see how the process is going to work.

The Paper Airplane Challenge

WE HAVE DONE THIS project numerous times with both adults and kids, and it is fun and engaging every time. The development of the paper airplanes feels very playful to all involved and leads to a high level of participation. It also leads to a deep and unexpected philosophical discussion about each person's unique definition of "best," and is a superb example of how projects engage people's intellect in ways that other types of learning generally do not.

The Paper Airplane Challenge engages students on two levels: construction and developing the "best" paper airplane based on each student's criteria. Students are asked to research the science and construction of paper airplanes while deciding the specific parameters of what constitutes their "best" model. The parameters can include, for example, aesthetics, flight, tricks, historic accuracy, or speed, depending on how students choose to define "best."

This project can easily be incorporated into larger projects focused on the physics of flight, language arts, or design. It is included in the planned project The Art of Storytelling when discussing how words are defined by individuals. Most people would consider this project to be STEM-focused, looking at the physics of flight. By including history, art, and language arts, it becomes a SHTEAM project. Integrating multiple disciplines is easy to do in any project. If you are building a STEM project, The Paper Airplane Challenge can be used as an example of how to broaden the scope to make it a SHTEAM project.

Climate Literacy

CLIMATE LITERACY SHOULD BE an essential part of every child's learning. It is important and deeply pertinent to their life and the planet. This project has students investigate the science while they look at what they are going to do to make a difference. An important goal for this project is that students feel empowered to be the change they want in the world. Using this planned project, students create their own personal action plans, write letters to policy makers, and create their own educational outreach materials.

Climate literacy is a great topic to build a project around. The science is straightforward and not particularly complicated. There are many disciplines that can be incorporated into the project, which gives students multiple avenues for making the project their own. There are also myriad skills, vocational and

academic, that can be woven into it. As designed, this project has science, history, language arts, current events, and art. The science is essential to the project. The other disciplines can be removed or added based on student and teacher interest. If students want to follow a path different than suggested, that is okay. If making changes to the project, change the course description accordingly.

This project is designed as a four-week project. It could easily be condensed to a two-week project, but probably not shorter than that. To get the most out of this topic, a two to four-week timeline gives students the time to contemplate how they can make a difference, which is the basic challenge of the project.

The frontloading for this project is done at the start of each week instead of all at the beginning. This topic lends itself to the parceling of frontloading in this manner. We wanted you to have examples of the two most common types of frontloading, all at the start and parceled out as is done in this project. Many projects will have both types of frontloading. The scheduling of frontloading is also affected by your students. Some students need more frontloading before and during the project than others.

Inclusivity in Historical Memorialization

THE INSPIRATION FOR THIS project was an ongoing protest of Confederate Civil War statues in the Southern region of the United States coupled with an article that detailed how they were installed, not after the Civil War, but during the era of Jim Crow segregation. It is an incredibly deep and meaningful project, forcing students to take a critical look at how the past is remembered, who those memories benefit, and the way memorials can have long-lasting impact on communities.

This project prompts the question: Is there a way to create an inclusive and truthful representation if memorializing events and people that are controversial? This important challenge is complicated because these people and events can have different meanings depending on community, location, and experience. Inclusivity in Historical Memorialization is flexible and easily matched with academic standards. The root of the challenge is about understanding how memorials can contribute to continued oppression. It emphasizes how memorials have the power to change the way history affects people, culture, and legislation by changing the way it is represented in our communities.

This project is best done with older students in middle or high school due to the subject matter, though some of the controversial memorials mentioned, such as Mount Rushmore, can be analyzed by younger students. You can look at larger, national monuments, or dive deeply into regional monuments that are directly affecting your community. If you are unable to take field trips or there aren't any appropriate examples nearby, slide shows will work in a pinch.

Inclusivity in Historical Memorialization is a great example of tailoring a problem, question, or challenge to a specific time and place. Doing this type of project changes the way students view history, seeing it as something living. It connects to current events, which makes this project relevant and a pathway towards productive social action.

Finally, you will notice that in the planned projects, Inclusivity in Historical Memorialization includes a sample student workbook. We chose to include the student workbook for this project to illustrate how open-

ended this (or any) project can be. The student workbook does not strictly match the planned project, since it gives information about memorials in the Virginia/Washington D.C. area, and the student workbook was used by a student working on this project in Colorado. We intentionally included it this way, to show that this project is relevant to any location. While the original project was done in Washington D.C, it has been executed many times in other places, most recently in Colorado. You will see that the over-arching themes remain intact while the field trips and research on re-design and social awareness shifts easily to a local focus. The student workbook can help your learners organize their thoughts and resources, as well as contribute in a substantial way to the planning and activities of the project.

