OHIO
Roadmap to Future Jobs & Prosperity
Mapping Your STEM Commercialization and Business Plan

Believe in OHIO Program

STEM Commercialization Plan & STEM Business Plan Competition

Standards for Plan Preparation, Competition Rules including Judging and Student Awards
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What is Believe in Ohio?
Believe in Ohio is a student entrepreneurship program to develop Ohio's next generation of STEM innovators. High school students will receive cash awards and scholarships to Ohio colleges and universities based on competitive STEM Commercialization or STEM Business Plans. We hope they will pursue their futures in Ohio by inventing products and services, creating jobs, paying taxes and contributing to society.

Our ultimate vision is that a student will develop a competitive STEM Commercialization or STEM Business Plan, receive a scholarship to an Ohio college or university, graduate and pursue his or her future in Ohio: be employed, create jobs, and contribute to society.

An Invitation for Ohio High School Students to Participate:
Believe in Ohio (BiO) is a free program developed by The Ohio Academy of Science and Entrepreneurial Engagement Ohio with support from The Ohio General Assembly and The Ohio Board of Regents. BiO prepares Ohio high school students for the future. It will 1) Introduce them to the “Innovation Economy of Ohio,” 2) Inspire them to pursue their STEM education and careers in Ohio, and 3) Encourage them to become one of the innovators and entrepreneurs Ohio needs to help develop new products, services and jobs.

While the Believe in Ohio program includes many components and activities, the centerpiece of the program is an Annual Student STEM Commercialization Plan and STEM Business Plan Competition to compete for hundreds of thousands of dollars in cash awards and scholarships to Ohio's colleges and universities. We invite all Ohio high school students to participate.

Perspective – Why This Program is Important:
America’s prosperity is the result of generations of innovators and entrepreneurs who developed the products, services, businesses and industries that have made the United States economy the largest in the world. Today, however, our state and nation are being challenged on an unprecedented basis to maintain their historic prosperity. We are living in an Innovation Age in which technology advancements and global competition point to a future where continuous innovation will cause every product, service, and aspect of life to be transformed and reinvented during the lifetimes of today’s students.
While many challenges are ahead, so will be the opportunities, but only if today's students rise to the occasion to become our country's next generation of innovators and entrepreneurs who create the new jobs and prosperity of the future. Thus, the purpose of the Believe in Ohio program is to:

• Open students' eyes to what they will experience in the future and learn how to prepare for it.

• Inspire students' interest in STEM where many of the best jobs and careers of the future will be.

• Plant in students the seed of entrepreneurship and help develop students' problem solving, critical thinking, collaboration and the other 21st Century skills they will need to create the future.

• Introduce students to Ohio's "Innovation Economy" and inspire them to pursue their STEM and entrepreneurial education and careers in Ohio.

• Recognize and award Ohio's high school students with cash awards and scholarships to Ohio colleges and universities through participation in the Believe in Ohio STEM Commercialization Plan and STEM Business Plan Competitions.

Who may participate in the statewide competition? Individuals and Teams

Students may work as individuals or in teams of up to four (4) members to compete for cash awards and scholarships. However, if a student team also wishes to participate in the local district and State Science Day Program sponsored by The Ohio Academy of Science, then the size of the team must be limited to three (3) students. Annually students may submit only one plan, either commercialization or business and either an individual or team plan.

All team members must be present for oral presentations to be eligible for competition at the State level. If, for some compelling reason, a team member cannot participate in person at the State level, then he or she must request in writing an excused absence to be shared with judges, to explain the reason for the anticipated absence and describe his or her contributions to the team effort. An absent member, except for accidents, illness or death in the family or among close relatives, will forfeit all rights to awards, scholarships and recognition. Teams are eligible for cash awards or scholarships with the value divided equally among team members.

The Ohio Academy of Science will retain scholarship funds for future distribution for those not needing the money in the year of the award. Subsequently, if the student does not attend an Ohio college or university, and enrolled in an out-of-state institution, the Academy will award $1,000 cash for educational expenses. Scholarships are stackable, that is, they may be accumulated each year for a maximum of four years.

Students in a STEM class or under a STEM teacher should enter the STEM Commercialization Plan competition, while students in a business, economics, marketing or entrepreneurship class or related teacher should enter the STEM Business Plan competition.

How will the competition work? Local, Regional and State

The STEM Plan Competition at the Local High School Level: Local competitions will be run by teachers who will apply standards, rules and grading and judging rubrics. Local judges will be recruited by the participating teachers. Believe in Ohio will provide funds for one or more $500 cash awards (depending upon how many STEM Plans are actually completed). Awards should be given to those students who have the highest scores in their local high school competitions, if each student awardee earns a score of at least 24 points. Students may work as individuals or in teams of up to four (4) members to compete for cash awards. However, if a student team also wishes to participate in the local district and State Science Day Program sponsored by The Ohio Academy of Science, then the size of the team must be limited to three (3) students.

Eligibility for participation in Believe in Ohio's regional and statewide Competition: All local plans with 36 points or greater may compete regionally. If this number is less than 25% of all local plans, then additional plans up to 25% may compete in the regional competition, provided all local plans submitted have a score of 24 or greater. Plans must be submitted/uploaded within 10 days after local judging ends but no later than the March deadline posted on the BiO website calendar, whichever comes first. Judging is blind. (i.e. School names and most other personal information will be unknown to judges). The top 20-25% of plans judged at this level will advance to compete at the statewide level. There are no awards at the regional level.

