After-School Project Academy: Solving World Problems … *Learning life skills*

Mission:

The mission of "Project Academy "is to advance the development in spirit and mind of students drawn from diverse cultural and social backgrounds and to inspire in them a commitment to the best in the community, education, and business world.
The goal of the after-school program is to prepare students for higher education, society, careers (College & Career Readiness(CCR)) and lifelong learning by developing these life skills. The focus will be with students in middle and high school. They will understand that problems are opportunities. "The bigger the problem, the bigger the opportunity" (*Vinod Khosla*).

Culture of the Organization:

The school will provide a community based learning environment where students will be treated with respect and as equals.
Key values are: respect, empathy, kindness, curiosity, innovation, persisting, flexibility, continuous learning, humor, taking responsible risk, commitment, and buy-in.

What are the learning outcomes?

- Work in a team and understand the values and culture within it
- Clearly articulate the nature of the design process & problem solving
- See the "World" as a place of excitement and inspiration
- Use assessment strategy and feedback as learning tools
- Use relevant soft-skills in their life to connect with society
- Begin the steps to become a lifelong learner
- Have taken steps for self-control in their interface with others
- Understand the processes within a business and finance
- Understand that problems are opportunities in life
- Build on their strengths and skill sets
- See errors as a learning point

Services Provided to middle and high school students:

Project Academy, Inc will be established as a non-profit organization providing classes for student in after-school programs. Initially the organization will provide classes within other organizations that provide after-school programs. It will also offer Professional Development programs to after-school staffs to provide their own program. Following initial establishment and the creation of income from grants and gifts, Project Academy will establish its own facility for after-school programs. Provide both curriculum and teaching to after-school programs and professional development to school programs that focus on doing a project based learning that solves world problems while the students learn college, career and social skills. To support these activities, Project Academy will develop methods that improve delivery and content of these programs using game theory, virtual reality, and improved curriculum.

Services Provided:
1. After-school classes
2. Professional development for in school programs
3. Adult learning classes covering business/life skills - Evening School

Life Skills:

The students will review the different world problems and the engineering society list of problems and decide what they want to work on. A team (about 4-7) will get together under the same world problem they want to tackle. Depending on time available, as they work on the problem, they will learn the following skills:

Team operation	Organizational culture	Decision making
Problem Solving	Financial literacy	Time management
Thinking skills	Character traits	Self-control/ Values
Collaboration	Continuous improvement/ Quality	Process methods
Measurements/ Feedback	Planning	Risk taking/Stretch goals
Learning from failure	Entrepreneurship	Innovation
Study skills		

This list will be updated as additional learning occurs

Financial projections:

Book-keeping processes will be established based on guidelines created when a CPA firm is hired. Listed below is our budget plans for the organization. A detailed spreadsheet is available.

Categories	YR 2016	YR 2017	YR2018
Paid Head Count	0	7	13
Income (grants & fees)	$0	$120K	$528K
Expenses	~$3K	$245K	$514K
Gain/Loss	-(~$3K)	-$125K	+$14K

Uniqueness of the program:

- Focus on quality and continuous learning while solving problems.
- Cognitive learning the life skills during the project.
- Supplement the school's curriculum with skills based learning.
- Students choose their problem and develop their measurements.
- Learning will be interdisciplinary in nature.
- Focus on students' strengths.
- Learn by developing solutions to real issues verses a scripted approach.
- Focus on developing a team structure with its own culture and values.
- Provide a culture of support for the students.

Design Process	Example of problems
Implementation Design Process: *Areas of discussion …can be tailored to local needs such as the local community food needs.* See the problem/Bug Frame it Research List possible solutions Pick a few Select Test	The course will be done with hands on learning using methods from ***WPI/engineeringlens.org*** **Feed the World** **Heal the World** **Clean the World** **Power the World** **Respect the World** **Connect the World** **Entertain the World** **Sports of the World**

Reflection Present solution ***Make the world/community a better place***	**Music of the World** **Record the World …activites** **Dance of the World**
Other possible problems that could be worked on are the Grand Challenge for engineering determined by the National Academy of Engineering.	

- How do students learn life skills while solving world problems?

As the students do the problem-solving process, we harvest the life skills.
We get the students to be cognitively aware of the skills they are using.
How do we do this? Let's take an example of the Team set-up.

We spent time having the team form a charter (overview of the project), set norms, develop the values of this team, discuss the roles needed and how are they going to develop trust and handle conflicts? This ensures the student cognitively embraces the learning. **Another example**: Setting up and defining an organization culture. Students learn that organizations have traits, operating styles, and values. Where does this come from? The students define a culture for their team.