Making for Social Impact

MAKING IS A CREATIVE endeavor that empowers students by connecting their curiosity and creativity with hands-on, vocational and academic skills. Making for Social Impact empowers learners as they actively pursue paths that are valuable to them while they build meaningful projects for others. It is a powerful experience for students when they realize they are problem-solvers and can use their own knowledge and skills to make a difference in the world.

Making for Social Impact focuses on learning and applying vocational and academic skills, often used by Makers. It was originally designed collaboratively with a group of students who wanted to learn how to solder so they could make electronics. They were also actively interested in service projects.

To bring both of these together, a project was created where students applied skills and knowledge to make products. Students made bilirubin lights to send to Doctors Without Borders in Bhutan, sewed wheelchair bags for Children's Hospital, made 3D prosthetics, laser-cut adaptive designs for people and pets, made bee boxes, and more. There are multiple pathways to address and adapt the original challenge. This project was first done in a makerspace and was later modified for an after-school program.

Making for Social Impact can serve many different needs and include many different mentors. By focusing on the application of useful knowledge and skills to real-world problems that can center on issues like health, accessibility, ecology, and community needs, students receive a hands-on experience with tools and materials that are frequently neglected in consumer culture.

This project might seem overwhelming if you are unfamiliar with the equipment and skills required, but anyone can do it. Because the project is designed as a series of mini-projects within a larger project, you can take as much time as you need on any skill a mini-project uses. If needed, you could even skip a suggested mini-project and do something different. The point of Making for Social Impact is to match students' interests in Making with ways they can use it to serve both themselves and others. As long as that is satisfied, the project will be successful.

This is the only planned project that includes information about soliciting grants and crowdfunding. Projects that are service focused lend themselves to more expansive outreach, and make larger funding sources accessible and possible. As an example, this project was funded by a crowdfunding campaign by

asking for monetary donations from the immediate community, as well as applying for and receiving a grant from a funding organization focused on STEAM education and community service.

The Art of Storytelling

HUMANS ARE NATURAL BORN storytellers. For the Art of Storytelling, students will investigate four different ways to tell a story, using words, illustrations, oral storytelling, and through music. Learners will choose one of these and write a book, musical story, or develop an oral story. This project engages more than just the language arts. As designed, students will learn how to make paper and ink and bookbinding. Students who develop musical scores or oral stories will create a video and a CD to document their work. Although not written to include these, this project could be tailored to use dance, painting, videography, or another form of visual art.

The Art of Storytelling is a grade school project that takes a holistic, creative approach to storytelling, both fiction and non-fiction. The driving question is, "If you told your inner story, what would it be, and how would you tell it?" In this project, there is a de-emphasis on the mechanics of writing and an emphasis on how students tell their stories, nurturing their ability to develop an internal voice and express their stories through various mediums.

Elementary writing often focuses primarily on the rules of writing. This is to the detriment for students when it comes to finding their inner storyteller. Writing is an art and a craft. People who are "wordsmiths," such as poets and rappers, make an art out of how they use, punctuate, and even spell words and what those words make.

The act of creating written dialogue, fiction and non-fiction, is a creative process. There is a craft to writing that leads to structure choices. As students learn about the craft and then write their own stories, they begin to take ownership over how good writing is structured and why certain choices make more sense. This project can lead to profound changes in a student's relationship with their words and stories.

The Art of Storytelling focuses primarily on one discipline, instead of being multidisciplinary. You'll notice that even when focusing on one discipline, other disciplines are still naturally incorporated, as you apply skills from those to the project. Unlike most writing projects, this project melds hands-on vocational skills, like bookbinding, with academic skills, like writing. There is also an exploration of graphic design, emphasizing the visual and organizational work that goes into telling a story.

Examining all the parts that go into creating a written work broadens the appeal of this project, so that students who are not naturally drawn to writing will find something that engages and interests them. The Art of Storytelling is designed to span five months, which gives young writers time to explore their inner storyteller, however it could easily be shortened or lengthened.

In fact, some may notice that we define a mid-term project as one to three months, but this project is scheduled out a bit longer than that. We felt that because of the wide range of scheduling that could be done for this project depending on age and ability, it was a better fit for the mid-term project section. Regardless

of how long you take on this project, telling their own stories in their own way is a transformative experience for students.