State level Believe in Ohio Competition: A third level of competition will be held at the state level by The Ohio Academy of Science with Academy judges applying the same rules and grading rubrics as used at the local high school and regional competition levels. Judging will be by a panel of judges at the statewide level and will include both an evaluation of the students' written plans submitted at the regional level as well as a short oral presentation (5 min) to judges followed by 10 minutes of questions from judges. The statewide competition for 9th, 10th, 11th, and 12th grade students will be in May at a date and location posted on the BiO website calendar.

Cash awards must be used for educationally-related expenses. Scholarship awardees are expected to major in a STEM discipline or major in business with a STEM minor. Prior year awardees are eligible to compete for cash awards and scholarships annually. The State competition will offer the following awards:

- $20,000 scholarships to any Ohio public or private college.
- $10,000 scholarships to any Ohio public or private college.
- $5,000 scholarships to any Ohio public or private college.
- Multiple cash awards for educationally related expenses.
Minimum grading requirements at the statewide competition level to receive a cash award or scholarship:

For a plan to receive any award at the statewide level, it must receive a judged score of at least 24 points. For a plan author to be awarded a scholarship to an Ohio college or university, his or her plan must receive a judged score of at least 32 points. This requirement protects the integrity of the highest level awards and ensures that they have distinguished themselves sufficiently to receive one of the top awards. Within each Plan judging category, students will be asked to designate what their STEM discipline is so as to aid in obtaining relevant judges. There are two plan categories: STEM Commercialization Plan and STEM Business Plan.

Commercialization Plan STEM discipline categories
1. Advanced Materials
2. Aerospace & Aviation
3. Agriculture, Food Technology & Bio-Products
4. Computer Science & Information Technology
6. Environmental Technology
7. Medical Devices, Products & Services
8. Cellular, Molecular, Genomic, Pharmaceutical & Regenerative Medicine
9. Sensing & Automation Technologies and Manufacturing

Business Plan STEM discipline categories
1. Biological/medical
2. Physical/engineering/computer/mathematical
3. Earth/space/environmental

STEM Plan Competition Grading and Judging Information

General grading and judging rules and instructions:
- First, the teacher of record must grade each student’s plan using the applicable standardized grading rubric, and assign each plan a score of 0–40. If a student receives a teacher grade of 19 or less, the plan shall be excluded from judging. Teachers should avoid wasting volunteer judge time by asking them to judge clearly substandard plans.
- Next, all plans with a teacher grade of 20 or higher should be judged locally by at least two judges who apply Believe in Ohio’s standardized grading rubric. Only plans that receive an average judged score of at least 24 grading points will be eligible to receive a cash award locally.
- Judges must use Believe in Ohio’s STEM Commercialization Plan Judging Card or scoring sheet if the student’s plan is a STEM Commercialization Plan, and STEM Business Plan Judging Card or scoring sheet if the student’s plan is a STEM Business Plan. These judging cards are the standardized rubric.
- While the students’ teacher of record must grade each plan applying the standardized grading rubric, the teacher of record cannot also be a judge of their students’ plans.
- Judges can include other teachers or members of the local STEM professional and business community.
- Judges evaluating STEM Commercialization Plans should have a science, technology, engineering or mathematics background.
- Judges evaluating STEM Business Plans should have a business background and a fundamental knowledge of science, technology, engineering or mathematics background.
- Given that judges are volunteers and that we do not want to overload them or else they may not volunteer again, we recommend that each judge be given no more than 6-8 plans to judge.
- Optimally, each plan should be judged by at least three judges, with an absolute minimum of two judges for each plan.

Instructions for teachers to record and report judging results to Believe in Ohio:
- When all grading and judging is completed, teachers must mail a copy of the cover page from all of the student plans that the teacher has graded to the Bio office to document how many total plans their students have completed.
- Believe in Ohio will use this information to determine the actual amount of each teacher’s program support grant and the actual amount of funding for competition awards at each high school.
- Mail (postmarked) within 10 days of the completion of local judging or the final plan submission deadline, whichever comes earlier.
- The following information must be written and marked on each submitted cover page copy:
  - The grade given to each plan by their teacher
  - For all those plans that have been judged, the judged score given by each judge
  - The median scores of all the individual judged scores.

Use the median, judged score to determine competition awardees locally and to select plans for regional competition.
What is a STEM Commercialization Plan?

The primary emphasis is on scientific, technological, engineering or mathematical proof of concept.

A STEM Commercialization Plan is a written document that describes how a new and/or an existing STEM concept, prototype, process, idea or technology (or a combination of multiple STEM concepts, processes, ideas or technologies) may be applied, or further developed to provide a solution to a marketplace or societal problem, need or opportunity. It will likely be the cross fertilization and application of concepts and research from the many new and evolving STEM disciplines where most new products, services and other market opportunities (and jobs) will develop.

A STEM Commercialization Plan essentially provides a written “science & technology proof of concept” to support an innovative product or service concept or idea. A STEM Commercialization Plan includes both a persuasive science and technology assessment and plan and a discussion of the concept’s likely commercial feasibility and viability.

What is a STEM Business Plan?

The primary emphasis is on a business and financial proof of concept.

A STEM Business Plan is a written document that describes how to apply a new or existing technology to create a new product or service or enhance an existing product or service with new features or capabilities that can be successfully developed into a real world business opportunity and “taken to market.” Thus, a STEM Business Plan provides a written “business & financial proof of concept” to support an innovative product or service that may be taken to market.

