Logbook

Invention Logbook

Grades 9-12

Teaching Edition

ANDREWS UNIVERSITY
STEM
Science | Technology | Engineering | Math

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Teacher resources and videos available on our website:
www.andrews.edu/go/invent

Contact us at stemconnect@andrews.edu
with any questions, comments, or suggestions.

Introduction

STEM has become increasingly important in the world today, as companies expect applicants to understand basic science and math concepts and be able to think critically and solve problems in the workplace. Learning these skills starts in the classroom where you as a teacher are expected to instruct your students in STEM.

The goal of this project is to engage students with math and science through a hands-on learning opportunity. They are encouraged to work collaboratively, think for themselves, and solve real-world problems. The engineering design process will serve as the problem-solving method.

Traditional math and science classes are important for teaching the basic skills, but it is difficult for students to appreciate what they are learning without a practical application. This project lets them think and experiment and learn by doing. When students are able to use math and science as tools to solve problems, they develop a greater appreciation for what they are learning. Even beyond the STEM professions, the problem solving skills they learn from this project are useful for everyone.

Project Summary

Students will choose a problem and create an invention to solve that problem. They will collaborate in groups of 3-4 to solve the problem together. Each team of students will complete one Logbook together over the course of the project. The Logbook will keep their work organized and provide instructions for each step of the process. We have designed this as a workbook with prompts and space to write/draw.

When you start the project, print one copy of the Logbook for each group and put it in a 3-ring binder. This way you can add more pages as needed. Alternatively, you are welcome to use a notebook for each team instead of the workbook version. If you choose to do that, give each group one notebook to fill out together and use the digital version of the Logbook as an outline.

In addition to the Logbook, we recommend students journal what they did for that day or week. This helps them reflect on their progress and set goals for next time. This can be done in a notebook or using the Weekly Progress worksheet available online.

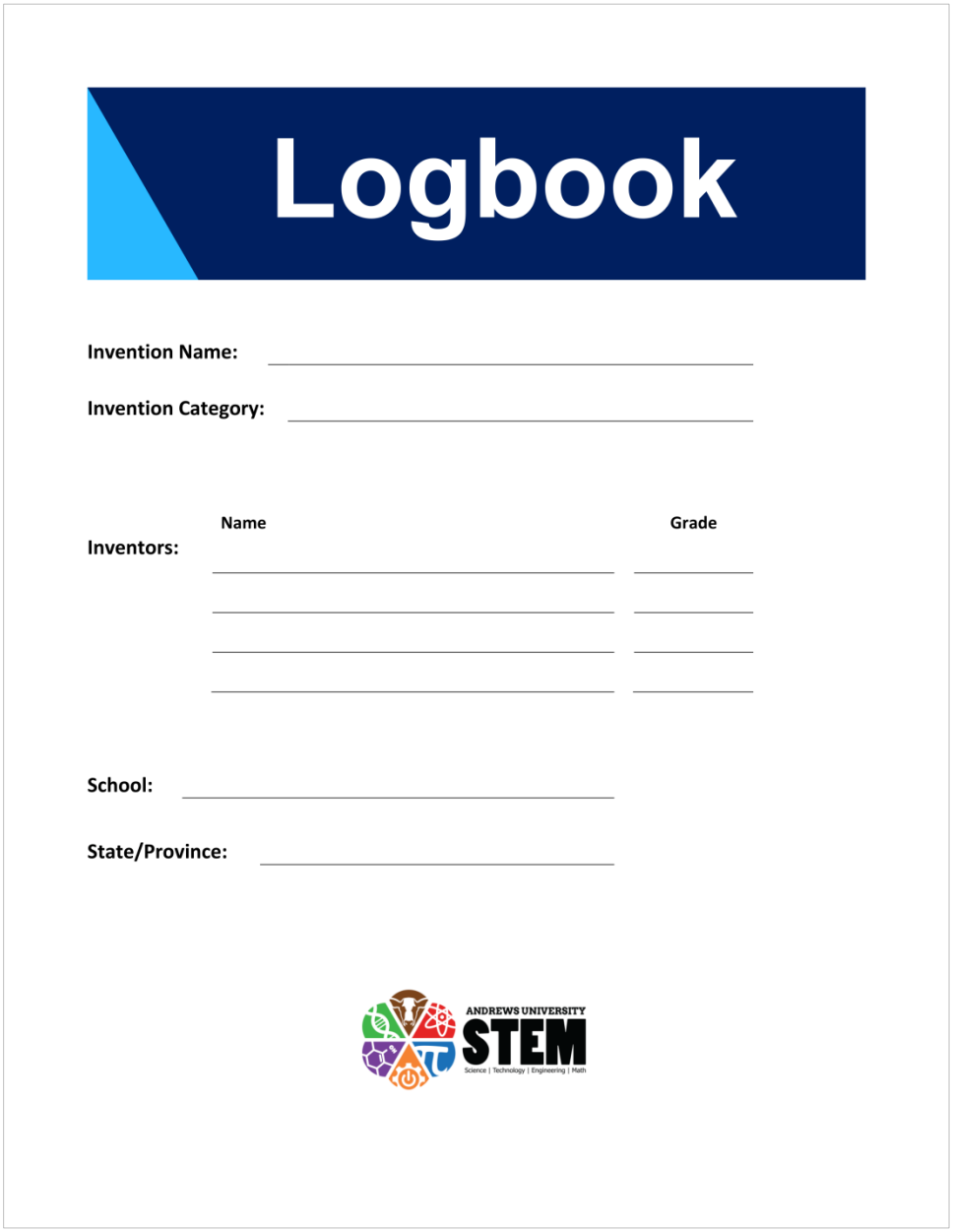
As Adventist educators, we are encouraged to integrate biblical principles throughout our curriculum. To meet this need, we have included a biblical connection with this project. Give examples throughout the project and let each group think of a favorite Bible story, character, or a verse that relates to their invention. It is easy to separate STEM from spirituality, but we hope this will help students see STEM as a God-given gift to bring Him glory.

Cover Page

Invention Name:
Let the students come up with a fun and creative name that describes their group's invention. They should write it here on the cover page and use it in their presentation.

While it might be tempting to name the invention early on, the students should wait until the end of the project when they know more about it.
We recommend naming the invention during the Communicate step.

Invention Category:
The students will choose the invention category that best describes their invention and write it here on the cover page.
See the Invention Categories handout for more information.



If you decide to use composition notebooks or other blank notebooks instead of the provided Logbook, include the information from this page on the cover or first page of the notebook.

Logbook Introduction

Encourage your students to read this page on their own or summarize it to the class when you start the project.

Introduction

Math and science can often seem impractical for everyday life. Maybe you've asked your teacher, "Why do I need to learn this?!" In fact, math and science are part of a broader creative problem-solving mindset. Everyday life is full of challenges, which means we all need to solve problems. The goal of this project is to give you practical hands-on experience with solving problems. Engineering and inventing use the tools of math and science to solve real-world problems. Whether or not you decide to pursue a career in STEM (Science, Technology, Engineering, and Math), the problem solving skills you will learn through this project can be applied to almost any challenge. So have fun, be creative, and enjoy this opportunity to learn about STEM in a hands-on collaborative experience!

About the Logbook

Fun hands-on project? Cool! So why do I need this big document? The Logbook is your record of the steps you will take to create your invention. It contains all your design ideas, iterations, tests, etc. Your team will fill it out together over the course of the project, so it isn't too much all at once.

In addition to the Logbook, each team member will keep a personal record of their progress and goals, either on a provided worksheet or in their own notebook. This is just a quick record of your progress each week to help you stay on track.

The completed Logbook will serve as the proof of what you did as well as a comprehensive project report. It is important to take neat, careful notes for each step. It needs to be clear for other people to read as well as for your future self (further development or improvement). If you decide to patent the invention, this can also serve as the record of your work in case there are questions about your claim to the ideas.

In support of this, it is important that you properly research the ideas and solutions you come up with to be sure they are original. As a matter of professional and academic integrity, we ask that every team member sign the Statement of Originality. This applies to your final design and the prototype you create. Along the way, you may come up with potential solutions that have already been invented. You may not be able to develop those ideas but you should still record them since they were part of your ideation process.

At the end of the project, you will submit your Logbook for grading as well as have it available during your final presentation. The Logbook will also be useful when creating the presentation because it will contain the complete record of the work you did. So do a good job on the Logbook and your presentation will be easy.

Project Guidelines

Requirements:

- The teacher must sign off on the project and design before the prototype is built.
- The final design and solution must be completely original or sufficiently different that it can be considered a true innovation and not a copy of existing inventions/products.
  See the Solution section of the Logbook for more information (pg. 15).
- All group members must sign the originality statement promising that the design ideas in the Logbook follow the originality requirements.
- The invention prototype does not need to be fully functional, but it should be able show how the final design would operate. If the group can create a functional or partially functional prototype, they should do so.
- If the invention cannot be demonstrated at the final presentation due to size constraints or other considerations, a video must be made demonstrating its use.
- For all presentations, each group will need a Tri-Fold board explaining the project, the signed and completed Logbook, and the prototype. Some or all of these items can be used in the verbal presentation but regardless, they need to be available to show people afterwards.
  See the Presentation Guidelines handout for more information.

Restrictions:

- Animals may not be brought to the final presentation at the invention event. If the design is for animals or uses animals in any way, you must find a way to demonstrate its function without the animal present.
- Inventions may not use wall outlet electricity (110V or higher) unless you are only using unmodified consumer products such as a fan or smartphone charger.
  Battery operated devices are acceptable as long as they use common low voltage batteries (i.e. no car batteries, etc.).
- Inventions may not use any flames or heat sources (lighters, matches, candles, fireworks, heating elements, etc.) or any combustible liquids.
- Inventions may not use biohazards or other dangerous materials.
- Inventions may not be or make use of any weapons such as guns, knives, explosives, stun guns, pepper spray, or blunt weapons.

