



Sample of a Winning Educator Initiative Grant Application

School	Immaculate Heart of Mary School
Grades Encompassed by School	K-8
Team Leader Name	David Hall, MakerSpace and Technology Teacher
Project Title	MakerSpace is More Than Just a Room
Amount Requested	\$15,000

Brief Project Description

Modern children are comfortable and adept with devices that have screens and buttons. The large majority, however, are lost and inept with common real world hands-on skills. Most students cannot identify or demonstrate how to use tools safely and properly. To address this issue, MakerSpace is all the rage in education. We can't, however, simply assume that if children have access to a room labeled "MakerSpace", they will be able to: invent, construct, make and solve problems. This project desires to add useful, practical hand tools and construction materials to the IHM MakerSpace (which currently has little) for students' use.

Anticipated Project Start and End Date:

Fall of 2018 onward. Most hand tools should last more than a decade. Some consumable raw materials will need to be replenished yearly. If awarded this grant, all IHM students will use age appropriate tools and materials regularly and all tools and materials will be used throughout the school year.

Please provide a description of your proposed project in 500 words or less. Provide the need for the project, what K-12 grades are served, and what data informs and supports the stated need. Include the Learning Standards that are addressed by your proposal.

A 2013 Stanford study found that students thrive when they see first-hand that academic principles actually work in the real world. Hands-on learning helps students become more adept at grasping complex concepts and applying their knowledge to non-academic situations. The Atlantic Magazine (2013), Forbes (2012) and Education.com cite the importance of the values and skills taught in "shop" classes. A 2015 Deloitte study concluded that the skills gap will grow to two million by 2025, meaning that young people who understand basic manufacturing principles and can put them to practice will be at an advantage over their college educated peers.

All K-8 IHM students take MakerSpace classes on a weekly basis. MakerSpace class at IHM is well established. We focus on the four following activities:

Problem Based Learning Challenges; Students use scientific inquiry and experimentation to solve these challenges using provided tools and materials, typically in one class session. Examples include paper air powered rockets that fly up to 150 feet and floating Lego towers that must withstand a tidal wave.



Long Term Projects; Students construct more in depth projects that are often tied to core class curriculum and take several weeks to complete.

Tool Use; Students learn how to properly and safely use common tools. I would like to be able to include hand and power tools such as: screwdrivers, wrenches, metal snips, coping saws, drills, hammers, soldering irons, rivet guns, palm sanders, etc.

Materials Properties; Ceramic clay, glues, paints, metals, wood, foam, etc.

Tools and resources in our MakerSpace are very haphazard and sparse. I have been making do with random donations of materials and a few old tools. I do not have access to a class set of any type of tool, even scissors. I regularly pass up some of the best ideas and projects simply because I do not have tools and raw materials available.

I am a craftsman, tool expert, artist and inventor. When I was in junior high I designed and flew scratch built balsa model airplanes. When I was in high school I could disassemble, fix and reassemble any part of a car. In college I won the highest art honor in the state. As an adult I have designed and built boats, an addition on my house and my wife's wedding dress. I know how to make things; however, I am struggling to pass on my knowledge and passion for creating without proper tools and materials.

I regularly incorporate a wide variety of Ohio Learning Standards into my project assignments including: Science (especially Physics), Mathematics, Technology, Engineering and Science Technologies, Construction Technologies, Manufacturing and Visual Arts, such as:

Energy is explored through electrical energy, magnetic energy. (Grades 4-5)

Design and construct a machine that performs a simple task in many steps. Grade 7

Improve craftsmanship and refine ideas in response to feedback.

Social and emotional standards of "Self" are continuously met through the confidence and pride achieved by completing hand built projects and through learning new skills.

How does the project prepare students for college and career readiness? At what transition point on the cradle-to-career continuum does your project fit? Please limit your answer to 250 words or less.

Students follow a variety of pathways into adulthood after high school. Whether they choose to enroll in college, begin employment or enlist in public service, students need skills as they leave high school - career skills as well as academic skills.

In the disposable society we live in, people often buy what people used to make for themselves, and replace what people used to fix. This leads to a feeling of dependence instead of self reliance. By having students, design, invent, engineer and then analyze, fail, and improve, they build confidence in their own abilities and take pride in their accomplishments. This confidence in turn will serve them later in high school, college or beyond. Many advanced careers, such as engineering, require people to design and fabricate. MakerSpace integrates many subject matters such as science, technology, engineering, art and math and gives them a real world application.

The addition of tools to our MakerSpace will increase student motivation and confidence. Since MakerSpace projects use low stake formative assessments, there is less stress on students regarding



grading. Students are exposed to practical applications that will not only strengthen their understanding of math and science, model the value of persistence when things do not go as planned, but also teach self reliance and the satisfaction of taking a project from start to finish.