STEM Business Plans will be judged by business people with an understanding of STEM fields, as opposed to STEM academics, researchers and practitioners. As such, judges will be most interested in the quality of the student’s plans for taking their product to market, and secondarily, although importantly, in the student’s assessment of the viability of the science and technology supporting the product or service idea.

Basic Plan Preparation Instructions:

Your written plan shall not exceed 12 single-spaced, typewritten pages, minimum 10 point type with no additional attachments permitted. All plans must be typed. Hand written plans will not be accepted. Use 1” margins on all sides. Clear, concise writing is expected. Omit needless words. Proof carefully. Number all pages except for the cover sheet (which is page 1). If requested to provide an electronic version of your plan, you should use your last + first name as the file name like this (SmithCarol.pdf) and the file must contain the entire Plan in a single Adobe PDF file. (Note: Multiple files will not be accepted except for online submission for identification purposes.) Type all pages “flush left”. Do not justify paragraphs. You may use optional indentations for first lines of paragraphs. The plan may be single or up to 1.5-spaced. Please keep type size reasonable, at least 10 points; preferably, 12 points for better legibility except in tables or on graphs or drawings where font sizes may be smaller. We recommend 10, 11 or 12 point Times New Roman, Century Schoolbook, Arial, Calibri, Minion or Myriad Pro in the body of the report.

Judging of plans

All plans will be judged on weighted, common criteria or rubrics based on a 40 point scale similar but different from criteria used by The Ohio Academy of Science local, district and State Science Day judges. Plan grading rubrics are on the Believe in Ohio website at www.BelieveInOhio.org. Students are encouraged to review these grading rubrics before developing their plans so that they can see the basis upon which their plans will be judged. At least two judges will evaluate each plan at the local school level. Regional judging will endeavor to have three judges for each plan. State judging, limited to a 5 minute presentation and 10 minutes of questions from judges, will endeavor to have a panel of five judges for each plan.

Three common judging criteria will apply to either a STEM Commercialization or a STEM Business Plan: (1) Communication, (2) Commercial Feasibility and (3) STEM Concepts and Principles with 8 points each out of 40 points. A maximum of 16 points out of 40 may be earned for the Science and Technology Proof of Concept for a STEM Commercialization Plan. A maximum of 16 points out of 40 may be earned for the Business and Financial Proof of Concept for a STEM Business Plan.

Complete plan preparation instructions, comments and rules are on the Believe in Ohio website at: www.BelieveInOhio.org. Please read them carefully.
How to Navigate the Believe in Ohio STEM Commercialization Plan and STEM Business Plan Instructional Roadmap

Your Journey Will Reach 12 Mileposts.

MILEPOST “0” - GET READY FOR YOUR JOURNEY

STEP 1 – Determine if you will develop a STEM Commercialization Plan or a STEM Business Plan. The answer depends mainly on the subjects taught by your sponsoring teacher. Generally, complete a STEM Commercialization Plan if your supervising teacher teaches science, technology, engineering, mathematics or career technical subjects. Complete a STEM Business Plan if your teacher teaches business, economics, marketing or entrepreneurship.

STEP 2 – Read all the program materials and thoroughly explore the Believe in Ohio website to get a big picture understanding of what you are being asked to do. www.BelieveinOhio.org

STEP 3 – Use the “Roadmap to Ohio’s Future Jobs & Prosperity” as a brainstorming tool to help develop your plan.

• Use the “Roadmap to Ohio’s Future Jobs & Prosperity” provided by the Believe in Ohio program or reproduce that roadmap on a large sheet of paper or poster board, then tape or hang it on a wall.

• Use your Roadmap as a brainstorming tool by using Post-it® Notes to post your thoughts and findings to your Road Map. As you research and discuss your plan ideas with others, you will find that your ideas will evolve and you will likely make many course corrections, often called pivots.

• Continually keep revising your Post-it® notes until you are satisfied that your Plan idea is a commercializeable idea.

• Throughout your innovation “journey” if you come upon a term that you don’t know or understand, stop for a minute to determine the meaning and determine how it relates to your journey.

NOTE: Believe in Ohio’s “Road Map” is based loosely on the “Lean Canvas Business Model” developed by Ash Maurya (http://practicetrumpstheory.com/2012/02/why-lean-canvas/) that was adapted from the “Business Model Canvas” (http://www.businessmodelgeneration.com/canvas/bmc) by Alexander Osterwalder & Yves Pigneur, and is licensed under the Creative Commons Attribution-Share Alike 3.0 Un-ported License.

NOW, SET OUT ON YOUR JOURNEY

Milepost 1 – Problem Statement – Pain Point – Market Opportunity

Whether developing a STEM Commercialization Plan or a STEM Business Plan, often the hardest part about getting started is coming up with an idea for a Plan. The first step is to put your imagination to work. In brainstorming an idea, remember that innovation and entrepreneurship are about challenging the status quo and transforming or developing new products, services, and solutions to meet the changing needs, wants, and problems of society. Start by looking around you at needs that are not being fulfilled, problems that remain unsolved, and things that do not work. Then think about how technology developments have made possible or could make possible products, services, and solutions that simply were not possible before.

If you are a STEM student doing a STEM Commercialization Plan, think about how a new and/or an existing STEM technology concept (or a combination of multiple new or existing STEM technology concepts) may be applied, or further developed to create a commercializeable technology concept that might be applied to fill a marketplace need or solve a societal problem.

If you are business student doing a STEM Business Plan, think about how a new or existing technology can be applied to create a new product or service or enhance an existing product or service with new features or capabilities that can be successfully developed into a real world business opportunity and be “taken to market.”