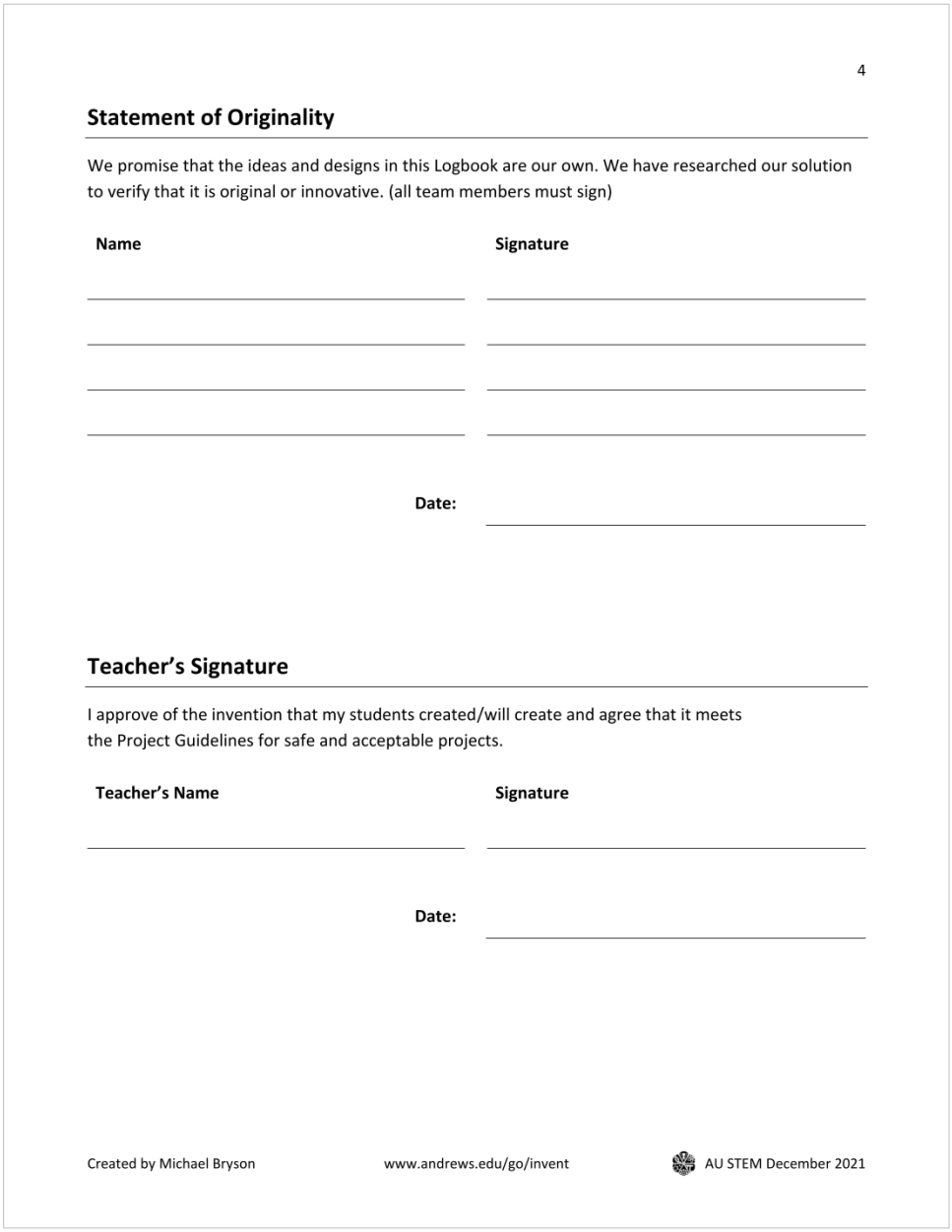
If you have any questions about the project guidelines or feel that the project deserves an exception to the above Requirements & Restrictions, the teacher may contact us at stemconnect@andrews.edu.

Signatures

Statement of Originality:
Students are encouraged to identify original/unique invention ideas for their project. This statement helps students formalize this commitment.

Originality also pertains to the origin of students' ideas. Students should work together to develop their inventions, rather than relying on adults or copying an idea they've seen.

Each student in the group must sign the originality statement sometime before the project is over.



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Statement of Originality

We promise that the ideas and designs in this Logbook are our own. We have researched our solution to verify that it is original or innovative. (all team members must sign)

Name	Signature

Date:

Teacher's Signature

I approve of the invention that my students created/will create and agree that it meets the Project Guidelines for safe and acceptable projects.

Teacher's Name	Signature

Date:

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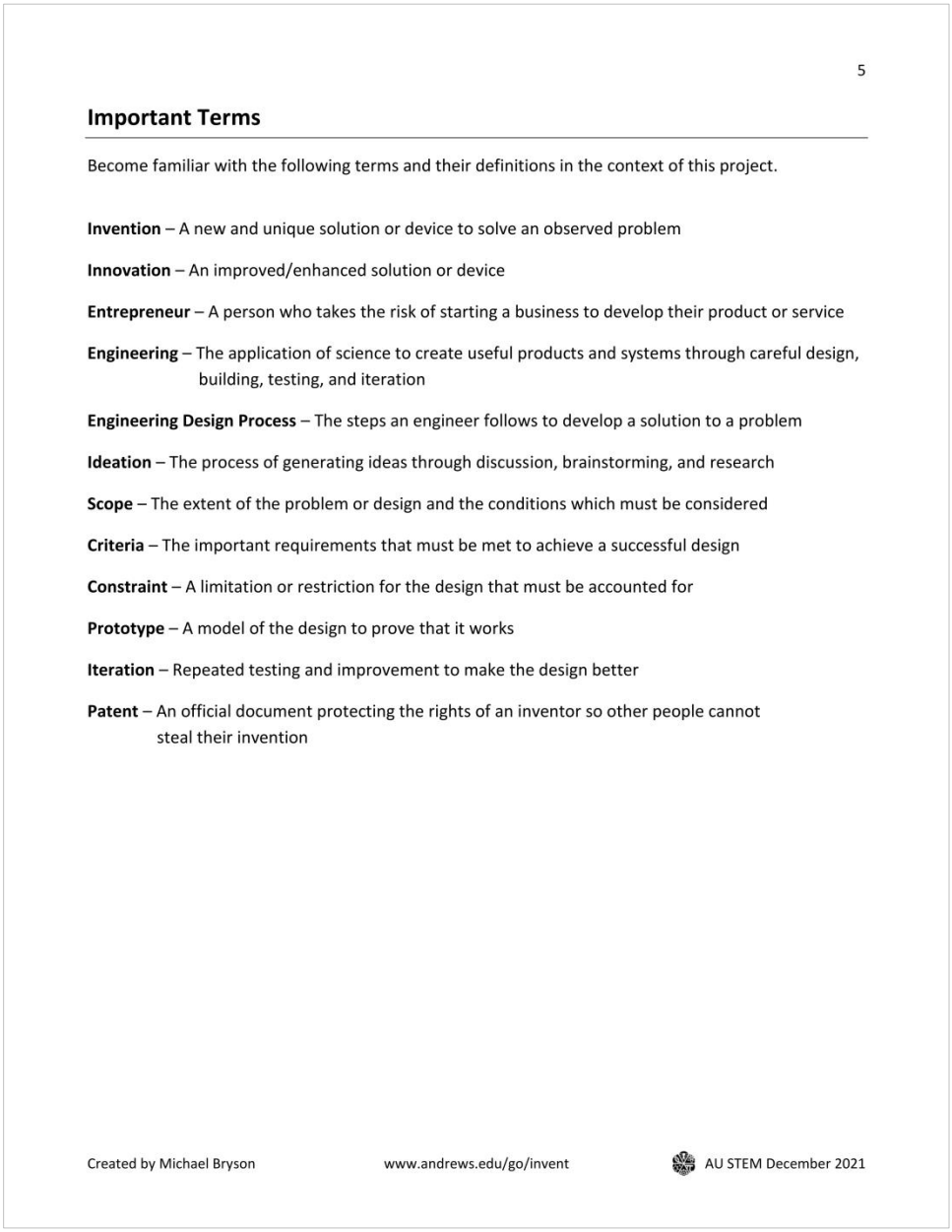
Teacher's Signature:
Once your students choose a solution to their problem, discuss it with them to make sure it meets the Project Guidelines (pg. 3). Once you are satisfied, sign off on the idea. You may need to check again after they build the prototype and whenever they revise the design.

Vocabulary

Introduce the following words to your students. The provided definitions are intended to help your students understand the vocabulary and concepts covered in this project.

Feel free to use and teach the words in the way that best helps your students.

This vocabulary list is also available as a separate document you can print or refer to in class.



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Important Terms

Become familiar with the following terms and their definitions in the context of this project.

Invention – A new and unique solution or device to solve an observed problem

Innovation – An improved/enhanced solution or device

Entrepreneur – A person who takes the risk of starting a business to develop their product or service

Engineering – The application of science to create useful products and systems through careful design, building, testing, and iteration

Engineering Design Process – The steps an engineer follows to develop a solution to a problem

Ideation – The process of generating ideas through discussion, brainstorming, and research

Scope – The extent of the problem or design and the conditions which must be considered

Criteria – The important requirements that must be met to achieve a successful design

Constraint – A limitation or restriction for the design that must be accounted for

Prototype – A model of the design to prove that it works

Iteration – Repeated testing and improvement to make the design better

Patent – An official document protecting the rights of an inventor so other people cannot steal their invention

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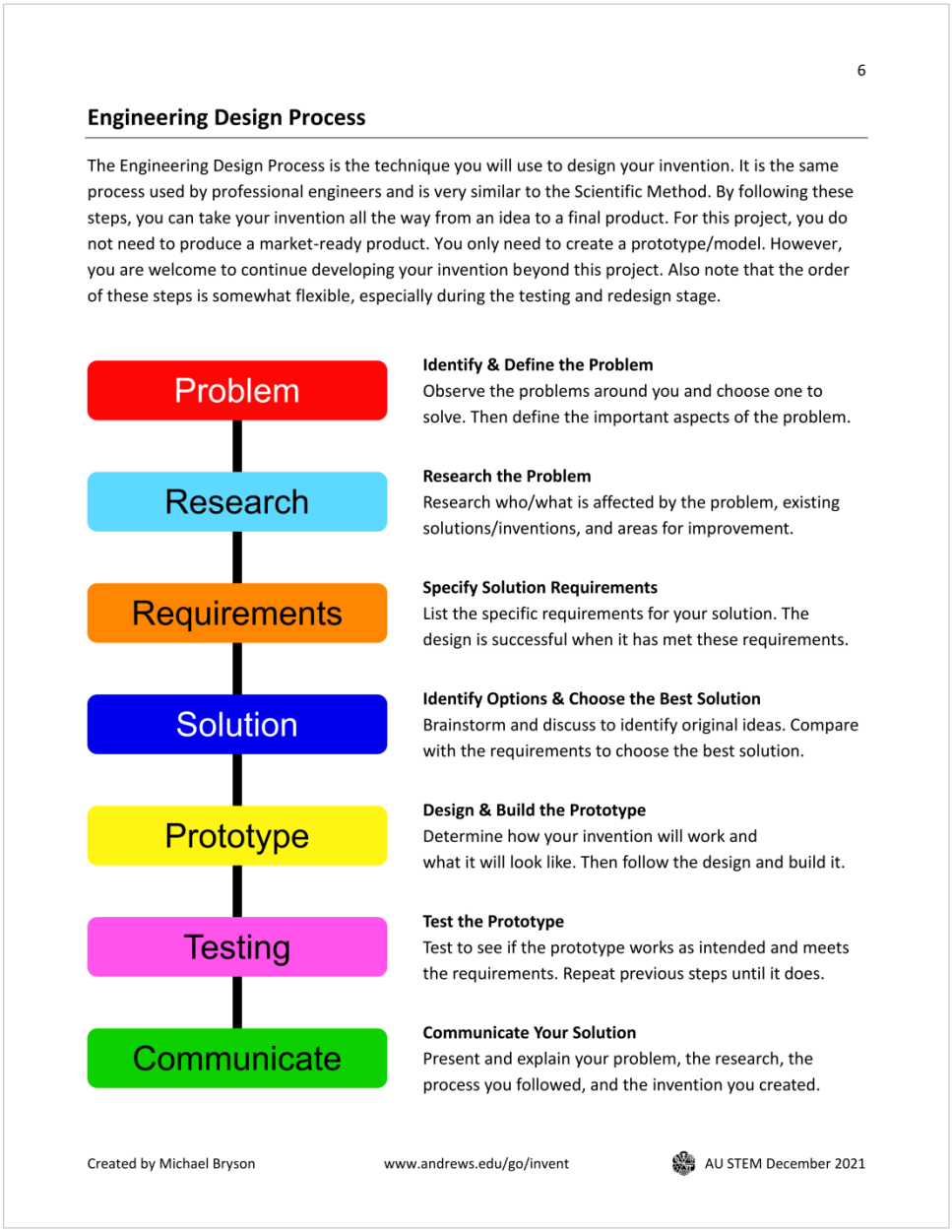
Engineering Design Process

The engineering design process is how engineers solve problems and develop the products we use every day. Many inventors throughout history were engineers, so it makes sense to use this process when creating a new invention.