The History of Fashion and the Modern Wardrobe

THIS IS A YEARLONG project that is both vocational and academic. It merges hands-on design and Making skills with the history of fashion. Expect students to be highly engaged as they choose how to re-design historical fashion into modern pieces. There are so many choices, and a myriad of ways in which to re-imagine traditional clothing and accessories, that the end result each week is personal and unique. It is rare to find an academic project that focuses on textile and jewelry arts. For the right student, this project will feel like it's one of the most meaningful academic endeavors they have ever done.

The History of Fashion and the Modern Wardrobe explores fashion from Pre-History to modern times, as a reflection of the history and culture of each time period. It uses historical fashion to inspire modern interpretations of clothing and accessories. It is wonderfully flexible and can be adapted to fit the needs of the learner and environment. Even without equipment and most materials, students could still produce sketches or miniature model designs to express their ideas. The project could also target very specific eras in fashion history to compliment other coursework. The project was planned to incorporate a wide range of vocational and academic knowledge and skills that covered multiple subjects efficiently and with purpose.

If you do not have a lot of experience with the skills required to do this project, you can learn along with students or bring in mentors to help with the design and Making. Do not let inexperience prevent you from using this project, which is rich with academic and vocational opportunities.

There can be quite a bit of math and science within this project. However, additional math and science will need to be added. More extensive studies in geometry, fractions, measurement, and estimation would be good choices to cover. Environmental studies or engineering are science courses that compliment this project. There is enough history, art/art history, and possibly geography within this project to cover those subjects completely. Finally, this project does not need to follow a rigid schedule. It can span six to twelve months, or less. It can easily be broken up or planned to fit into a quarter system.

Our Year Studying Politics

THIS YEARLONG, MULTI-DISCIPLINARY PROJECT focuses on politics in your home country. As long as you live in a country where citizens have a say in policy legislation and who runs the country, you can do this project. Our Year Studying Politics is profoundly impactful. It has been used by students who were passionate about politics as well as those who had no interest in politics at the start of the project. For those students, doing this project resulted in a deep and abiding interest in a particular issue and candidate. Our Year Studying Politics has long-ranging consequences for students as they investigate those issues under the purview of the government, and decide which matter most to them as a citizen and eventual voter.

Students will come to understand how legislative change happens as well as the work that goes into making it happen.

Our Year Studying Politics starts with ten weeks of frontloading across several disciplines. At the same time, students are studying the platform issues of the various political parties. This is done as a prerequisite to choosing a candidate to support. Students should be given full autonomy to choose a candidate. This is their project, their country, and, eventually, their vote. The strength of this project is that it engages teens, creates an informed voter, and helps them recognize the importance of their vote, but only if they have the ability to choose their own candidate and the platform issues they want to vote for. The biggest limitation of this project, is that it is best done during an election cycle. For U.S. citizens, that is every two years. In off years, when students cannot volunteer for a candidate, we do not recommend conducting this project.

As designed, the subject areas incorporated into this project include government studies, civics, art and graphic design, language arts, history, computer programming, literature, volunteering and service work, film, and social media outreach. Depending on the candidate students support, their project might include academic and vocational skills that are not listed. Alternatively, some of the courses listed might not be done by your students. We are including a whole range of disciplines that can be included so you are aware of these options.

Some science will likely be covered, since all party platforms include some climate and medical science. You could work to create a year of science focused on climate literacy or human health with a focus on how public policy is shaped around those, but be prepared for the amount of work it takes to develop a yearlong lab course. There are good resources for doing this for climate science, and possibly for human health and public policy. However, it is easiest to teach science outside of the project. Math needs to be added as an ancillary course outside of the project as well. There is no good way to weave a year of grade-level math into this project. Because of the length of this project, we recommend skipping classes that will run outside of the project scope during the first ten weeks when you are frontloading material, then doing a year's worth of math and science during the rest of the academic year. This has the benefit of mimicking how college courses and projects in a work environment are structured, which is good practice for students as they prepare to transition to college and jobs.

It might seem daunting to develop or use a project for the high school years that is intended to take the place of a number of subjects. It can be done, however, and is well worth the effort. This project has successfully been completed by students who were accepted into colleges using the courses in this project as a part of their official transcript. A project like this is a great example of one where students should develop a portfolio. It is likely to be an unprecedented course, and some colleges and employers may want to see examples of the work that students did. In addition, portfolios offer a more complete, holistic view of a student's work. In a project like this one, where students are approaching topics differently than done in traditional schools, portfolios can set students apart and highlight their unique skills.