In a few words note on one or more Post-it notes, the Problem(s), “Pain Points” or Market Opportunities that the plan will address. At all Mileposts you should focus generally on three or fewer problems, needs or opportunities.

Milepost 2 – What is Your Proposed Solution?

At Milepost 2, use Post-it notes to describe briefly your proposed solutions to the problem(s) and need(s) identified at Milepost 1.
The accelerating pace of technological change is the catalyst behind most of the innovation that will cause virtually every product, service, and aspect of life to be continuously transformed and reinvented during your lifetime. In that context, use your Post-it® notes at Milepost 3 to indicate the key science and technology concept(s) and advantages that you plan to address to address the problems and solutions you previously identified at Mileposts 1 and 2.

You can’t have a useful and economically sustainable product, service and market opportunity unless someone other than you actually will buy and use what you are planning to develop. Thus, at Milepost 4, note who you believe to be your target customer(s). While you are thinking about who your targeted customers are, consider the size of the market opportunity they represent. Would millions likely see value in or purchase your idea, or only a small group of people? At the same time, keep in mind the difference between who your customer might be and who the ultimate user will be. For example, if your idea is intended to be used by young children, the children will be the intended user while it will be their parents who will be the intended customer. At Milepost 4 note both your expected target customer(s) and intended user(s).

At Milepost 5, note who you expect your competitors will be. When considering the potential feasibility of a new idea, product, or service, you must know and understand your competitors. Both are important because you need to know what your idea, product, or service will be competing against and because we learn from competitors.

At Milepost 6, note what you believe is the customer value proposition and competitive advantage your plan offers. Describe the “Consumer Value Proposition” your solution offers. Stated another way, unless your target customer perceives value in your idea, it won’t go far. In the real world you would do research to try to answer this question. Describe what you see as the “competitive advantage” your proposed solution has over other potential solutions to the problem/pain point/market opportunity that your plan addresses. Generally, some form of cost advantage or differentiated features or benefits gives your problem solution a competitive advantage.

At Milepost 7 note what revenue sources and the potential size of those revenue streams that your venture would anticipate receiving. Now that you have noted the customers and competitors and what customer value proposition or competitive advantages your solution offers, identify what revenue streams you expect such as: product sales through middleman wholesalers or direct to customers, fees for services performed, subscription fees, usage fees, advertising revenues, lease income, license fees, franchise fees, etc.

At Milepost 8, consider what kind of startup and operating costs you would expect to incur. These costs will be determined in part based on all the matters you considered at Mileposts 1 - 7. To what extent will costs incur for ongoing research and development or for the development of potential prototypes and testing? Will you manufacture a product yourself, or outsource production? What staff will be needed to bring your plan idea(s) to fruition? You will find that all of the issues discussed earlier at Mileposts 1 - 7 and at this Milepost 8 trade off against one another.

Stop! – Traffic Light – In Your Opinion Does Your Solution and Plan Make Commercial Sense?

- If NOT - Then start again at Milepost 1 and repeat until you are satisfied that your solution makes commercial sense
- If YES – Write your Plan by following through on Mileposts 9 -12.

Challenge your plan to determine if it makes commercial sense. Why? It makes no sense to invest time, energy and resources to pursue an idea that a pragmatic assessment concludes won’t fly. Better to go in another direction.

Talk to any business incubator or accelerator and they will tell you, that it is rare if ever that someone’s first idea is the one that they move forward. Instead, what happens is that the entrepreneur or innovator takes to heart what they learn from their research and discussions with others and decides to make course corrections, or pivots. It is not uncommon for a new idea to pivot 5-6 or more times before it is ready to advance.
OHIO Roadmap to Future Jobs & Prosperity

STEM Commercialization Plan & STEM Business Plan Instructional Roadmap

In the spaces for (Mileposts 1-8), use Post-it® Notes to sketch out your thoughts. As you obtain more information and evolve your thoughts and ideas, continually revise this section until your overall assessment is that your idea is commercializable.

Prepare an Executive Summary and Elevator Pitch of Your Entire Plan (250 words or fewer)

An Executive Summary of 250 words or fewer provides a concise summary of your plan. It should include:

- Your proposed marketing, sales, and pricing strategies to bring your new product, service or other concept idea to market.
- How you will operationally develop and make your product, service or other concept idea into a tangible commercial venture.
- The most significant risks and uncertainties you expect to face in bringing your new product, service or other concept idea to market.
- The amount and type of investment you believe will be required to bring your new product, service or other concept idea to market.
- The most important assumptions you expect to be true in bringing your new product, service or other concept idea to market.
- Your proposed solution.
- Your review and assessment of the scientific literature related to your idea. What does the scientific community already know in this field?
- Your written statement of a single, clear and compelling (1) testable hypothesis or (2) engineering design.
- Your proposed marketing, sales and pricing strategies to bring your new product, service or other concept idea to market.
- A description of any prototypes and models that you create (including computer and other drawings or photos, sketches, engineering or other drawings or photos of models or prototypes).
- An inquiry or design-based discussion rather than simply a summary of knowledge. Your writing should include:
  - A description of your findings with relevant, references cited within the text that you will include in a list of cited references at the end of your Plan. There must be a 1:1 concordance between in-text citations and references.

Your entire written plan may not exceed 12 pages including the cover sheet, Mileposts 9–12, data tables, graphs, charts, sketches, engineering drawings, photos, cited references and financial schedule (if doing a STEM Business Plan).
Services, jobs and prosperity of the future!