Beyond engineering and inventing, the engineering design process can also serve as a pattern for solving all kinds of problems. The steps in this process will help your students identify and develop good ideas and focus their efforts to produce tangible and fulfilling results.

Learn More:
To learn more about engineers and the engineering design process, check out the engineering videos and examples on our website.



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Engineering Design Process

The Engineering Design Process is the technique you will use to design your invention. It is the same process used by professional engineers and is very similar to the Scientific Method. By following these steps, you can take your invention all the way from an idea to a final product. For this project, you do not need to produce a market-ready product. You only need to create a prototype/model. However, you are welcome to continue developing your invention beyond this project. Also note that the order of these steps is somewhat flexible, especially during the testing and redesign stage.

This diagram provides an overview of the engineering design process and the following pages will expand on this, providing steps for your students to follow as they develop their inventions.

This engineering design process diagram is also available as a separate document you can print or refer to in class. We also have a printable quick reference version (without descriptions).

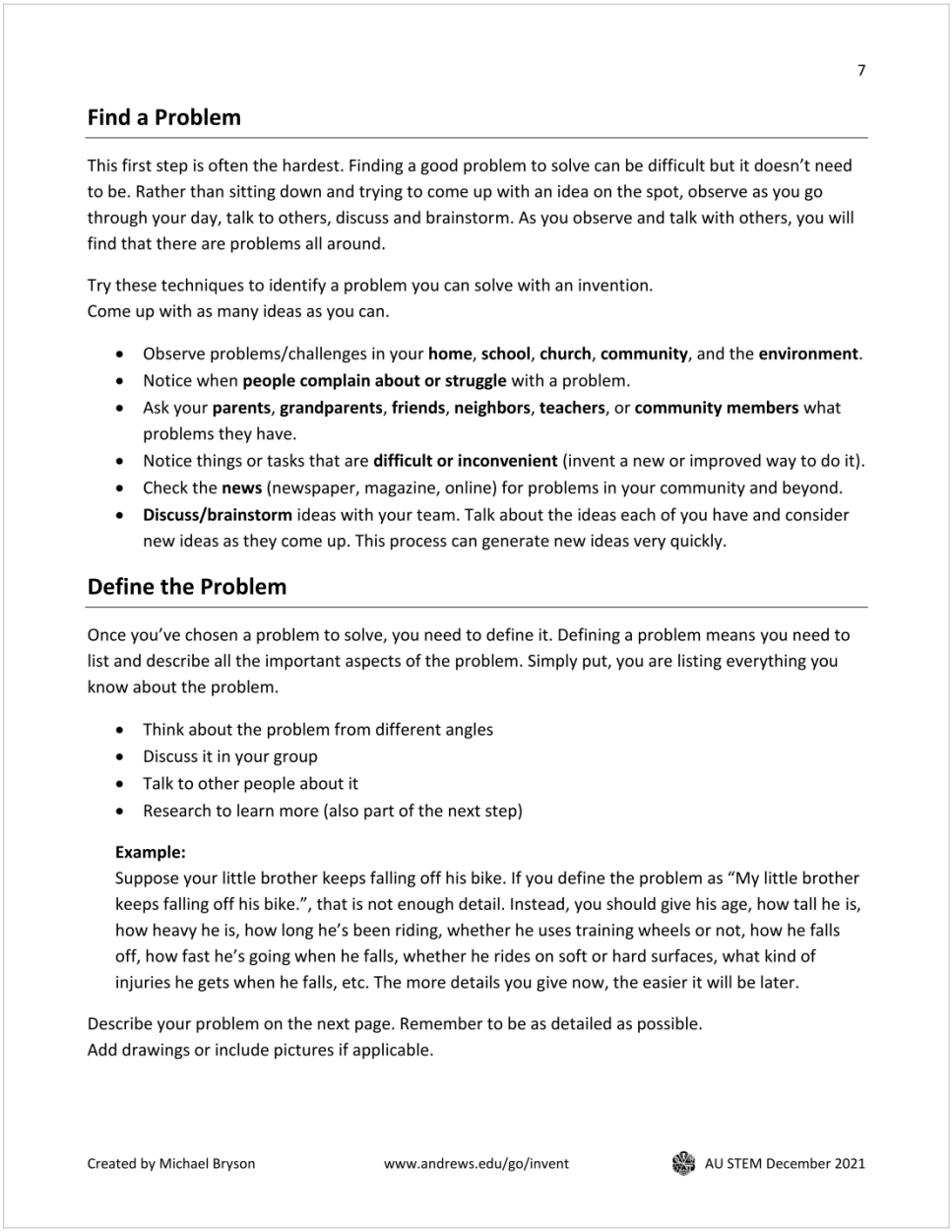
Problem

Find a Problem:
Divide the class into groups of 3-4. The groups will stay the same for the entire project. Each group needs to choose a different problem and create an invention to solve it.

Finding a problem is often the hardest step so you may need to try different things to help the students find good problems. Discuss the Invention Categories in-class or let the students read it together. This list suggests many areas where problems may be found.

Let the students look for problems on their own (worksheet available). Have them check around their house, talk to people they know, and pay attention to challenges throughout their day. Start this as soon as you begin the project.

Let them share with their group or the whole class. Discussion introduces ideas much faster than simply working alone. They should record the ideas as they talk together.



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Find a Problem

This first step is often the hardest. Finding a good problem to solve can be difficult but it doesn't need to be. Rather than sitting down and trying to come up with an idea on the spot, observe as you go through your day, talk to others, discuss and brainstorm. As you observe and talk with others, you will find that there are problems all around.

Try these techniques to identify a problem you can solve with an invention.
Come up with as many ideas as you can.

- Observe problems/challenges in your **home**, **school**, **church**, **community**, and the **environment**.
- Notice when **people complain about or struggle** with a problem.
- Ask your **parents**, **grandparents**, **friends**, **neighbors**, **teachers**, or **community members** what problems they have.
- Notice things or tasks that are **difficult or inconvenient** (invent a new or improved way to do it).
- Check the **news** (newspaper, magazine, online) for problems in your community and beyond.
- **Discuss/brainstorm** ideas with your team. Talk about the ideas each of you have and consider new ideas as they come up. This process can generate new ideas very quickly.

Define the Problem

Once you've chosen a problem to solve, you need to define it. Defining a problem means you need to list and describe all the important aspects of the problem. Simply put, you are listing everything you know about the problem.

- Think about the problem from different angles
- Discuss it in your group
- Talk to other people about it
- Research to learn more (also part of the next step)

Example:
Suppose your little brother keeps falling off his bike. If you define the problem as "My little brother keeps falling off his bike.", that is not enough detail. Instead, you should give his age, how tall he is, how heavy he is, how long he's been riding, whether he uses training wheels or not, how he falls off, how fast he's going when he falls, whether he rides on soft or hard surfaces, what kind of injuries he gets when he falls, etc. The more details you give now, the easier it will be later.

Describe your problem on the next page. Remember to be as detailed as possible.
Add drawings or include pictures if applicable.

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Choose a Problem:
Each group needs to choose a problem they can solve with an invention. Give them a deadline and remind them to choose quickly so they have enough time to make the invention. If they still can't decide, you might need to discuss with them or suggest a problem. It's great if they can find a problem they are passionate about, but working through the process is more important than the specific problem they choose.
Try not to spend more than 1-2 weeks on this step.

Problem (continued)

Define the Problem:
After the students choose a problem, they need to write down everything they know about it.

Read the example from the previous page (student edition) and practice defining the problem together on the board.

Think about what the problem is, where it is, what needs to be fixed, why it is important, etc.

Imagine you are describing the problem to someone who has no knowledge about it. What information do they need to know?

After completing the example, let each group discuss their problem and describe it in the Logbook. The more details the better.

In addition to the written description, students are welcome to draw a picture or take a photo to further explain things.


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Define the Problem

Brief Description:

Important Details:

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Notice that this step is different from the upcoming Requirements step. The requirements describe the *solution*, while this step describes the *problem*.