You, too, can develop projects that are big and incorporate many disciplines. It starts with a passionate belief that something should be learned. If you or your students feel strongly that there is a problem, question, or challenge that is not being currently addressed with traditional subjects, we recommend that you sit down by yourself or with your students and plan how those could be approached. It is essential you do a great job

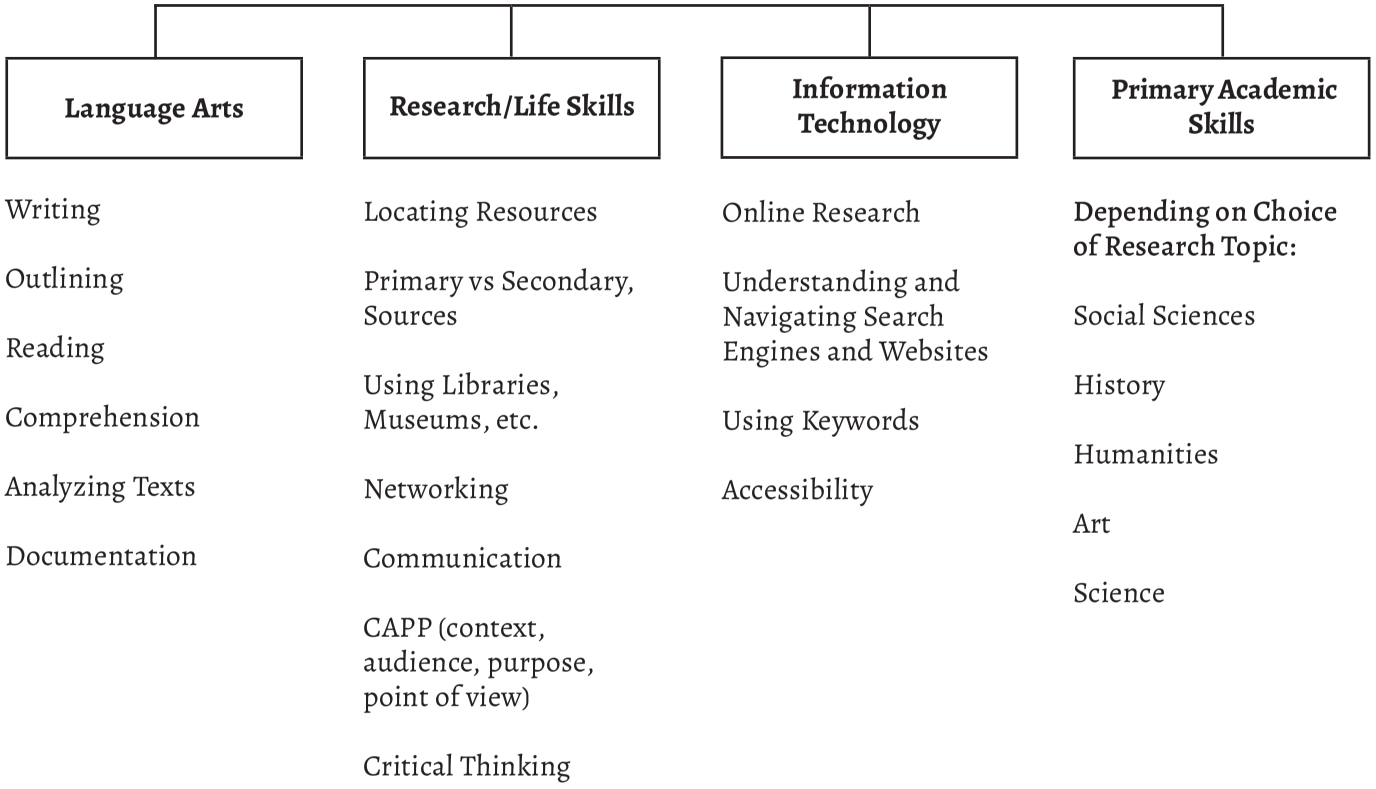
of documentation and include robust course descriptions that are written at the beginning and edited at the end to reflect what you did. You need to have a solid system for grading that is explained within the course description. You can see examples of how this was done in the planning workbook for Our Year Studying Politics. You will also need to create a syllabus for each course. This is easy to do as you go along, writing the syllabus based on your weekly logs. It is important that you cover any subjects that cannot be incorporated into the project.