Consider becoming one of the Innovators and entrepreneurs.

Complete and review your Ohio Roadmap to Future Jobs & Prosperity (STEM Business Plan).

- What is the Customer Value Proposition and Competitive Advantage?
- What Revenue Streams Do You Expect?
- What Startup and Operating Costs Do You Expect to Incur?
- Does Your Assessment of Mileposts 1-8 Make Commercial Sense?
- If No, Start Again at Milepost 1 and Repeat Until You Are Satisfied Your Solution Makes Commercial Sense.
- If Yes, Write Your Plan by Following the Mileposts Below.

MILEPOST 1
Opportunity

MILEPOST 2
Problem, Pain Point or Market Opportunity

MILEPOST 3
Are Your Concepts and Principles Underlying Your Solutions?

MILEPOST 4
What is Your Proposed Solution?

MILEPOST 5
Who Are Your Target Customers/Competitors?

MILEPOST 6
What is Your Customer Value Proposition?

MILEPOST 7
What is Your Proposed Marketing, Sales and Pricing Strategies?

MILEPOST 8
Who Are Your Principal Revenue Streams?

MILEPOST 9
Does Your Solution Make Commercial Sense?

MILEPOST 10
Summarize in Writing Your Commercialization Assessment of Your Plan
(Based on your findings at Mileposts 1-2 and 4-8)

Summarize your conclusions as to the commercial feasibility of your Plan. Include a discussion of the following:

- The problem, pain point or market opportunity you seek to address.
- Your proposed solution.
- Who your target customer(s) are.
- Why your intended users are, and how they may be different from your customers.
- Why your competitors are not or what barriers you expect to overcome with them.
- What your customer value proposition is, and what competitive advantage your solution offers.
- What principal revenue streams you foresee generating.
- What significant startup and operating costs you expect the development of your venture will require.
- Your overall assessment of the commercial feasibility of your Plan.

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**Milepost 9 – Summarize The STEM Concepts and Principles Underlying Your Solutions**

(500 words or fewer. Based on Milepost 3)

If your idea is based largely on existing or developed science that has not previously been applied in the way you propose, discuss how that science provides a feasible basis for your product, service or other concept idea. Also discuss what additional scientific research or development may be required to bring your concept or idea to completion.

**Milepost 10 – Summarize in Writing Your Commercialization Assessment of Your Plan**

(Based on your findings at Mileposts 1-2 and 4-8)

Summarize your conclusions as to the commercial feasibility of your Plan. Include a discussion of the following:

- The problem, pain point or market opportunity you seek to address.
- Your proposed solution.
- Who your target customer(s) are.
- Who your intended users are, and how they may be different from your customers.
- Who your competitors are and on what basis you expect to compete with them?
- What your customer value proposition is and what competitive advantage your solution offers.
- What principal revenue streams you foresee generating.
- What significant startup and operating costs you expect the development of your venture will require.
- Your overall assessment of the commercial feasibility of your Plan.

**Milepost 11A – If a STEM Commercialization Plan, Develop a Science and Technology Proof of Concept**

This section provides an assessment of the science and technology concepts and principles underlying your proposed idea and provides a proof of concept for the feasibility of the idea. Your discussion should include:

- Your review and assessment of the scientific literature related to your idea. What does the scientific community already know that is relevant to your idea? You do not need to summarize every paper in the field.
- Your statement of a single, clear and compelling (1) testable hypothesis or (2) engineering design.
- An inquiry or design-based discussion rather than simply a summary of knowledge. Your writing should include a discussion of any prototypes and models that you create (including computer and mathematical models) with strong data analyses. Discuss additional research, design or analyses that should be done.
- Data tables, graphs, sketches, engineering or other drawings or photos of prototypes or models, and cited references.
- A description of your findings with relevant, references cited within the text that you will include in a list of cited references at the end of your Plan. There must be a 1:1 concordance between in-text citations and references.

**Milepost 11B – If a STEM Business Plan, Develop a Business and Financial Proof of Concept**

The purpose of this section is to provide an assessment of the business and financial feasibility of your proposed business venture, which effectively provides a proof of concept for your idea. Your discussion should include:

- Your proposed marketing, sales and pricing strategies to bring your new product, service or other concept idea to market.
- How you will operationally develop and make your product, service or other concept idea into a tangible commercial venture.
- The most significant risks and uncertainties you expect to face in bringing your new product, service or other concept idea to market.
- The amount and type of investment you believe will be required to bring your new product, service or other concept idea to market.
- A three year financial projection that confirms the financial feasibility of bringing your new product, service or other concept idea to market on a sustainable basis. Access the financial template at: [http://www.believeinohio.org/student-tools](http://www.believeinohio.org/student-tools).
- A description of your findings with relevant, references cited within the text that you will include in a list of cited references at the end of your Plan. There must be a 1:1 concordance between in-text citations and references.

**Milepost 12 – Prepare an Executive Summary and Elevator Pitch of Your Entire Plan**

An Executive Summary of 250 words or fewer provides a concise summary of your plan. The Executive Summary must be written in a manner that a person, who may not be familiar with the topic, can understand your plan’s important points. An Elevator Pitch is a three or fewer sentence summary of your entire plan.
Complete and review your plan, include the prescribed cover page and appropriate student contact information sheets, then submit it for competition.

