YIPLit: LITERATURE & INVENTION TOGETHER EDUCATOR GUIDE

Welcome to the Robert H. Rines Young Inventors' Program at the UNH Leitzel Center. The Young Inventors' Program (YIP), is a cutting-edge, K-12 project-based learning experience that provides hands-on STEM enrichment opportunities. Through the YIP, you will set your students on a course to shape an innovative future. Our resources help you guide students through the invention process to solve problems while applying STEM learning and gaining 21st century skills. The program takes learners on a path to showcase their original inventions that runs from their school/local invention fair all the way to national and international competitions. More than 5,000 K-12 inventors across Northern New England participate in YIP annually.

Our Mission

The mission of the Young Inventors' Program is to provide programs, pathways, and information to develop the intellectual capacity, critical thinking, creativity, and problem-solving abilities of all students so that they may become contributing, and forward-thinking members of the science, technology, engineering, mathematics (STEM), and the invention community.

Young Inventors' Program & Invention Education

Students are at the center of the Young Inventors' Program. We are unique among similar programs in that students pick the problem that they wish to solve. While we offer challenges and special categories, the heart of our program is imagination — the spark of creativity and innovation in every young person.

Invention education develops important 21st century learning skills through the process of identifying real problems and applying empathy, creativity, and design to create new solutions. Thinking skills are important in all fields of endeavor. In the invention process, they are essential. Creative thinking allows an inventor to generate new insights, strategies, and solutions. Critical thinking allows an inventor to sort through a potentially overwhelming collection of ideas and identify those that have promise. Problem solving encourages students to ask open-ended questions, categorize and classify information, find patterns, and make decisions. Collaboration requires students to work together toward a common goal. All are essential tools in life, and all are addressed by YIP.

YIPLit: Literature & Invention Together

YIPLit introduces invention to K-2 students specifically, using children's literature as the foundation of this invention unit. Our youngest inventors develop critical 21st century skills as they explore the process of design thinking to develop and create their own unique invention idea through hands-on activities based on

a theme book. The unit culminates with a capstone project, an invention fair, to showcase their learning and achievements.

Resources and Materials

YIPLit materials are adaptable to all learning environments. We designed it to be easy to implement, flexible enough to meet diverse student needs, applicable to a broad range of disciplines and most important, accessible to anyone. Educators and group leaders with and without STEM expertise can use the modules to introduce fun activities and teachable units.

YIPLit requires few supplies and many of the materials used are those that can be found at home or in school. Specific curriculum resources are provided by the program and are accessible electronically on the YIP website (https://www.unh.edu/leitzel-center/young-inventors-program) and may be ordered in a YIPLit Pack which can be delivered to your site. Each lesson plan includes a list of the materials needed to complete the lesson and any included activities. Access to videos and photos for activities are provided in Google Slides that accompany each lesson and links are provided for alternative access.

Invention is about creativity and resourcefulness. Our young inventors are not only creative in their invention ideas, but also in the materials they use to build their prototypes. They are encouraged to build models that are "materials neutral", meaning they can be made of reused and recycled materials and the overall product should not require money. If a student or their program site would like to purchase materials, they may, but the total cost of a project may not exceed $50. YIP provides limited funds to support program supplies.

In addition to the curriculum and supporting content, YIP provides sites with:

- YIPLit Inventors' Journals (hardcopies or electronic format to be downloaded)
- Awards Medals
- Participation and Awards Certificates (hardcopies or electronic format to be downloaded)
- Professional development and networking opportunities
- Engaging events at local, regional and national levels

Virtual Instruction

In recent years we have learned to pivot our educational instruction in response to health and public safety concerns. YIP is at the forefront of adapting quickly to deliver content and programming to educators and students in virtual, hybrid, and in-person formats. Each lesson plan includes recommendations for virtual instruction so that all students, no matter where they are learning, can engage in the invention process. And educators can shift rapidly to meet ever changing requirements and protocols that may arise during their YIP program.

Competitions

The Young Inventors' Program celebrates all inventors wherever they are inventing. In Northern New England, we offer opportunities for students to showcase their projects, meet other young inventors, and celebrate each other's accomplishments. These local, regional, national and international events allow students to progress to higher levels of competition. All YIPLit participants who complete an invention project and have the required materials are eligible for all levels of competition and are encouraged to participate in these events.

Schools and organizations are encouraged to host their own showcase event which may be competitive or not. These fairs allow students to show off their achievements and display their unique inventions with peers, families and the community. In the process, students continue to develop valuable communication and presentation skills and more importantly, self-confidence. In order to be eligible for regional and national competitions, students must be nominated by their lead educator for an invitation to participate. School/Local Fairs are a way to assist with this nomination process. Nominations for the Northern New England Invention Convention are usually due in late February, so it is recommended that school/local fairs take place before then.