A Note about the Planned Projects Using the Educator Workbook

Some of the pages from the Educator Workbook were not used for the planned projects. Those pages were removed to save space in this section of the book. You will find that, in using these projects or in designing your own, not every section of the Educator Workbook is relevant to the project. If you need those pages that were omitted when you use a planned project, print the relevant pages from the Educator Workbook.

Planning the Project

Academic Disciplines and Basic Skills



List applied skills needed for the project in the spaces above.

<table>
<tr><th colspan="4">Before Planning the Project, Continued</th></tr>
<tr><td rowspan="5">Choosing a Project

The section below is an exercise to help you think through your project choice.

You just need brief answers for the questions.

More extensive planning will happen after you have established if this is a good topic for the project.</td><td colspan="3">What academic disciplines can be woven into the project? Art, science, history, engineering, math, technology</td></tr>
<tr><td colspan="3">How is the project focus thought-provoking and meaningful? Students are tasked with researching and designing their version of the “best” paper airplane, challenging them to define and match a value system.</td></tr>
<tr><td colspan="3">What are the real-world applications? Understanding the aerodynamics of flight, critical thinking about value systems, assessment and evaluation</td></tr>
<tr><td colspan="3">List resources that may be used during this project:</td></tr>
<tr><td>Materials
General: Blue masking tape for launch line, measuring tape, stopwatch, computers, books

Materials for each student/group: Sheets of three different weights of paper, tape, notebook pad or paper (graph?), paper clips, pennies, scissors, colored pencils, stickers</td><td>Information
The science and history of flight, paper airplanes, Internet research and videos (see especially Paper Airplane guy, Scientific American articles on paper airplanes and the physics of flight)</td><td>Activities
Building paper airplanes</td></tr>
</table>

Frontloading: Skills that are essential to know before starting the project.

Skills and Knowledge	Resource(s) Chosen To Teach This Skill	Length Of Time To Teach Skill	Do all students have skill?
History of Memorial Design	Excerpts from relevant articles and books (e.g. *Monument Wars* by Kirk Savage or *Controversial Monuments and Memorials: A Guide for Community Leaders*, edited by David Allison)	1 day/Class period	No
Research Skills	Research Bootcamp Project (Library, Internet, Museums, Universities)	1 day/Class period	Many
Engineering	Film on building design and construction, math of building and scale	Half day/Class period	Some
Art/Architecture	Aesthetics and considerations of design	Half day/Class period	Some
Sociology	Excerpts from relevant articles and books such as "The effects of public memorials on social memory and urban identity" (Science Direct)	1 day/Class period	No
Psychology	Excerpts from relevant articles and books such as "Do Memorials Matter?" (Univ. of Cambridge) and "Memorials to Lynching Victims help their African American Descendants" (History News Networks, New York Times)	1 day/Class period	No
Law	Excerpts from relevant articles and books on process and current events	Half day/Class period	No
Political Science	Articles and interviews	Quarter day/Class period	Some

Rubric For: Our Year Studying Politics		
Project Criteria	**Instructor**	**Student**
Knowledge and Skills Civics Political Science History Computer Science Website Development Graphic Design Sociology Rhetoric Language Arts Literature Service Work Documentary Filmmaking (optional) Social Media Literacy Public Speaking	Did the student educate themselves on platform issues and candidates, as well as the political process and social issues? Did the student complete the frontloading and demonstrate an understanding of topics by incorporating them into the project? Did the student choose diverse, credible literature, videos, and other media strategically to support the platform issues and candidates they chose? Did the student demonstrate an understanding of the political process through their persuasive writing in essays and on social media? Did the student design and develop products, such as a website or film, that displayed their knowledge with skill and accuracy? Did the student effectively use social media to promote their political views? Did the student choose volunteer work that used their strengths and interests?	Did I educate myself on platform issues and candidates, as well as the political process and social issues? Did I complete the frontloading before the project began? Was I able to incorporate what I learned throughout the project? Did I choose diverse, credible literature, videos, and other media strategically to support the platform issues and candidates I chose? Did I demonstrate an understanding of the political process through my persuasive writing in essays and on social media? Did I design and develop products, such as a website or film based on my knowledge and skill? How well do these show what I know and believe? Did I effectively use social media to promote my political views? Did I choose volunteer work that used my strengths and interests?