**Some additional thoughts to consider as you complete and review your plan:**

- Review your plan carefully before turning it in to your teacher.
- Write and re-write your plan until you have what you believe to be a professional presentation of your ideas.
- You may have the best idea in the world but it may go unnoticed if not presented professionally.
- Carefully review your plan for good grammar, correct spelling, proper punctuation and its overall appearance.
- Be sure to acknowledge those who helped you and tell exactly what they did.
- Best practice for writing a scientific research paper, such as a STEM Commercialization Plan, requires that references be cited within the text and that there be a 1:1 concordance between in-text citations and the list of cited references at the end of the plan.
- While best practice for citing references within a business plan is less specific and may not take the form of in-text citations, students must document and show attribution for the ideas of others within their business plans.
- Make sure you cite references in text like these examples: Smith (1993) or (Smith 1993).
- List cited references from the text alphabetically by last name at the end of the plan.
- Complete citation information only for literature or sources actually cited in your plan.
- Please do not use footnotes in the body of your plan.
- Do not use the term “Bibliography” to refer to a list of cited references. They are two different things.

**ADDITIONAL NOTES**

**Originality, attribution, and plagiarism:** Although always hoped for, it is not required that student participants make scientific breakthroughs or develop products or services that are previously unheard of in the marketplace as a result of their participation in this program. Indeed, most students will probably evolve an existing project, prototype, idea, process or concept for use in some new or different application. What students must understand, however, is that they must fully document and show attribution for the ideas of others by citing the sources of ideas or background statements **within their plan document.**

**In-text citation is required for both STEM Commercialization and STEM Business plans.** **Best practice for writing a scientific research paper, such as a STEM Commercialization Plan, requires that references be cited within the text and that there be a 1:1 concordance between in-text citations and the list of cited references at the end of the plan. The safest way to avoid plagiarism is to cite all references within the text.**

Here is an excerpt from an actual student plan showing in-text citations and 1:1 concordance with full references.

Natural biological systems and structures are often soft and adaptive in design; however, for many years researchers have been trying to imitate these useful structures by means of traditional electrically powered motors and rigid supports (Majidi, 2014). With the introduction of soft robotics, however, researchers can more closely mimic the qualities of the naturally occurring soft and adaptive biological systems and structures found in any number of organisms, including humans (Majidi, 2014). Soft robotics now enables researchers to create continuously distributed actuation in a manipulator, such as the continuous curvature found in nature as elephant trunks or octopus tentacles (Lipson, 2014). This continuous structure can be applied to robot manipulators with versatile and dexterous results (Trimmer, 2014).


**Codes of ethics**

Many businesses and engineering societies have codes of ethics that should be considered and followed. For example, search Google for ASME code of ethics of engineers. See also this link to On Being a Scientist that may be downloaded free from the National Academy of Science: [http://www.nap.edu/catalog.php?record_id=12192](http://www.nap.edu/catalog.php?record_id=12192).

**Special circumstances**

At all levels (local school, regional and State) of participation and competition, research plans and certain special protocols must be approved in advance if any experimentation, student research or engineering design projects involve one or more of the following: 1) Human subjects, 2) Non–human vertebrate animals including observation projects, 3) Potentially hazardous biological agents, including microorganisms, recombinant DNA technologies, or human or animal fresh tissues, blood or body fluids, 4) Controlled substances and alcohol and tobacco, and 5) Hazardous substances or devices including certain chemicals, equipment, firearms, radioactive substances and radiation.

In these situations, search “International rules for pre-college science research” for forms and procedures to apply. These rules require
adherence to special student research protocols and supervision, including prior approval of student research and engineering design projects by local scientific review committees (SRCs), or, in the case of human subjects, institutional review boards (IRBs). Local schools must appoint and manage these committees.

Depending upon the project(s), committee members of SRCs must have sufficient professional expertise by way of education and experience to review both human subjects and non-human vertebrate projects. IRB board members must have appropriate psychological or social science backgrounds.

Participation in science days or science fairs: Similarly, if you enter a local science day leading to multi-county districts and State Science Days, all protocols above and additional rules must be followed as described in the Academy’s Science Day Standards posted here: [http://www.ohiosci.org/s/SSD-standards.pdf](http://www.ohiosci.org/s/SSD-standards.pdf).

**Patent, intellectual property and publication understandings**

Once a student(s) submits a plan for grading/judging locally, they are making a public disclosure of their ideas, concepts, research, etc. and therefore they retain no proprietary interest in those ideas, concepts, research findings or results, etc. unless they have made an appropriate patent or intellectual property filing to protect their interests prior to submitting their plan for review. (Any student/parent interested in protecting their intellectual property rights should consult an attorney for appropriate advice.)

Notwithstanding the above, it should be clearly understood by all Believe in Ohio participants that all teachers, mentors, judges, and any other people in any way connected with the Believe in Ohio program, The Ohio Academy of Science, Entrepreneurial Engagement Ohio, the Ohio Board of Regents or any other person involved with the Believe in Ohio program in any capacity are under no duty whatsoever to maintain the confidentially of any concepts, ideas, or research included in any plan submitted for review and judging.

Additionally, the student acknowledges that any plan that they submit may be published or publicized, in whole or in part, along with their name by the Believe in Ohio Program, The Ohio Academy of Science and related organizations, particularly if their plan is chosen as an awardee in the Believe in Ohio plan competitions.

Review video lectures and other background information about these topics on the Believe in Ohio website, [www.BelieveinOhio.org](http://www.BelieveinOhio.org).