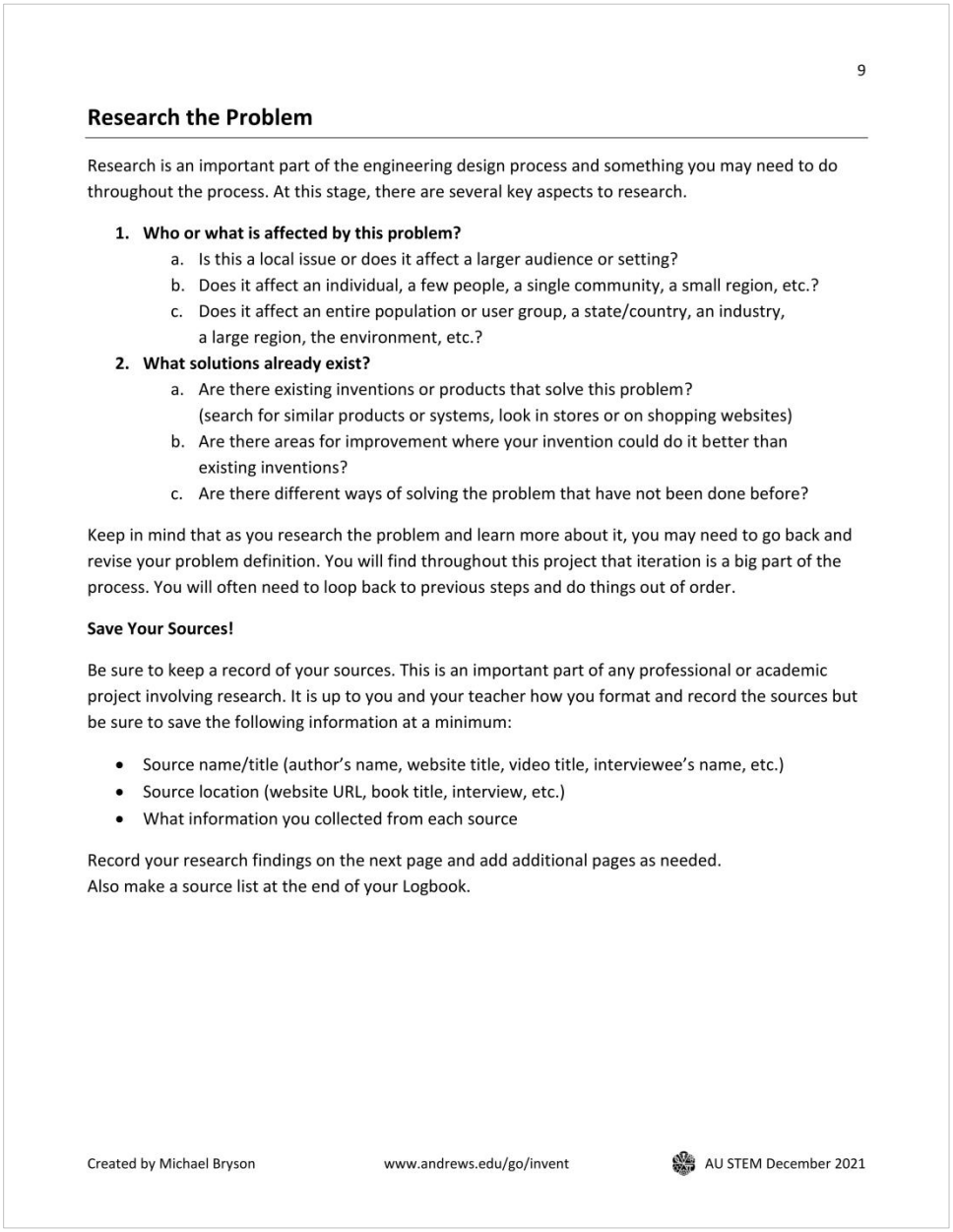
It is important to understand the problem before considering solutions. This will make the following steps easier.

Research

Let students work in their groups to research the problem. The provided questions will guide their search but they are welcome to look beyond the prompts to learn more.

Ask them to use books, websites, videos, surveys, interviews, etc. to find the relevant information.
If they are not already familiar with this type of research, you may need to give additional instructions.

They should also cite where they found the information. They need brief citations on the next page and a full source list at the end of the Logbook. You can choose how they format these and what details to include.



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Research the Problem

Research is an important part of the engineering design process and something you may need to do throughout the process. At this stage, there are several key aspects to research.

1. **Who or what is affected by this problem?**
   a. Is this a local issue or does it affect a larger audience or setting?
   b. Does it affect an individual, a few people, a single community, a small region, etc.?
   c. Does it affect an entire population or user group, a state/country, an industry, a large region, the environment, etc.?
2. **What solutions already exist?**
   a. Are there existing inventions or products that solve this problem? (search for similar products or systems, look in stores or on shopping websites)
   b. Are there areas for improvement where your invention could do it better than existing inventions?
   c. Are there different ways of solving the problem that have not been done before?

Keep in mind that as you research the problem and learn more about it, you may need to go back and revise your problem definition. You will find throughout this project that iteration is a big part of the process. You will often need to loop back to previous steps and do things out of order.

Save Your Sources!

Be sure to keep a record of your sources. This is an important part of any professional or academic project involving research. It is up to you and your teacher how you format and record the sources but be sure to save the following information at a minimum:

- Source name/title (author's name, website title, video title, interviewee's name, etc.)
- Source location (website URL, book title, interview, etc.)
- What information you collected from each source

Record your research findings on the next page and add additional pages as needed.
Also make a source list at the end of your Logbook.

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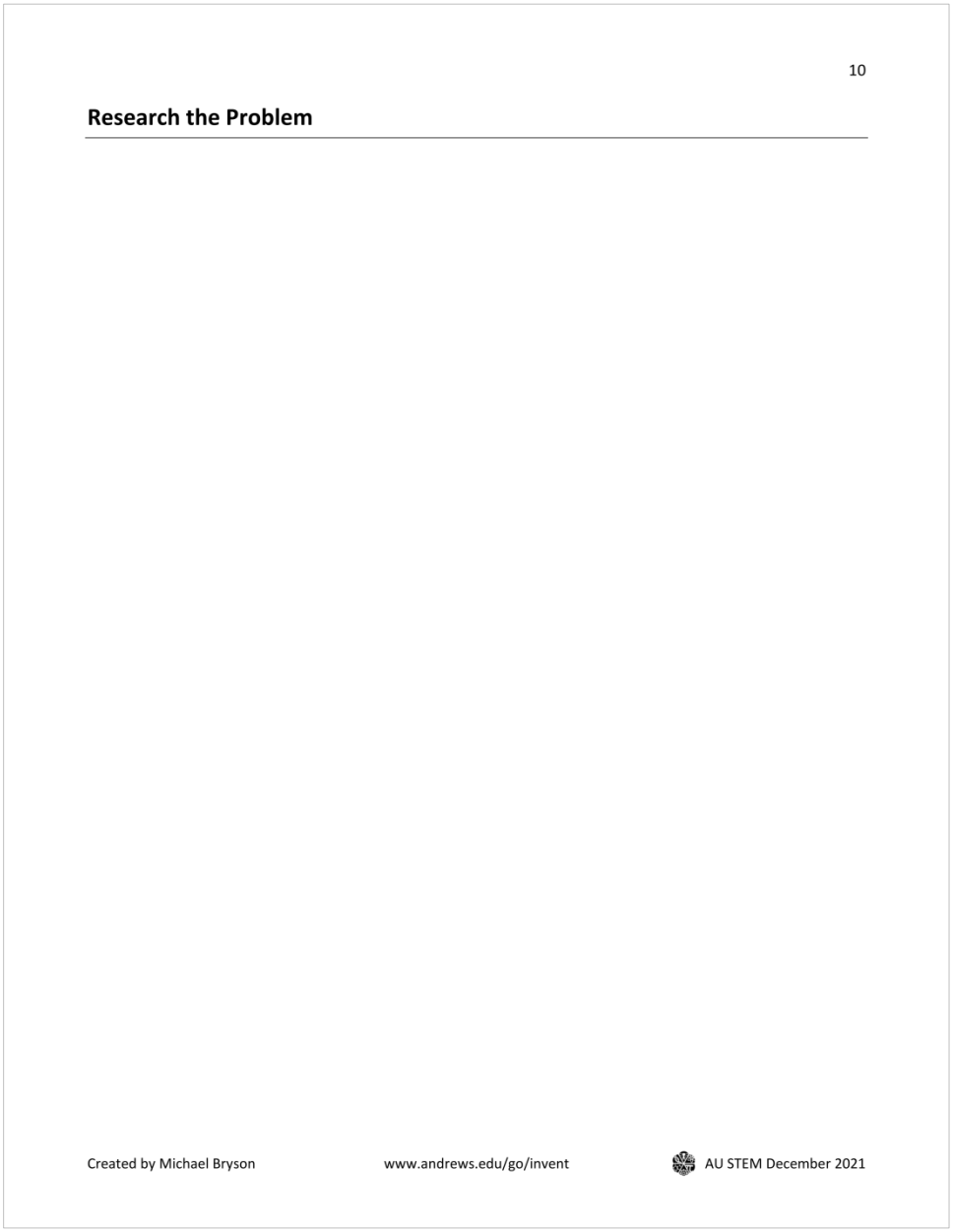
Research (continued)

Students will describe what they learned from their research.

Add pages as needed.



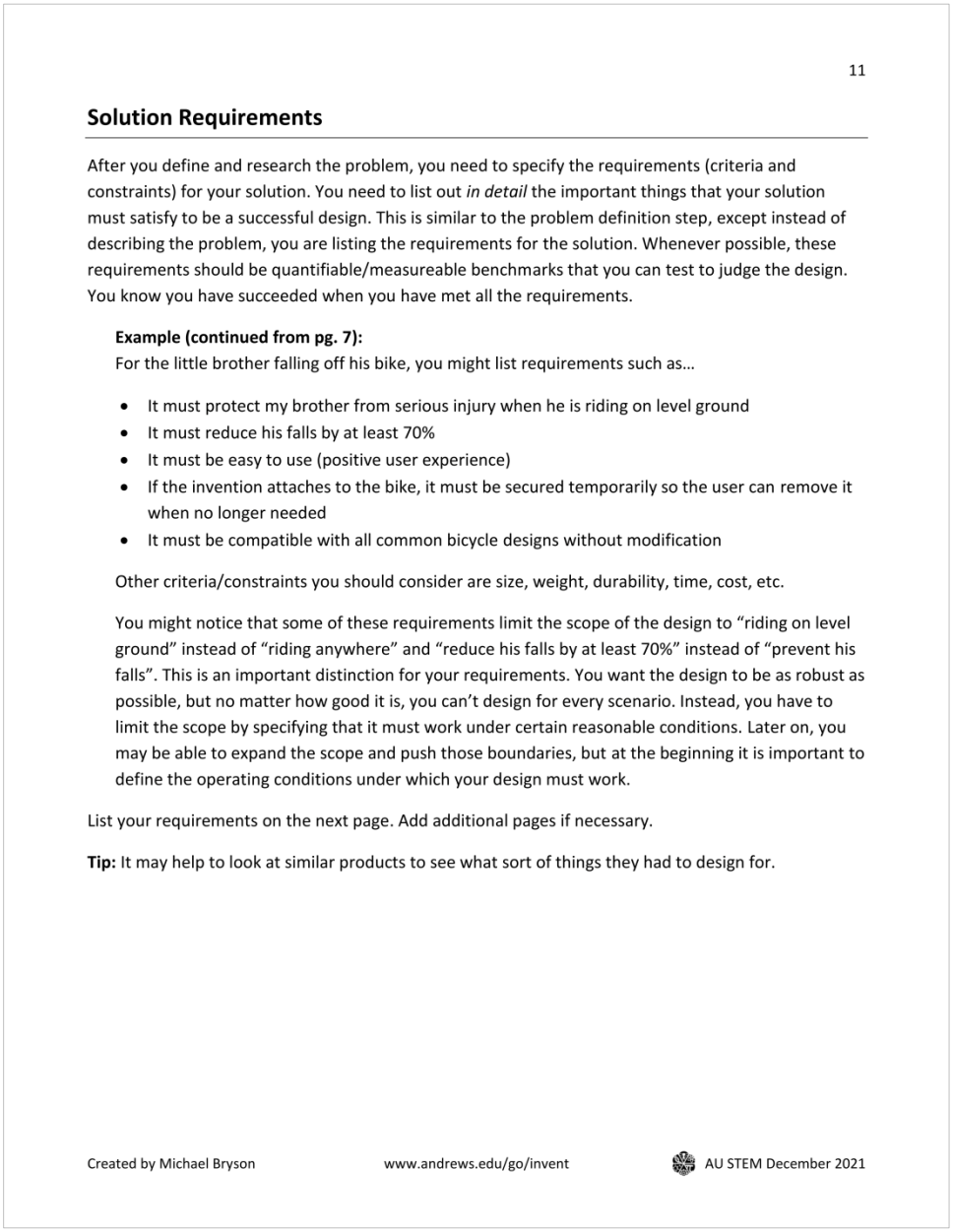
Requirements

Requirements are important. They tell you what the solution needs to do, help you choose the best solution, and let you test how well it works.