The capstone event for the Young Inventors' Program is the Northern New England Invention Convention (NNE-IC). Students from New Hampshire, Massachusetts, Vermont and beyond showcase their projects and celebrate together with the UNH partners, board, and volunteers. The NNE-IC typically takes place in late March/early April, and nominations are due in late February.

Students who compete at the Northern New England Invention Convention may then be selected for an invitation to the Invention Convention US Nationals, hosted by Invention Convention Worldwide and The Henry Ford in Dearborn, MI. The Invention Convention North Americas, also hosted by Invention Convention Worldwide and The Henry Ford, is the final step in the invention journey as selected students from the US Nationals may be invited to participate.

Invention Projects

Teams

Many project-based learning opportunities emphasize the development of 21st Century skills including collaboration, communication, social skills, and teamwork. Educators may choose to allow team projects or not. YIP encourages collaboration and welcomes teams to invent. Students may work in pairs or groups and students in a group do not have be in the same grade (they will compete in the grade level of the highest grade). All team members must participate in the development of the invention and should keep their own YIP Inventor's Journal or invention logbook.

*Please note that for the Northern New England Invention Convention and the Invention Convention US Nationals, only teams of two (2) students are allowed to present. If a team is larger, two students may be selected to represent the team at these competitions.

Please read more about Teams under the Rules of Competition.

Participation Requirements:

All YIPLit students are encouraged to produce the following materials to complete an invention project, however each site may establish their own expectations and requirements as needed. If students would like to be eligible to present their inventions at the Northern New England Invention Convention and the Invention Convention US Nationals, they must have:

- Inventor's Journal
- Tri-fold poster display
- A 3-6 minute oral presentation in which they present their project
- A 3-6 minute video of their presentation for review for originality
- Not required, but recommended: a model or prototype (working or non-working) of their invention

Please read more about the expectations for each of the above materials under Rules of Competition.

Rules of Competition

The following rules have been established for the Northern New England Invention Convention and the Invention Convention US Nationals. Individual YIP site may adjust and revise these rules as appropriate.

Teams:

- Only two students are allowed per Invention Team. Students do not have to be from the same grade.
- All team members must take part in the team presentation.
- All team members should keep their own YIP Inventor's Journal or invention logbook. *Note: logbooks are required materials for the regional and national competitions.*
- Each student can enter only one project for the School/Local Invention Fair, the Northern New England Regional Invention Convention, and the Invention Convention US Nationals. No student can enter both an individual and a team project.
- Teams will compete against individuals and vice versa.
- The judging process for individuals and teams is exactly the same at all levels.

Project Requirements

All projects must have the following components:

- **YIPLit Inventor's Journal or invention logbook**

The journal documents the student's journey and all aspects of the invention process. Journals should be used throughout the development of the project and should not be a report completed after the fact.

- **3-panel Display Board**

Displays are a visual aid to communicate significant aspects of the invention.

A tri-fold display board may be a maximum of 48" wide and 36" tall (the board should be 24" with both 12" sides folded in.) The board must fit into a footprint of no more than 30" wide (with sides folded in) on the tabletop. Prototypes and models should fit within this tabletop space as well or on the floor in front of the table and should not encroach upon neighboring display spaces. No oversize displays will be allowed.

Display boards **must** have the following information in one consolidated place on the poster:

- Student(s) Name(s)
- Name of Invention
- Student(s) Grade(s)
- Student(s) School
- School City, State
- Statement of the problem
- Explanation of the invention as a solution to the problem
- Details of model construction
- Diagrams of design

Note: Digital displays are not permitted at the Northern New England Regional Invention Convention or the Invention Convention US Nationals.

- **Oral Presentation**

An oral presentation or pitch must be 3-6 minutes in length. K-2 students may shorten their presentation to 2-3 minutes, and they may use note cards and interview style prompts from adults in the background. Grades 3-4 may use notecards, but no prompts. Grades 5-12 may not use any notecards or prompts. This is an opportunity for students to explain their invention, the problem it solves, who it benefits, and the process they took to develop the invention, including materials used and any tests, results and changes they made along the way.