**Team Projects**

Believe in Ohio students may work as individuals or in teams of up to four (4) members to compete for awards and scholarships. All team members must be present for oral presentations to be eligible for competition at the State level. If, for some compelling reason, a team member cannot participate in person at the State level, then he or she must request in writing an excused absence to be shared with judges, to explain the reason for the anticipated absence and describe his or her contributions to the team effort. By not participating in judging, an absent member, except for accidents, illness or death in the family or among close relatives, will forfeit all rights to awards, scholarships and recognition.

Teams are eligible for cash awards or scholarships, the value of which will be divided equally among team members.

**Scholarship Awardees**

The Ohio Academy of Science will retain scholarship funds for future distribution for those not needing the money in the year of the award. Subsequently, if the student does not attend an Ohio college or university, and enrolls in an out-of-state institution, the Academy will award $1,000 cash for educational expenses. Scholarships are stackable from the Academy’s perspective, that is, they may be accumulated each year for a maximum of four years. However, consult your preferred college’s financial aid office to determine the impact of Believe in Ohio scholarships on any financial aid package offered by the college.

**Prototypes, Models, Drawings or Sketches**

Prototypes or models and their testing are expected within reason in that both time and cost may prohibit their full development. At a minimum, however, well-labeled, scaled and described engineering or other drawings or 3-D sketches are required. Use a CAD program or Google SketchUp available free at [http://www.sketchup.com](http://www.sketchup.com).

**Apps**

Students proposing “apps” must describe the functions in detail. Validation of an idea for an app idea means that students must provide a schematic or flow chart with symbols portraying how the user will navigate the app as well as all the features envisioned. Snippets of source code or working prototype even with limited functionality will enhance a plan and should be included to demonstrate a student’s computer science general knowledge and skills.

**Carryover Projects not permitted**

Although ideas may be spin-offs of previous work, Believe in Ohio competitions do not permit carryover projects. New ideas must be generated in subsequent years. Students must discuss briefly the previous idea if the new idea is related to a previous project.

Always search and if used, cite sources discovered on these Google portals:


These resources will help you avoid duplicating existing projects, prototypes, ideas or concepts. They also can stimulate thinking about new designs that do not exist.

Consult your school librarian and the reference librarian at the local public or college library for access to professional STEM literature from scientific and engineering journals.
Expectations of plan report: Reports must be typed. Clear and concise writing is expected. Please avoid using personal pronouns in the text. Do not use cute project titles. Title MUST reflect the contents of the report. Edit text sharply removing needless words and proof carefully. Expect to write numerous drafts. Number all pages except for the cover sheet (which is page 1). If requested, electronic versions (use your last + first name as the file name (e.g. SmithCarol.pdf)) must contain the entire report in a single Adobe PDF file for regional or State competition.

Format of report: The written report shall not exceed 12 single-spaced, typewritten pages. Reports may be single or 1.5-spaced. Type all pages "flush left." Do not justify paragraphs. Optional indentations for first lines of paragraphs. Please keep type size reasonable, at least 10 points; preferably 12 points for better legibility except in tables or on graphs, sketches or engineering drawings. We recommend 10, 11 or 12 point Times New Roman, Century Schoolbook, Arial, Calibri or Myriad Pro.

NOTE: Reports generally follow the Ohio Roadmap to Future Jobs and Prosperity. Report must include and follow section headings, below, but do not break pages between headings. Section headings (Parts) need not be numbered. Type continuously, starting on page 2 immediately (on the same page) following the Executive Summary.

Part 1. Cover Sheet with Elevator Pitch (Three sentences maximum.) must not exceed one page with 1” margins on all sides.

SAMPLE FORMAT FOR COVER SHEET
Type all flush left, ragged right; do not justify. Do not type line instructions.

Line 1 Type your full name: Ms. Carol A. Smith
Line 2 Type your current grade level: 11
Lines 3-4 Type your project title in italics: A substitute for steel to reduce... 
Line 5 judging category: Advanced Materials 
Line 6 commercialization or business commercialization
Line 7 leave blank
Lines 8-10 or as needed within balance of Cover Sheet: Elevator pitch (3 or fewer sentences)

Part 2. Executive Summary (250 or fewer words) (Milepost 12). Type continuously.

Part 3. Problem Statement and Proposed Solution (Mileposts 1 and 2)

Part 4. Summary of STEM Concepts and Principles Underlying the Overall Plan (500 or fewer words) (Milepost 9) (This discussion should be based on your findings under Milepost 3.)

Part 5. Commercialization Assessment of the Overall Plan (Milepost 10). Your discussion should be based upon your findings under Mileposts 1-2 and 4-8. (Note: Milepost 3 should be separately discussed under the preceding Part 4.)

Part 6. Science and Technology Proof of Concept (Milepost 11B) including statement of a single, clear and compelling (1) testable hypothesis or (2) engineering design. For clarity, follow discussion points under Milepost 11B. (This is Part 6 for students doing a STEM Commercialization Plan)

or


Part 7. Acknowledgements

Part 8. References Cited must be in 1:1 concordance with references cited in text. Web references must cite accessed date and fully retrievable URL.
STEM COMMERCIALIZATION PLAN JUDGING CRITERIA

POINTS    BULLETS OR NUMBERS DO NOT HAVE A PRE-DETERMINED NUMERICAL VALUE.