Good Requirements:
Read the example together and talk about what makes a good requirement.

1. They are detailed enough to describe what the solution needs to do (criteria), without saying exactly how it will be done.
2. They describe the limitations for the solution (constraints) that the design must accommodate.
3. They describe the specific conditions where the design is intended to work.

Sometimes it helps to consider an extreme case. Would it make sense to protect your brother by wrapping him in tons of bubble wrap? Can you think of a constraint that would limit this sort of solution?



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Solution Requirements

After you define and research the problem, you need to specify the requirements (criteria and constraints) for your solution. You need to list out *in detail* the important things that your solution must satisfy to be a successful design. This is similar to the problem definition step, except instead of describing the problem, you are listing the requirements for the solution. Whenever possible, these requirements should be quantifiable/measureable benchmarks that you can test to judge the design. You know you have succeeded when you have met all the requirements.

Example (continued from pg. 7):
For the little brother falling off his bike, you might list requirements such as…

- It must protect my brother from serious injury when he is riding on level ground
- It must reduce his falls by at least 70%
- It must be easy to use (positive user experience)
- If the invention attaches to the bike, it must be secured temporarily so the user can remove it when no longer needed
- It must be compatible with all common bicycle designs without modification

Other criteria/constraints you should consider are size, weight, durability, time, cost, etc.

You might notice that some of these requirements limit the scope of the design to "riding on level ground" instead of "riding anywhere" and "reduce his falls by at least 70%" instead of "prevent his falls". This is an important distinction for your requirements. You want the design to be as robust as possible, but no matter how good it is, you can't design for every scenario. Instead, you have to limit the scope by specifying that it must work under certain reasonable conditions. Later on, you may be able to expand the scope and push those boundaries, but at the beginning it is important to define the operating conditions under which your design must work.

List your requirements on the next page. Add additional pages if necessary.

Tip: It may help to look at similar products to see what sort of things they had to design for.

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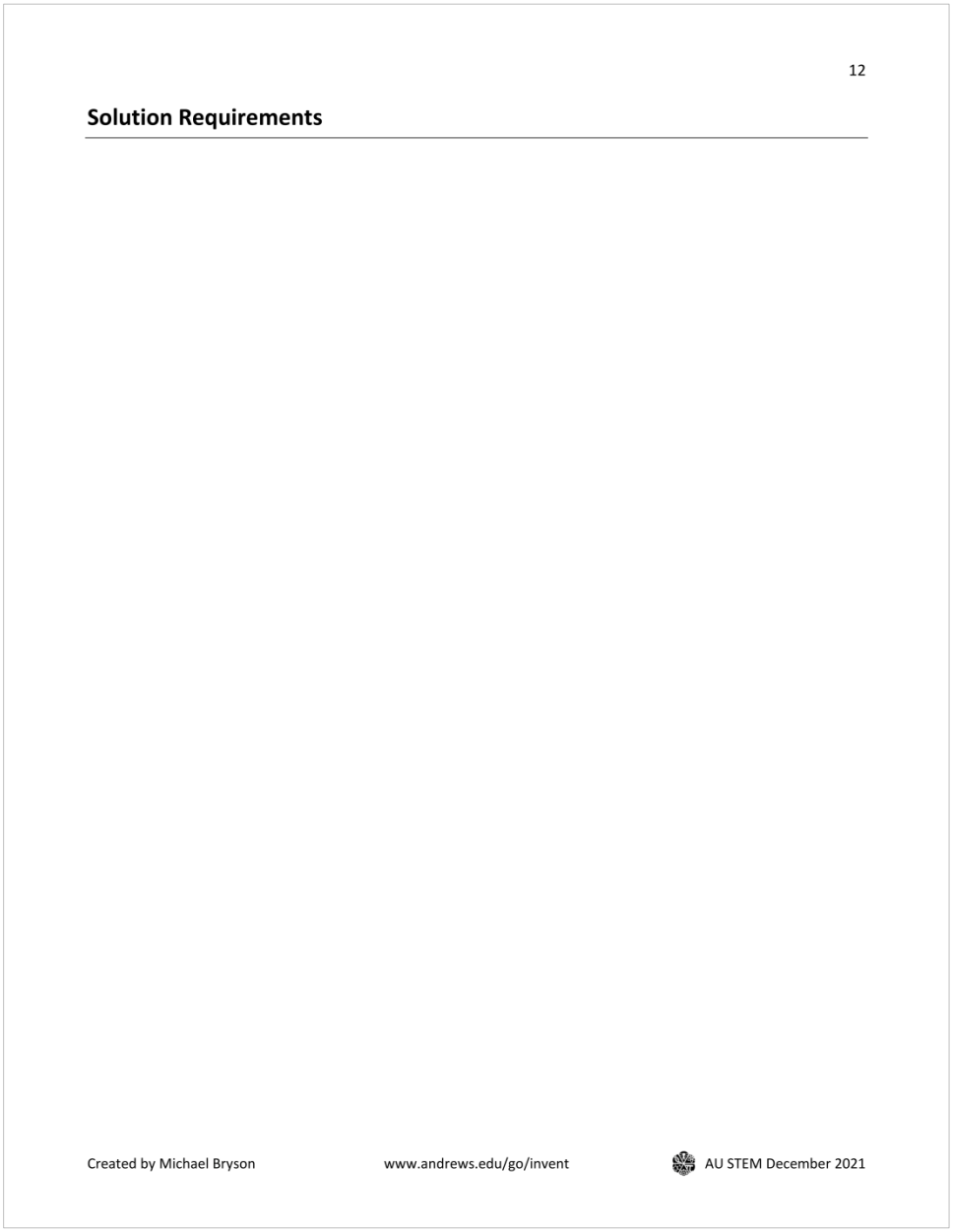
List the Requirements:
Let the students discuss together to determine their requirements. Remind them this is <u>not</u> the time to choose a solution. They should describe generally what any good solution needs to do to solve their problem. This will help them find solutions on the next step.

It may help to search for similar products. Images and descriptions can hint at the requirements for those products and provide suggestions.

Requirements (continued)

Students will list their solution requirements in the space provided.

Add pages as needed.

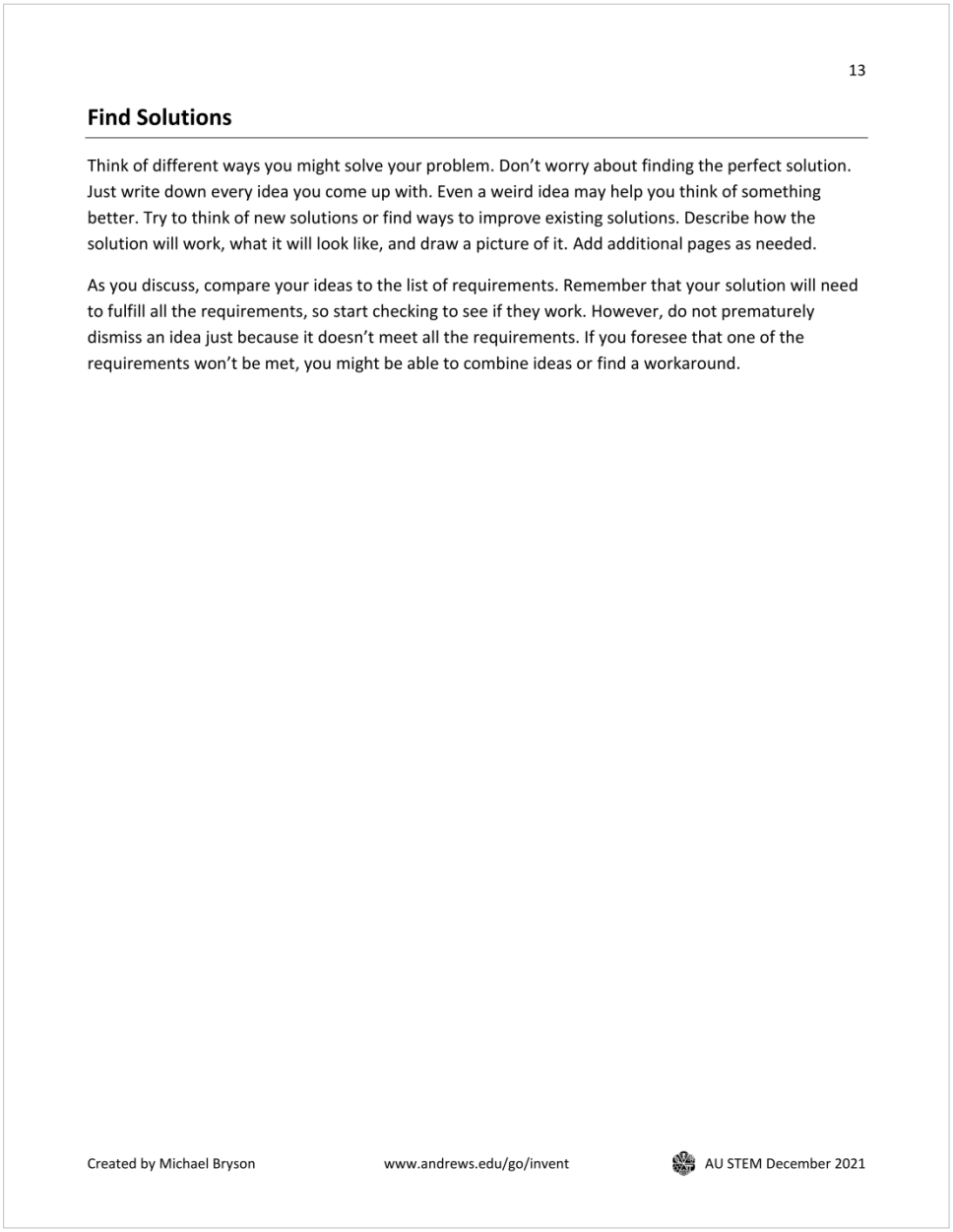


Solution

Find Solutions:
Brainstorming solutions is a fun activity. You can really let your imagination go and think of any and every solution that comes to mind. There are no bad ideas at this point, because even a weird idea might inspire something great.

Let the students talk in their groups and think up as many solutions as they can. Ideally, these should be things they can build, and they should be new (original) ideas.

Have them draw the ideas in their Logbook and write a brief description for each.