Presentations must include:

- Name of inventor(s)
- Grade(s)
- School
- City & State
- Invention name

- **Video Presentation**

A video presentation is **required in addition** to the in-person presentation. The video must be 3-6 minutes in length and must be recorded in a continuous take and unedited. The student should show their display board and/or prototype in their presentation. Powerpoint and other presentation software is not allowed, and students may not rely on videos show within their presentation. They should be the primary speaker, as if they were presenting in person. K-2 students may use interview style prompts from adults in the background. Grades 3-4 may use notecards, but no prompts. Grades 5-12 may not use any notecards or prompts. The video is similar to the oral presentation in which the student describes their invention and how it was developed.

Videos must include:

- Name of inventor(s)
- Grade(s)
- School
- City & State
- Invention name

- **Prototype/Model** *(recommended, but optional)*

Models or prototypes (which may be working or non-working) are not required but are recommended. These models demonstrate the key characteristics that make the invention valuable, original, and useful. This model does not have to be fully functional.

Project Restrictions

The following items are not allowed on your person or in your project:

- Electric stun guns, martial arts weapons or devices
- Guns, replica guns, ammunition, and fireworks
- Knives of any size
- Mace and pepper spray
- Razors and box cutters
- Live animals
- No balloons, glitter, or confetti are allowed in any form

If a project requires batteries, these must be provided by the inventor. The Regional Invention

Convention will have access to electrical outlets if needed.

Pacing Guide

YIPLit consists of 8 lesson plans (with Lesson 9 extension to help prepare students for competition) which include content and activities to support students as they develop an invention project. Each session is designed to fill a 45 minute period but may be adjusted as needed. More time is always encouraged.

SESSION	OVERVIEW & ACTIVITY
LESSON 1: Idenitfying and Invention **May be spilit into 2 class periods*	Identify inventions and the problems they solve. *Activities: Invention "I Spy"; Read Aloud; Everyday Objects*
LESSON 2: Understanding a Problem	Develop an understanding of problems and their possible solutions. Introduce empathy and forming questions. *Activities: Character Problem Identification; New Story Summary*
LESSON 3: Ideating **May be spilit into 2 class periods*	Form ideas to solve a problem. Use tools to practice divergent thinking and brainstorming. *Activities: Paperclip Redesign; SCAMPER to brainstorm and transform a straw; Change the Story*
LESSON 4: Defining and Designing	Develop basic inquiry skills to define the problem use information to desgin a solution/invention. *Activities: Character SCAMPER; MindMapping; Defining the Problem and Solution; Invention Desgin #1*
LESSON 5: Researching and Redesigning	Explore research strategies and feedback data to evaluate an idea and refine it to solve a problem. *Activities: Invention Research; Idea Gallery Walk; Partner Share; Refine the Invention Desgin*
LESSON 6: Planning and Building	Create a Prototype Plan to include steps required to build and materials that will be used. *Activities: Develop a Prototype Plan; Build a prototype using a "maker space".*
LESSON 7: Testing and Redesigning **May be spilit into 2 class periods*	Test and evaluate the prototype. Use feedback to make changes. *Activities: Build a prototype; Peer Testing and Sharing; Use feedback data to redesign.*
LESSON 8: Communicating the Idea	Explain the design process used in its creation through effective communication. *Activities: Naming the Invention; Invention Story Mountain; Presentation Practice- Let's Play T.A.G.*
LESSON 9: Preparation for Competition (optional)	Extension lesson to support preparation for competition in state/regional and national invention conventions. *Activities: Make the Display Board; Refine and Practice the Presentation- Let's Play T.A.G.*
CAPSTONE: Invention Fair (optional)	Host an event to showcase invention projects to the school community and/or families.

Tips For Success

Thanks to our YIP leaders and years of experience, we have collected best practices and lessons learned. These tips may help you frame lessons and conversations with students as you prepare them for success in their invention project.

Examples of Past Student Inventions

"*I can't think of anything to invent!"* is a complaint teachers sometimes hear when students begin the inventing process. You can encourage students by discussing some of these student inventions:

- Bright red salt that allows you to more carefully flavor food
- Solar-heated winter bird house
- Washing machine that deposits clothes directly into the dryer
- Solar-powered, lighted collar for dogs and cats
- Lunch box alarm that indicates its contents are being stolen
- Long-armed apple picker
- Peppermint dentist gloves
- Electric jump rope turner
- Jar that opens on both ends

- Water-cooled lawn chair
- Device to hold backpacks on school bus seats to safety keep them off of the floor
- Spoon-shaped cracker for spooning out pet food then crumbled up for the pet to eat
- Sleeve stopper to help people put on coats without bunching up their sleeves

Leading an Effective Brainstorming Session

Before starting the first brainstorming session, establish the ground rules with the class. A list of recommended rules is below, but certainly add to them with your students. Post these rules so everyone can see them, and review them before each brainstorming session. Rules should be simple and positive. Be sure to save this list of rules for future YIP activities.