In a MakerSpace, hands on learning can also introduce students to a future career. In our digital, tech-laden society many of the classic hands on trades are being overlooked.

Please explain the specific outcomes you expect from the project. How will you measure success? What evaluation tools will be used?

Before IHM offered MakerSpace classes, students received no training on tool use and fabrication methods and materials beyond typical school crafts. With our current MakerSpace class, I have been able to offer some training. With class sets of common useful tools, all students will learn how to use tools and materials safely. They will learn what tools can be used for and will develop a comfort level in working with them.

IHM science teachers occasionally present problem based learning challenges to students. In IHM MakerSpace class, problem based learning challenges have been the single greatest focus. Many problem based learning challenges are repeated. All challenges have a measurable and charted results and improvement can be seen. For example: the first problem based learning challenge of this past school year for grades 3-6 was to design and build air powered paper rockets. During the first week, the furthest flying rockets were traveling 75 to 95 feet. By the end of the third week, many third graders were building rockets capable of flying over 100 feet and our sixth grade record is an even 150 feet. Students would compare design and fabrication methods of their classmates' successful rockets.

My experience as a MakerSpace teacher, rocket team coach and teaching a tools elective one semester has given me unique insight into students' lack of tool knowledge. I have witnessed multiple students attempt to use the wrong side of X-ACTO and box cutter knife blades and not understand why they wouldn't work. No students knew how to change blades in either knife type. I have seen students attempt to drill holes with drills in reverse and not understand why the drill bit was smoking and ineffective. Most students did not know how to change drill bits. I have shown junior high students pop-rivet guns; none had an idea what it was. I've taught a few students how to solder; nearly all had never used a soldering iron. I have taught students how to mix and use epoxy, none had used it before. Students have had little to no experience building precise models with balsa or foam. The baseline of student tool and material use and knowledge is nearly zero. The measure of success of including tool use and training to the MakerSpace will be through teacher observation and student demonstration of tool use. I will also conduct pre and post student knowledge surveys and checklists with a goal of improving students tool knowledge, effectiveness, efficiency and safety to 100%. Students will have the opportunity to use the tools that they have been trained to use for their years at IHM. Proficiency will be obtained and observed through repeated use.

Describe in detail any teacher professional development that will be a part of the project's implementation, including the use of one-on-one coaching.

I will visit other MakerSpace facilities in the area, such as Western Reserve Academy, Case Western Reserve University and Archbishop Hoban High School in order to exchange ideas with instructors, and



problem-solve with them the variety of concerns of the MakerSpace classroom, such as varying lessons based on grade, storage of materials, creating engaging projects for large groups of students.

As a technology teacher, I learn a great deal online and solve most problems with online resources. I actually require my junior high technology students to learn and solve technology and real-world problems with online sources. This form of learning is efficient, has endless possibilities and clearly is an essential form of modern education.

If I receive this grant, I will receive one on one training with local MakerSpace expert Nick DiGiorgio (from Hawkins School) to better learn practical strategies to enhance PBL and MakerSpace strategies. I will use my own personal/professional days to pay for substitutes.

In addition to the planned above professional development, I have been to the Practical Strategies to Enhance STEM Learning (K-6) workshop this year and plan to consult with other MakerSpace teachers to exchange project ideas and classroom safety concerns. I also am part of online discussion groups: makezine.com, Google Forums K-12FabLabs and Reddit.com/Makerspace.

Please describe how technology will be integrated into the project and what instructional best practices will be implemented.

Having a dual role as the school's Technology and MakerSpace teacher, my subjects are regularly integrated. IHM junior high students are quite experienced with creating Computer Aided Design 3D files that are compatible with our school's 3D printer and have been introduced to the 3D slicing software that runs the 3D printer. IHM 7th grade students scratch built model Greek Trireme warships in the MakerSpace room this past year. Students based their projects on research of trireme historical articles, drawings and reproductions. Junior high students are currently learning laser engraver/cutter software that is compatible with our laser cutter and engraver. Students in all grades are taught how to use scales and measuring tools and make calculations pertinent to the challenge. Problem based challenges are always judged by measurements and ratios.

In MakerSpace class students are always hands on. Experimentation is encouraged. Failure is frequent and low stakes. Students are often given a chance to improve designs and try again. Students work individually, in pairs and in groups. Projects begin with class discussions on design considerations and conclude with formative assessments. I often have students give me feedback, either written or verbal, at the end of projects to have their input on how to make the project better.

How will the project be sustained and/or replicated by others after the funding has ended?

The items that will be used to stock the MakerSpace room are a variety of tools that should last well over a decade. There will be need for additional raw materials such as wood, nails, etc. as needed when the first supply runs out. Other IHM teachers have access to this room much of the time and use it occasionally. The MakerSpace work environment would be enhanced and more inviting to teachers with a fully stocked tool assortment and materials that cannot be found in their regular classrooms.