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Find Solutions

Think of different ways you might solve your problem. Don't worry about finding the perfect solution. Just write down every idea you come up with. Even a weird idea may help you think of something better. Try to think of new solutions or find ways to improve existing solutions. Describe how the solution will work, what it will look like, and draw a picture of it. Add additional pages as needed.

As you discuss, compare your ideas to the list of requirements. Remember that your solution will need to fulfill all the requirements, so start checking to see if they work. However, do not prematurely dismiss an idea just because it doesn't meet all the requirements. If you foresee that one of the requirements won't be met, you might be able to combine ideas or find a workaround.

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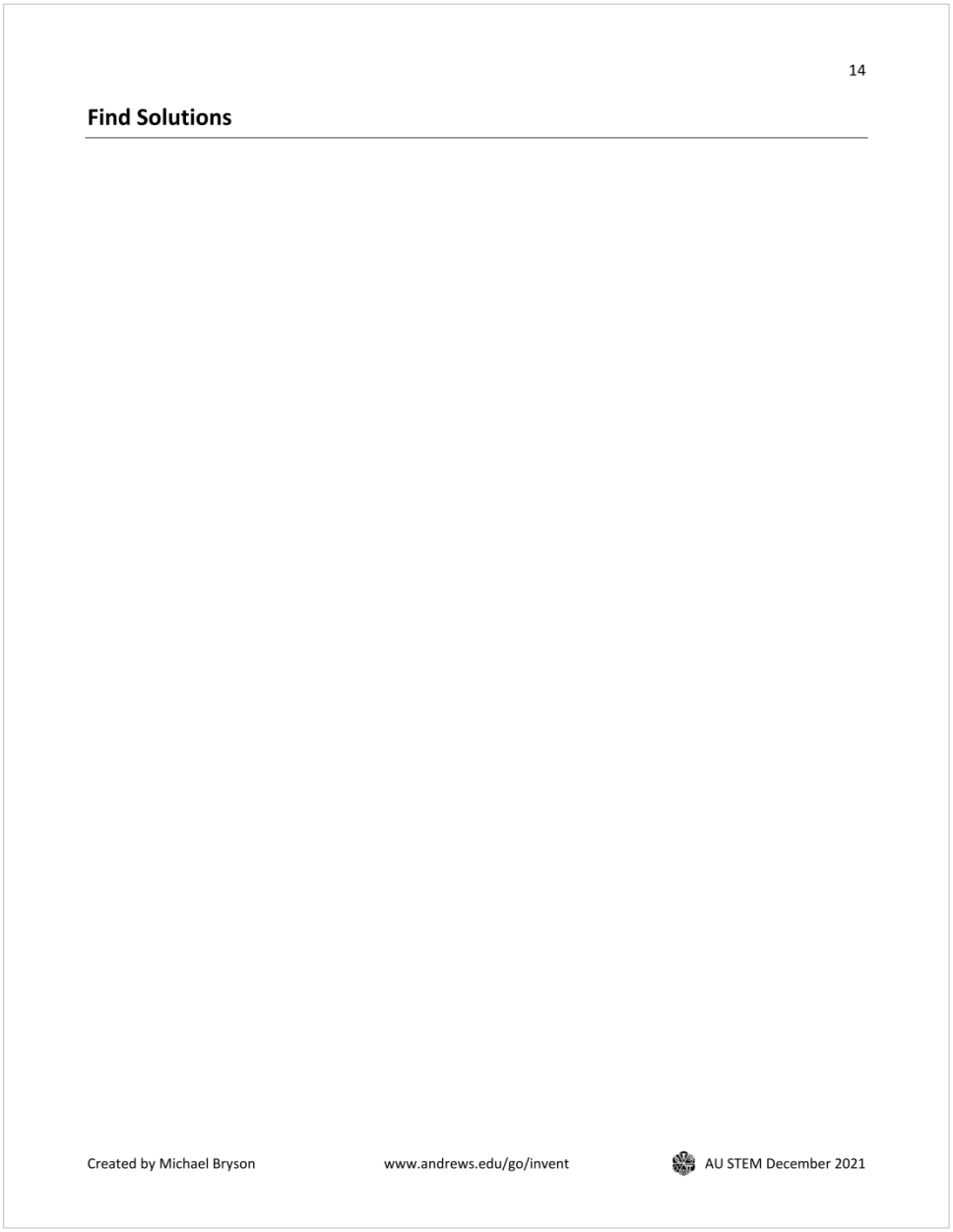
Solution (continued)

Students will write and draw their solution ideas in the space provided.

Add [solution pages](#) as needed.



Solution (continued)

Compare Ideas:
The students will narrow their list by answering questions for each idea.

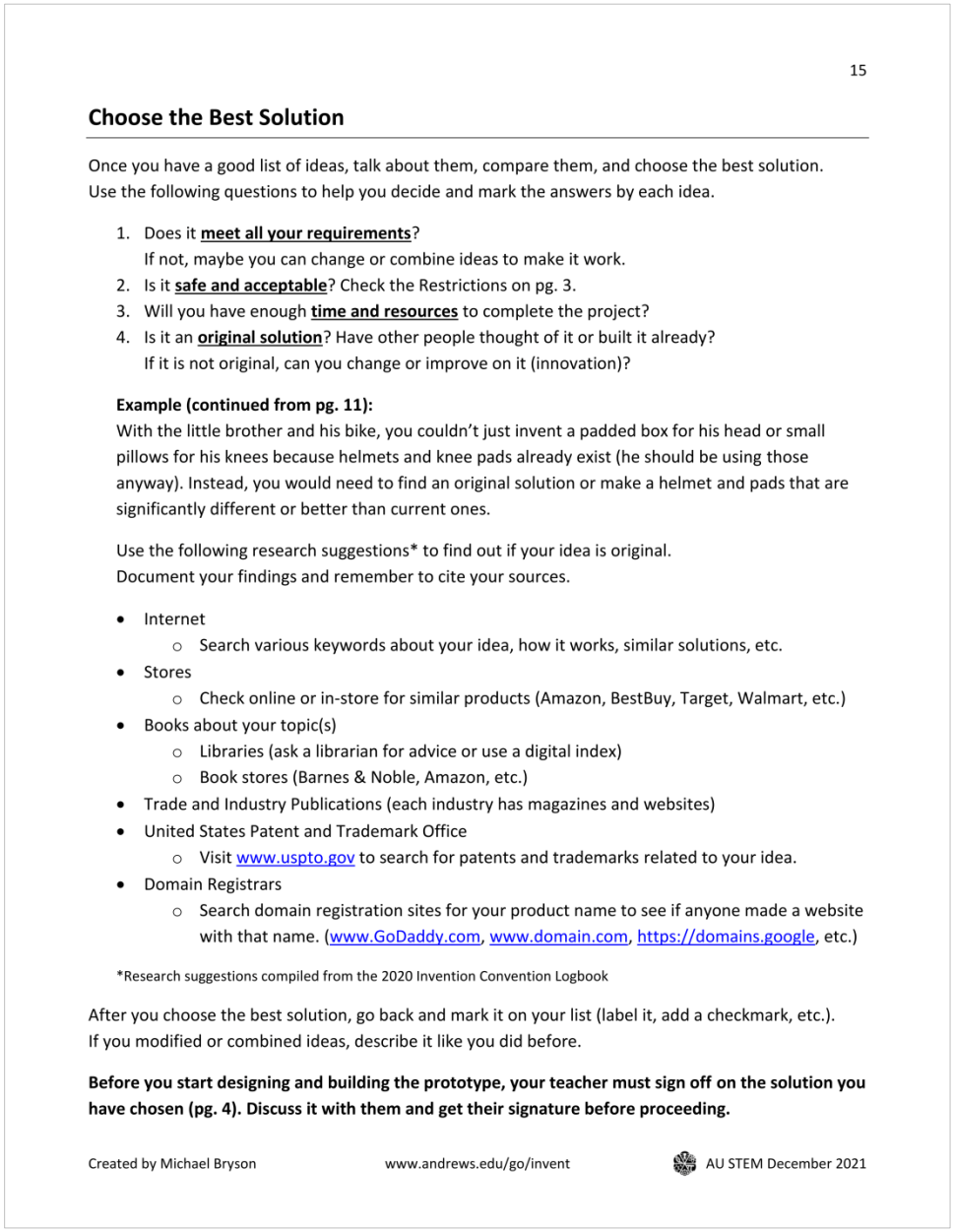
Question 4: Originality
Read the example and talk about why originality is important. If someone had the idea first, it is too late for you to *invent* it, but you might be able to do it differently or better (innovation).

Researching originality can be time consuming, so it should only be done for the top ideas. If the idea is not completely original, it should at least improve upon what currently exists.

Remind them to cite their sources.

Choose the Best Solution:
The group should choose the idea that answered yes to all 4 questions, or if multiple solutions passed, they may need to just pick one or combine ideas.

If they came up with new solutions during this process, they should describe it like before.



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Choose the Best Solution

Once you have a good list of ideas, talk about them, compare them, and choose the best solution. Use the following questions to help you decide and mark the answers by each idea.

1. Does it **meet all your requirements**?
   If not, maybe you can change or combine ideas to make it work.
2. Is it **safe and acceptable**? Check the Restrictions on pg. 3.
3. Will you have enough **time and resources** to complete the project?
4. Is it an **original solution**? Have other people thought of it or built it already?
   If it is not original, can you change or improve on it (innovation)?

Example (continued from pg. 11):
With the little brother and his bike, you couldn't just invent a padded box for his head or small pillows for his knees because helmets and knee pads already exist (he should be using those anyway). Instead, you would need to find an original solution or make a helmet and pads that are significantly different or better than current ones.

Use the following research suggestions* to find out if your idea is original.
Document your findings and remember to cite your sources.

- Internet
  - Search various keywords about your idea, how it works, similar solutions, etc.
- Stores
  - Check online or in-store for similar products (Amazon, BestBuy, Target, Walmart, etc.)
- Books about your topic(s)
  - Libraries (ask a librarian for advice or use a digital index)
  - Book stores (Barnes & Noble, Amazon, etc.)
- Trade and Industry Publications (each industry has magazines and websites)
- United States Patent and Trademark Office
  - Visit www.uspto.gov to search for patents and trademarks related to your idea.
- Domain Registrars
  - Search domain registration sites for your product name to see if anyone made a website with that name. (www.GoDaddy.com, www.domain.com, https://domains.google, etc.)

*Research suggestions compiled from the 2020 Invention Convention Logbook

After you choose the best solution, go back and mark it on your list (label it, add a checkmark, etc.).
If you modified or combined ideas, describe it like you did before.

Before you start designing and building the prototype, your teacher must sign off on the solution you have chosen (pg. 4). Discuss it with them and get their signature before proceeding.

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Approve the Invention Idea:
Compare each group's idea with the Project Guidelines (pg. 3) and sign on page 4 if you feel it is appropriate. You may need to check again when they revise their design or if they choose a new solution.