Suggested Brainstorming Ground Rules:

- Defer Judgement: accept all ideas without comment at this initial stage
- Work for Quantity: all ideas should be recorded and allow ample time for everyone to think and contribute to the list
- Piggy-Back: encourage students to combine or improve ideas already on the list.
- Freewheel: Encourage wild ideas. They may be dismissed but should be considered.
- Everyone Participates: all students should be involved in the brainstorming process.

Invention Idea that Already Exists

Students, especially young students, may "reinvent the wheel" unknowingly. ***If this happens, that's fine.*** The process of invention is by far the more important goal. Research can help students learn more about the existing invention and identify ways their invention is different or how they can re-design their idea to be an improvement. Recording the research and clearly illustrating how their invention is unique should be done in the YIP Inventor's Journal as documentation of the integrity of their work. By stressing and encouraging the process of discovery, your students will stay positive and will continue on the path to success.

Using the YIP Inventor's Journal

A journal helps students learn valuable communication, writing and recording skills. Proper record keeping is an important part of any research project. And, if a student ever wants to patent their invention or publish research, a journal is essential to protect their rights. An Inventor's Journal is "an official record of the process of invention…[It] is an ongoing record of all the events, actions, experiments, and observations during the entire development of the invention." (*Steven Caney's Invention Book*) Neatness is not the priority as creativity is messy!

Suggestions to follow:

- Write in ink and do not erase.
- Leave no empty spaces.
- Use a bound notebook.
- Date your notes.
- Begin your journal with all your problem ideas and the results of your survey.
- Record your invention ideas and describe how you got them. Also, record all changes as time goes by.
- Explain what your invention does.
- Explain why your idea is new and original (an invention) or that it is an improvement on an already existing invention (an innovation). List places you have checked to be sure your idea

is new.
- Write about the problems you found and how you solved them.
- Tell how your invention works.
- Make a diagram of your ideas whenever possible.
- Tell what you changed and why.
- Describe all materials and parts you use. List your costs.
- Diagram and describe the tests you run. Include the results of each test.
- Describe your search for a catchy name.
- Sign and date all entries at the time they are made and have them witnessed at least once a week.

Invention Displays
Student display may include things such as:

- How you thought up your idea
- How you researched whether such an invention already exists
- A statement of the problem solved
- Other brainstormed idea solutions which were unsuccessful and/or improvements
- Other people's impressions about the usefulness of the invention
- Personal testimonies of your own uses
- A short autobiography
- Photographs and/or diagrams

Please see the Rules of Competition section for a full list of display requirements.

Presentation Tips
Help your students prepare for their presentation experience. The following tips are great reminders and preparation tools to get your students ready and excited for their big day.

Inventors need good ideas and good communications skills. Part of YIP is to present your invention to your peers at your school or program and present to judges at showcases and competitions. We have a few tips to prepare for your invention presentation:*

- Practice Out Loud: Practice your presentation in front of a friend or family member at least 5 times so you are more familiar with your speech and are comfortable speaking in front of someone.
- Take a Deep Breath: If you lose your place or get nervous, take a deep breath, pause and restart. There is no rush when speaking and the audience appreciates time to think about what you are saying as well.
- Practice in Front of a Mirror: Stand in front of a mirror and give your presentation. Be careful not to wiggle, twitch, or shift. Practice how you will stand, sit, move or point as you present.
- Time Yourself: Time yourself as you give your entire speech from start to finish. Speak at a normal pace, which will probably seem slower than you think it should.
- Make Eye Contact: Look up at your audience at least 3 times when you present.
- Expect the Unexpected: It is okay if things do not go as planned. Stay positive and follow through.
- Summarize & Restate: At the end of your presentation, repeat your most important points to

summarize your project.

- SMILE!: When you smile, your whole body relaxes. And smiling is contagious- if you smile, your audience will too.

** Adapted from Science Buddies, "Science Fair Project Presentation Speech Tips".*

Please see the Rules of Competition section for a full list of display requirements.

Final Thoughts

As you embark on your own YIP journey, we hope that you will embrace discomfort and challenge yourself and your students to think differently and to innovate in the face of adversity. While we hope you will find our resources valuable, we want you to add your own personality and bring your own interests as well as those of your students into each program. This Educator Guide is exactly that- a guide. All of the information and resources in this guide are recommendations and are not requirements as you design your own YIP experience. Just like the iterative invention process, it should take different forms with each group you lead. We count on the help of community of users and inventors (past and present) to provide feedback and share their best practices. Please let us know how you these tools spark your interest in inventing.