Project details:

Key learning objectives,

- Ability to work in a collaborative team environment
- Understand the organizational culture and the values of it
- Internalize the problem-solving process.
- Understand the benefits of continuous improvement and excellence
- Putting elements together to form a coherent or functional whole; creativity
- Use critical thinking to make judgements based on checking and analyzing
- Using questioning, why, what and how are we doing in activities
- Understand the elements of College and Career Readiness skills

Pedagogical approach

- Small group projects
- Project based learning … Sustained inquiry, Authenticity, Students voice, Reflections, Critique and revision, Students make a public product
- Students involved by choosing the problem and assessment
- Hands-on team learning
- Community based work

Time (depends on the level of life skills incorporated)

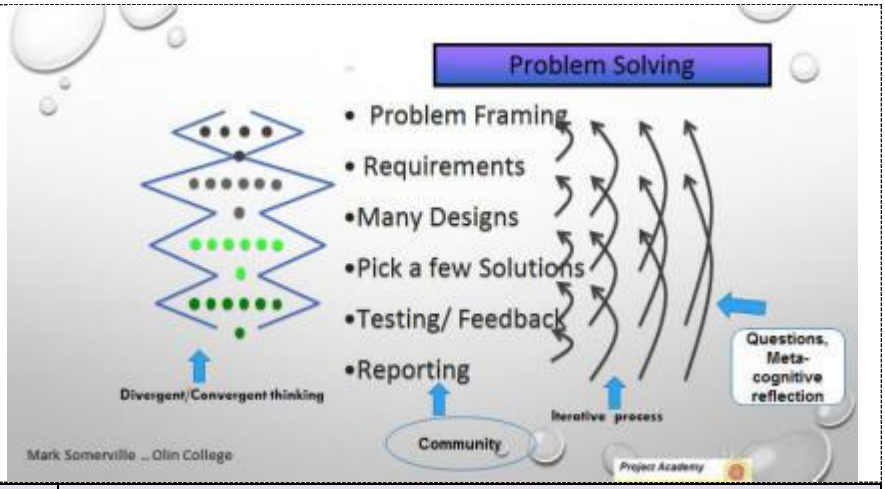
- The minimum course will be 6 weeks with at least 2 hours/week
- The basic course is 8 weeks with 3 hours/week

Topics:

- World/Community problems
- Solving the “BUGS” in your life
- Science literacy: ... The process
- Innovation/ Entrepreneurship

Problem Examples:

- The students will be formed in teams
- Develop the problem to work on
- follow the problems solving process
- Learn life skills as the problem solve



Tasks to be done on the project	Description of life skills

Essential Question?

1. Is *open-ended;* that is, it typically will not have a single, final, and correct answer.
2. Is *thought-provoking* and *intellectually engaging*, often sparking discussion and debate.
3. Calls for *higher-order thinking*, such as analysis, inference, evaluation, prediction. It cannot be effectively answered by recall alone.
4. Points toward *important, transferable ideas* within (and sometimes across) disciplines.

Tasks to be done on the project	Description of life skills
5. Raises *additional questions* and sparks further inquiry. 6. Requires *support* and *justification*, not just an answer. 7. *Recurs* over time; that is, the question can and should be revisited again and again.	
Problem solving process • Creative thinking • Critical thinking • Questioning • Reflection • System thinking	What is the problem we need to solve • Research • Developing requirements • Brain writing • Shaping • Decisions • Develop solutions • Testing and modifying from feedback • Presenting
Forming a team and setting a culture for the organization • Wring a team charter • Creating the organization culture document	• Picking roles and developing rules of engagement • Collaboration skills • How are they going to measure success • Progress measurements • Time management • Character skills
Creating a plan	• Writing … milestone • Deliverables • Balance scorecard
Resource plan	Learn about financial literacy Do they need resources to solve the problem?
Developing partners	Reach out to the community & business for support
Reflection process *Skills, Attitudes and Behaviors*	Stopping and looking back on what we learned What would we improve? What worked well?