Design, Build, & Test the Prototype

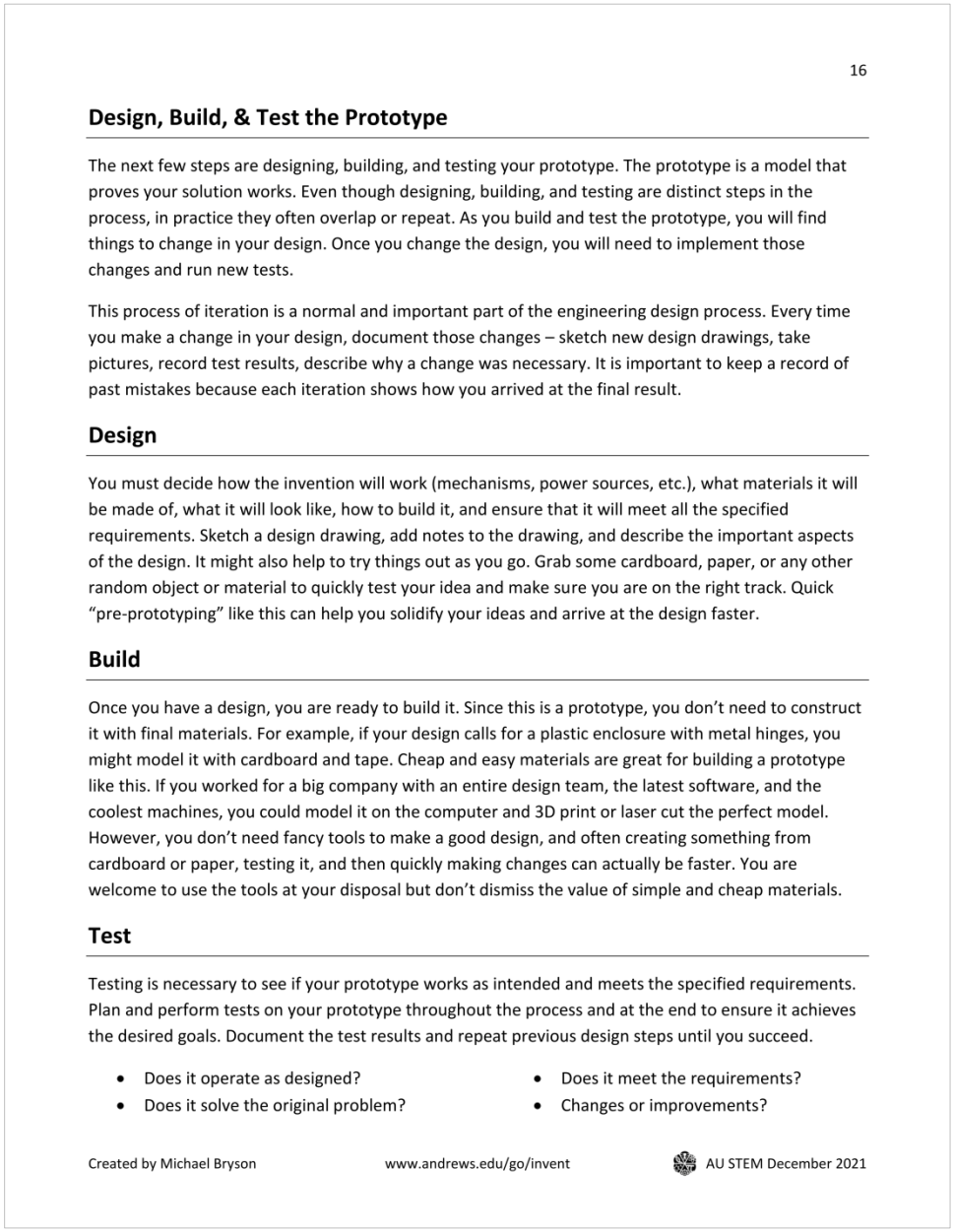
Reminder:
Review and sign off on each group's invention idea.

Design:
Before building the prototype, a detailed design must be drawn up. The students will discuss in their group and draw the design together.

Build:
Provide the students with inexpensive materials such as cardboard, paper, tape, glue, etc. (raid the recycle bin or the craft closet). If they want to use other materials, that's fine as long as they meet the Project Guidelines.

Test:
The students will test their prototype and answer the provided questions. This will help them evaluate the prototype and look for things to improve.

Plan Enough Time!
These steps will be the majority of the project.



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Design, Build, & Test the Prototype

The next few steps are designing, building, and testing your prototype. The prototype is a model that proves your solution works. Even though designing, building, and testing are distinct steps in the process, in practice they often overlap or repeat. As you build and test the prototype, you will find things to change in your design. Once you change the design, you will need to implement those changes and run new tests.

This process of iteration is a normal and important part of the engineering design process. Every time you make a change in your design, document those changes – sketch new design drawings, take pictures, record test results, describe why a change was necessary. It is important to keep a record of past mistakes because each iteration shows how you arrived at the final result.

Design

You must decide how the invention will work (mechanisms, power sources, etc.), what materials it will be made of, what it will look like, how to build it, and ensure that it will meet all the specified requirements. Sketch a design drawing, add notes to the drawing, and describe the important aspects of the design. It might also help to try things out as you go. Grab some cardboard, paper, or any other random object or material to quickly test your idea and make sure you are on the right track. Quick "pre-prototyping" like this can help you solidify your ideas and arrive at the design faster.

Build

Once you have a design, you are ready to build it. Since this is a prototype, you don't need to construct it with final materials. For example, if your design calls for a plastic enclosure with metal hinges, you might model it with cardboard and tape. Cheap and easy materials are great for building a prototype like this. If you worked for a big company with an entire design team, the latest software, and the coolest machines, you could model it on the computer and 3D print or laser cut the perfect model. However, you don't need fancy tools to make a good design, and often creating something from cardboard or paper, testing it, and then quickly making changes can actually be faster. You are welcome to use the tools at your disposal but don't dismiss the value of simple and cheap materials.

Test

Testing is necessary to see if your prototype works as intended and meets the specified requirements. Plan and perform tests on your prototype throughout the process and at the end to ensure it achieves the desired goals. Document the test results and repeat previous design steps until you succeed.

- Does it operate as designed?
- Does it solve the original problem?
- Does it meet the requirements?
- Changes or improvements?

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Improvement:
After testing, the students will likely need to fix things. Remind them that this is a normal part of the process. They shouldn't be discouraged if it fails the first time (or even the second or third time). Every great inventor fails before they succeed, but they keep trying until it works! If improvements are required, simply go back to the appropriate step and try again. If they change the design, increase the Design Version number (#2, #3, etc.).

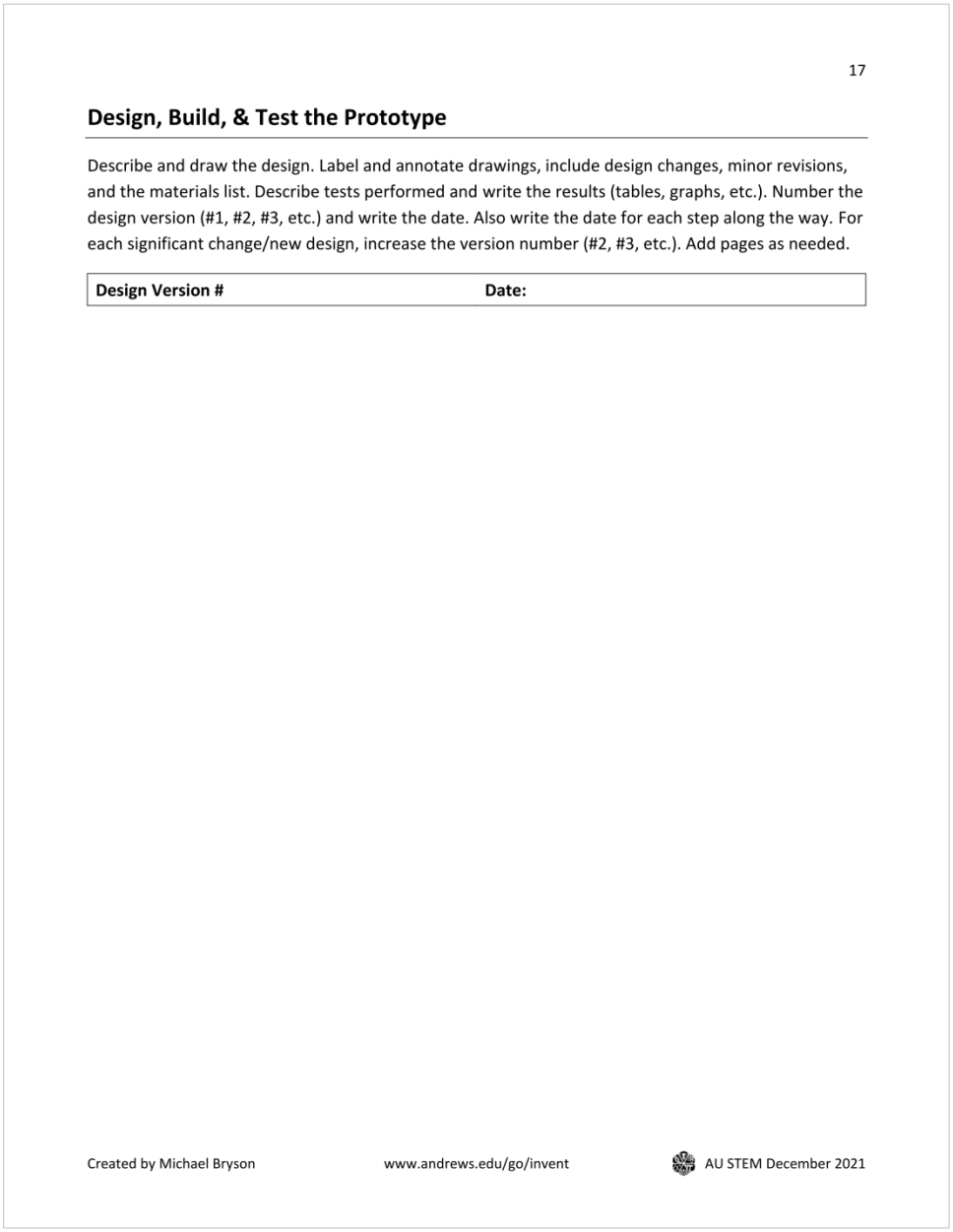
Design, Build, & Test the Prototype (continued)

Version Number:
Write the Design Version # and Date at the top of each page to keep track of which version it is for.

Take Notes:
As the students work on their prototype, they should add notes to the Logbook describing any challenges, decisions, etc. Include the current date by each note.

Numbers & Graphs:
Students should record any numerical data about their designs or tests. This is a great opportunity to incorporate math concepts with appropriate tables, graphs, and calculations.

Perfection Not Required!
The prototype is only a model of the design, so it doesn't have to work perfectly. If they can make it functional that would be great, but even a static model can demonstrate how the invention works.