1. COMMUNICATION: Overall quality of the full Plan including the Elevator Pitch and Executive Summary and any Posters and PowerPoint presentations that may be used in presentation (8 points maximum)
   • An “Elevator Pitch” is a 1-3 sentence pitch that indicates what the product/service is, who the customer is & what the benefits are.
   • How concise yet well thought through, understandable and compelling is the written STEM Plan?
   • Assess the Plan's (and oral presentation, if given) overall quality of organization and writing including logic of data analyses and arguments, appropriate graphics, grammar, spelling and professional appearance.
   • Use of an unambiguous scientific/technical title that describes the product, service, or process; not a marketing brand name, per se, but a title that enables a person to know what it is or what it purports to do.
   • Relevance of contemporary, cited literature or references; extent of scientific, engineering or medical journals, society technical reports/sources etc., as compared to just popular literature citations or web only sources.

2. COMMERCIAL FEASIBILITY (8 points maximum)
   • How well thought through and developed, understandable and compelling is the student's assessment of the commercial feasibility of their concept or idea?
   • Have they clearly defined the problem, pain point and/or market opportunity and their proposed solution?
   • Have they clearly defined who their target customers and intended users are, the nature of competition and the consumer value proposition and competitive advantage that their Plan proposes?
   • Does the Plan's feasibility analysis reflect a reasonable understanding of the expected revenues (and revenue sources) and costs that they expect to occur?

3. STEM CONCEPTS AND PRINCIPLES (8 points maximum)
   • How well thought through and developed, understandable and compelling is the student's summary of the fundamental, salient STEM concepts, principles or processes upon which the product or service is based.
   • Does the student clearly understand the basic principles upon which his or her commercialization concept is based?

4. SCIENCE AND TECHNOLOGY PROOF OF CONCEPT (16 points maximum)
   • Does the Plan include a background or introductory description of the scientific literature related to their idea? Does the Plan include a quality discussion about what the scientific community already knows that is relevant to the Plan concept?
   • Does the Plan include a description of findings with relevant, cited references included and a list of cited references at the end of the Plan?
   • Does the Plan include a statement of a single, clear and compelling (1) testable hypothesis or (2) engineering design?
   • Does the Plan include an inquiry or design-based discussion rather than simply a summary of knowledge?
   • If the Plan includes a discussion of prototypes and models that they may have created, is their use relevant & supported with strong data analyses?
   • Does the Plan discuss additional research, design or analysis that should be done?
   • Does the Plan include appropriate data tables, graphs, charts, sketches, engineering drawings or photos of prototypes or models?

TOTAL POINTS

JUDGE’S Printed Name ______________________________________ Signature _______________________________________________________

JUDGES MUST ADD COMMENTS ON BACK: Please add your comments about the project. Students especially look for constructive criticism to improve the project for the future.
# STEM BUSINESS PLAN JUDGING CRITERIA

**POINTS**  
**BULLETS DO NOT HAVE A PRE-DETERMINED NUMERICAL VALUE.**

### 1. COMMUNICATION:  Overall quality of the full Plan including the Elevator Pitch and Executive Summary and any Posters and PowerPoint presentations that may be used in presentation (8 points maximum)

- An “Elevator Pitch” is a 1-3 sentence pitch that indicates what the product/service is, who the customer is & what the benefits are.
- How concise yet well thought through, understandable and compelling is the written STEM Plan?
- Assess the Plan’s (and oral presentation, if given) overall quality of organization and writing including logic of data analyses and arguments, appropriate graphics, grammar, spelling and professional appearance.
- Use of an unambiguous scientific/technical title that describes the product, service, or process; not a marketing brand name, **per se**, but a title that enables a person to know what it is or what it purports to do.
- Relevance of contemporary, cited literature or references; extent of scientific, engineering or medical journals, society technical reports/sources etc., as compared to just popular literature citations or web only sources.

### 2. COMMERCIAL FEASIBILITY (8 points maximum)

- How well thought through and developed, understandable and compelling is the student’s assessment of the commercial feasibility of their concept or idea?
- Have they clearly defined the problem, pain point and/or market opportunity and their proposed solution?
- Have they clearly defined who their target customers and intended users are, the nature of competition and the consumer value proposition and competitive advantage that their Plan proposes?
- Does the Plan’s feasibility analysis reflect a reasonable understanding of the expected revenues (and revenue sources) and costs that they expect to occur?

### 3. STEM CONCEPTS AND PRINCIPLES (8 points maximum)

- How well thought through and developed, understandable and compelling is the student’s summary of the fundamental, salient STEM concepts, principles or processes upon which the product or service is based.
- Does the student clearly understand the basic principles upon which his or her commercialization concept is based?

### 4. BUSINESS AND FINANCIAL PROOF OF CONCEPT (16 points maximum)

- Does the Plan include a quality discussion of its proposed marketing, sales and pricing strategy to bring the new product, service or other concept idea to market?
- Does the Plan include a quality discussion of how they would operationally go about developing and making their product, service or other concept idea into a tangible commercial opportunity?
- Does the Plan include a quality discussion about the significant risks and uncertainties they would most likely face in bringing their new product, service or other concept idea to market?
- Does the Plan include a quality discussion about the amount and types of startup costs and investment they believe would be required to bring their new product, service or other concept idea to market?
- Does the Plan include a reasonable three year summarized financial projection that bears out the financial feasibility of bringing their new product, service or other concept idea to market on a sustainable basis?

### TOTAL POINTS
What is STEM Education?

STEM education is both the mastery and integration of Science, Technology, Engineering and Mathematics for all PK-12 students. It incorporates scientific inquiry and technological design through student-focused, project based curricula to develop skills of communication, teamwork/collaboration, creativity/innovation, critical thinking, and problem solving.

What is the common element between local, district and State Science Day projects and a Believe in Ohio STEM Commercialization Project?

A single, clear and compelling
(1) testable hypothesis
or
(2) engineering design statement