Tasks to be done on the project	Description of life skills
Research	What questions do I need to ask? • What do I know? • What don't I know? • What do I need to know?
Developing requirements	How are we going to judge our design?
Brain writing	Coming up with ideas
Shaping	Sorting: Mundane, innovative, Magical Team communication
Decisions *Finding two to work on*	Building decision table
Testing	• Going to the community to get feedback • Importance of editing initial report and incorporating feedback
Presentation	Present to partners, community; develop a similar reporting items like a business plan
Celebrations	

Problem-Based Learning is, as its name suggests, learning that occurs as a result of solving real-world problems (Combs, 2008). It is inherently meaningful and contextualized. Problem-based learning creates environments where students assume ownership of their learning; it is simply more interesting than memorizing information (Jonassen, Howland, Moore, & Marra, 2003). In this constructivist instructional method (Driscoll, 2005), the problem to be solved has "some social, cultural or intellectual value to someone" (Jonassen et al., 2003, p. 20). Savery (2006) defined problem-based learning in the classroom as having certain critical characteristics:

1. Students have responsibility for their own learning.

2. Problems are ill-structured and allow for free inquiry.

3. Learning is trans-disciplinary.

4. Collaboration is essential.

5. Self-directed learning informs group decisions.

6. Reflection is essential.

7. Self and peer assessment happens regularly.

8. Problems have real-world value.

9. Assessment checks process and product. (Savery, 2006, pp. 12–14)

Design Thinking Problem-based learning is similar in many ways to the design process, defined as the process by which people understand, delineate, and solve problems.

A design thinking mindset allows people to work together (or "radically collaborate") to find new solutions to problems. As defined by the Stanford d.school (2011), the design process involves stages of empathizing, defining, ideating, prototyping, and testing. Though design thinking is not an instructional method, its processes are like those of problem based learning. However, the goals differ. In design, the goal is to solve the problem, and the process, though it is valued and documented, is incidental.

In problem-based learning, "learning along the way" is the goal of the work. As with problem-based learning, design thinking can be explained from a variety of theoretical perspectives (Feast & Melles, 2010). Design thinking is the foundation on which the Design-Make-Play movement is changing formal and informal education (Honey & Kanter, 2013). It makes sense to integrate design and design thinking into problem-based learning (Schnittka & Bell, 2010).

The program fits into the MA State needs of the framework

High School: Overview of Science and Engineering Practices

The practices in grades 9–12 build on pre-K–8 experiences and progress to more technical and sophisticated applications to the natural and designed world we live in. The integration of science and engineering practices in high school science courses gives students dynamic and relevant opportunities to refine and communicate science understandings to be well prepared for civic life, postsecondary education, and career success. Essential competencies for students by the end of grade 12 include reading

and comprehending relevant issues in science to be informed decision-makers. Accurately using mathematics and computation as it applies to daily life and engaging in the practice of modeling to solve real-world problems enables all students to understand and analyze key scientific and technical issues they will be asked to address throughout their lives. Communicating explanations coherently, with evidence from credible sources, is critical to engaging in public discourse.

Inclusion of science and engineering practices in standards only speak to the types of performances students should be able to demonstrate at the end of instruction of a particular course; the standards do not limit what educators and students should or can be engaged in through a well-rounded curriculum.

By the end of high school, students should have an understanding of and ability to apply each science and engineering practice to understand the world around them. Students should have had many opportunities to immerse themselves in the practices and to explore why they are central to the applications of science and engineering. Some examples of these science and engineering practices include:

1. Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical, and/or environmental considerations.
2. Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.
3. Plan and investigate, including deciding on the types, amount, and accuracy of data needed to produce reliable measurements, and consider limitations on the precision of the data.
4. Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific questions and engineering problems, using digital tools when feasible.
5. Use simple limit cases to test mathematical expressions, computer programs, algorithms, or simulations of a process or system to see if a model “makes sense” by comparing the outcomes with what is known about the real world.
6. Apply scientific reasoning, theory, and/or models to link evidence to the claims and assess the extent to which the reasoning and data support the explanation or conclusion.
7. Respectfully provide and/or receive critiques on scientific arguments by probing reasoning and evidence and challenging ideas and conclusions, and determining what additional information is required to solve contradictions.

8. Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media, verifying the data when possible.

While presented as distinct skill sets, the eight practices intentionally overlap and interconnect. Skills like those outlined above should be reflected in curriculum and instruction that engage students in an integrated use of the practices. The introductory courses (grades 9–10) integrate practices into the standards. In upper-level high school courses (grades 11–12), students should be given continued opportunities to develop the practices.

Possible game and fun activities: (Future activity)

- A set of project badges will be created around the process so the students can achieve points for completing the badge process. Examples are the design process, team work, social skills, decision making,
- Points and activity levels will be created around doing the problem solving process. Students will get points based on how they use the skills and make their team mates successful.

Final Report Structure (Students make a public product) to be used by the students:

- Problem statement
- Issues and their accuracy
- Findings
- Proposed solutions
- Benefits
- Next Steps
- Summary and feedback