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Design, Build, & Test the Prototype

Describe and draw the design. Label and annotate drawings, include design changes, minor revisions, and the materials list. Describe tests performed and write the results (tables, graphs, etc.). Number the design version (#1, #2, #3, etc.) and write the date. Also write the date for each step along the way. For each significant change/new design, increase the version number (#2, #3, etc.). Add pages as needed.

Design Version #	Date:

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Additional Pages:
Add new prototype pages as needed. For each significant change/new design, start a new page and increase the version number (#2, #3, etc.).

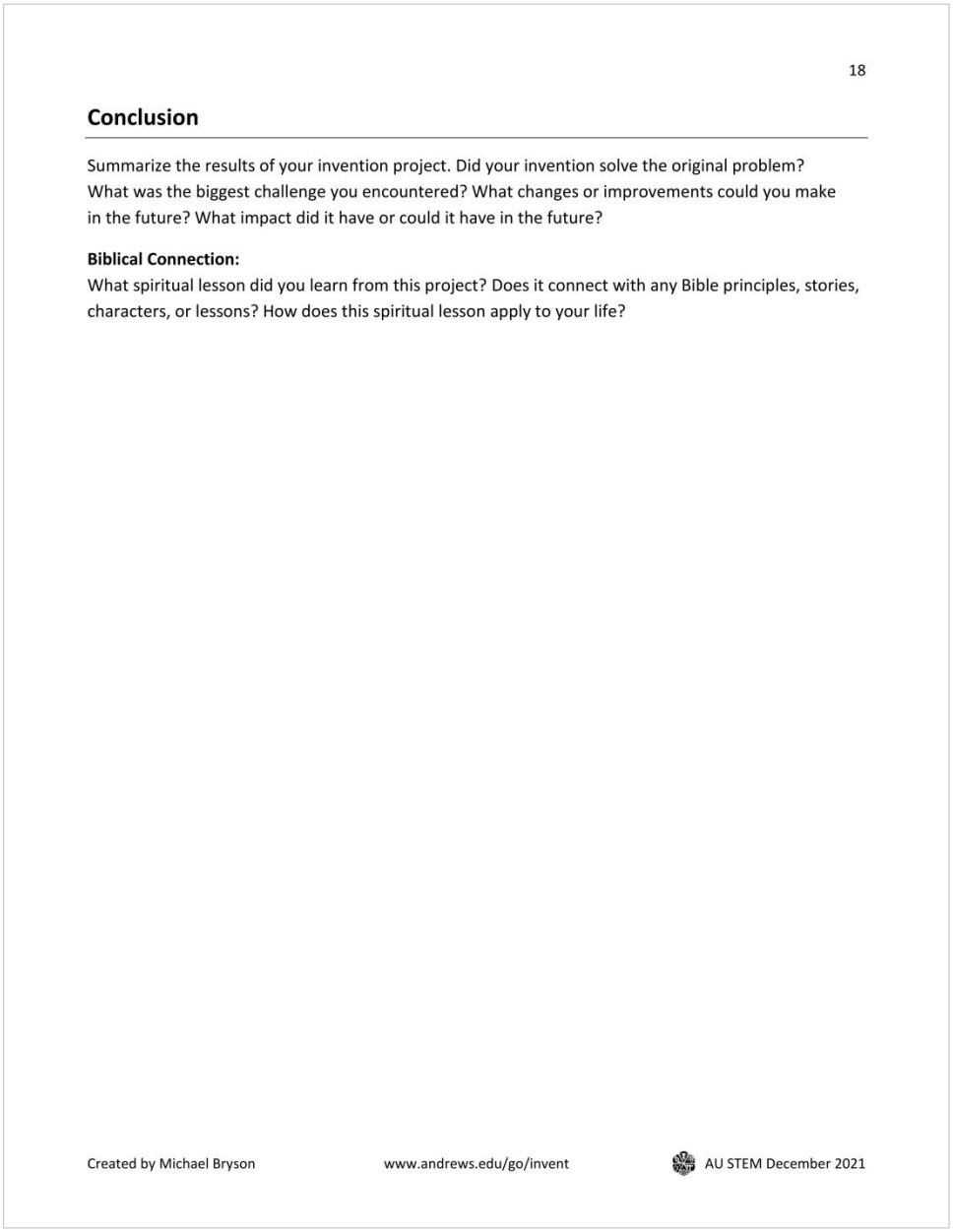
Conclusion

At the end of the project, each group will fill out the conclusion page to summarize what they did.

In the first section, the students will summarize their work.

The Biblical Connection relates their project to a Bible story, character, spiritual lesson, or anything from the Bible that connects in some way.

For examples, see the Biblical Connection section in the Teacher Resources on our website.



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Conclusion

Summarize the results of your invention project. Did your invention solve the original problem? What was the biggest challenge you encountered? What changes or improvements could you make in the future? What impact did it have or could it have in the future?

Biblical Connection:

What spiritual lesson did you learn from this project? Does it connect with any Bible principles, stories, characters, or lessons? How does this spiritual lesson apply to your life?

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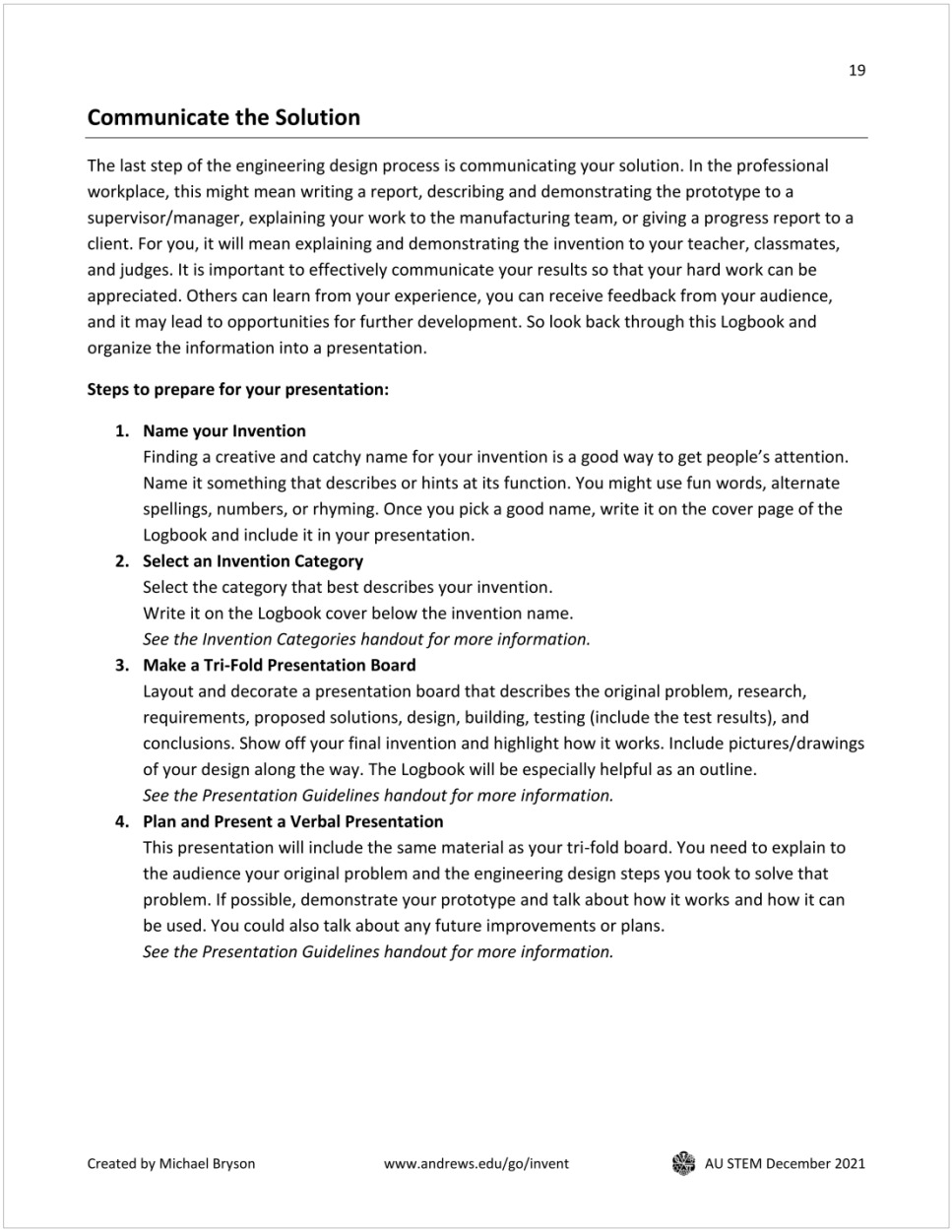
Communicate

Name the Invention:
After the students have finished their prototype, they can choose a catchy name that describes their invention and write it on the cover.

Invention Category:
The students will choose the appropriate invention category and write it on the cover below the name.
See the Invention Categories handout for more information.

Prepare to Present:
Each group will prepare a tri-fold presentation board and a verbal presentation about their project.

The tri-fold board will follow the engineering design process with one section for each step. The verbal presentation will cover the same material.
See the Presentation Guidelines handout for more information.



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Communicate the Solution

The last step of the engineering design process is communicating your solution. In the professional workplace, this might mean writing a report, describing and demonstrating the prototype to a supervisor/manager, explaining your work to the manufacturing team, or giving a progress report to a client. For you, it will mean explaining and demonstrating the invention to your teacher, classmates, and judges. It is important to effectively communicate your results so that your hard work can be appreciated. Others can learn from your experience, you can receive feedback from your audience, and it may lead to opportunities for further development. So look back through this Logbook and organize the information into a presentation.

Steps to prepare for your presentation:

1. **Name your Invention**
   Finding a creative and catchy name for your invention is a good way to get people's attention. Name it something that describes or hints at its function. You might use fun words, alternate spellings, numbers, or rhyming. Once you pick a good name, write it on the cover page of the Logbook and include it in your presentation.
2. **Select an Invention Category**
   Select the category that best describes your invention.
   Write it on the Logbook cover below the invention name.
   See the Invention Categories handout for more information.
3. **Make a Tri-Fold Presentation Board**
   Layout and decorate a presentation board that describes the original problem, research, requirements, proposed solutions, design, building, testing (include the test results), and conclusions. Show off your final invention and highlight how it works. Include pictures/drawings of your design along the way. The Logbook will be especially helpful as an outline.
   See the Presentation Guidelines handout for more information.
4. **Plan and Present a Verbal Presentation**
   This presentation will include the same material as your tri-fold board. You need to explain to the audience your original problem and the engineering design steps you took to solve that problem. If possible, demonstrate your prototype and talk about how it works and how it can be used. You could also talk about any future improvements or plans.
   See the Presentation Guidelines handout for more information.

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Sources

The students will keep a list of their research sources throughout the project. They should provide a brief citation where they used the information and a detailed citation here.

You can choose how they format the citations and what details to include, but at a minimum they need the name/title of the source and the location where they got it (book, website, interview, etc.).

The sources in this list will be from the Research step and any other time they researched information for the project.

Add pages as needed.