



# Makerspace

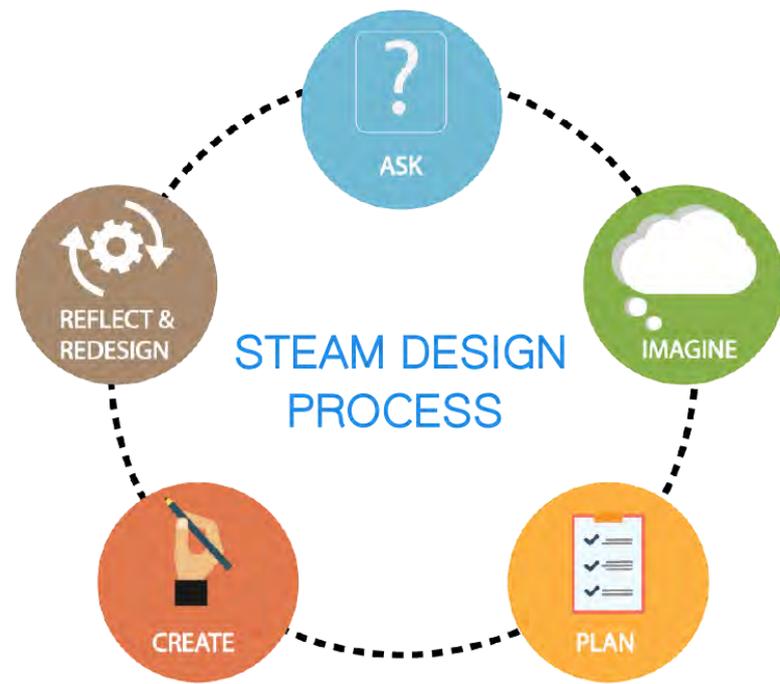
## A Space For Unlimited Learning



Makerspace is an area that gives learners the opportunity to create things based on their own interests.

It gives everyone the opportunity to think, research, design, plan, exchange, share, create and develop their work, leading to new innovation. Moreover, **Makerspace** also helps to promote creativity by providing an environment suitable for learning, including equipment for researching and creating new things, providing people with knowledge and skills, and having experts provide advice to help creators solve problems and work towards their goals.

# How Does Learning Occur in a Makerspace?



Learning through **Makerspace** is possible through the use of a systematic process known as the **STEAM Design Process**. This 5-step process begins with questions about a problem (**Ask**), thinking of ways to solve that problem (**Imagine**), then making a detailed plan (**Plan**), creating a solution (**Create**), and appraising how the work went and remaking the solution to be better (**Reflect & Redesign**). Learning by using the **STEAM Design Process** in a **Makerspace** creates a familiarity with step-by-step problem solving for students, and develops learners to be thinkers, problem solvers, and reasonable in their actions.



## Step 1 – Ask

Questions are great tools for self-learning. Good questions lead to observations, predictability, and analytical thinking. They also can stimulate curiosity, an interest in wanting to solve problems, the need to develop, and the desire to test difficult challenges.

Guidelines for asking questions include a focus on measurement and counting, asking about topics that interest a learner, comparative questions, questions about reactions and behavior, or predictions of what will happen.



## Step 2 - Imagine

This step involves coming up with ideas to solve problems that occur, using original experience, brainstorming, asking additional questions, or searching for information to get the best possible answer. Generally in this step, a solution to a problem can be found, or even several answers for that matter. Learners will have to decide the best and most possible solution to get to the next step. They record their answers and decisions through drawing or creating tangible models that show what can truly be created.



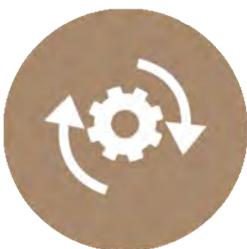
## Step 3 - Plan

In this step, learners specify the resources that are to be used, and lay out a process for how to make the ideas from the Imagine step become a real thing. Plans should be thought of in accordance with reality and should be reasonably possible to implement. They can be recorded in many forms, such as writing notes, making maps, using diagrams, or any other method not listed above.



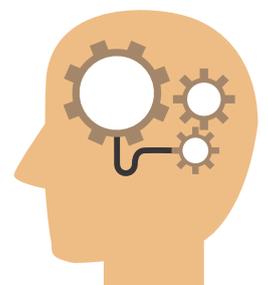
## Step 4 - Create

Learners follow their plan in this step. Creativity can result in many ways here, such as using materials to build a model, communication devices, books, concept art, an information campaign, or something else. In the action of creation, unexpected problems can be encountered, which may cause new questions to occur on top of the original question. Learners can go back to the Imagine step to try and fix the problem again, try to create in a new way through flexible thinking, or try to alter their methods and materials.



## Step 5 - Reflect & Redesign

Here learners consider what they have created, compare it with the question or problem, decide if the question has been answered or the problem solved, and to what degree. They also can review the creation process, and compare it with what was imagined, so that development and improvement of the work can be achieved in the future. This can be done by oneself, or by allowing others to comment and suggest improvements.



# Makerspace – Learning Many Subjects Simultaneously

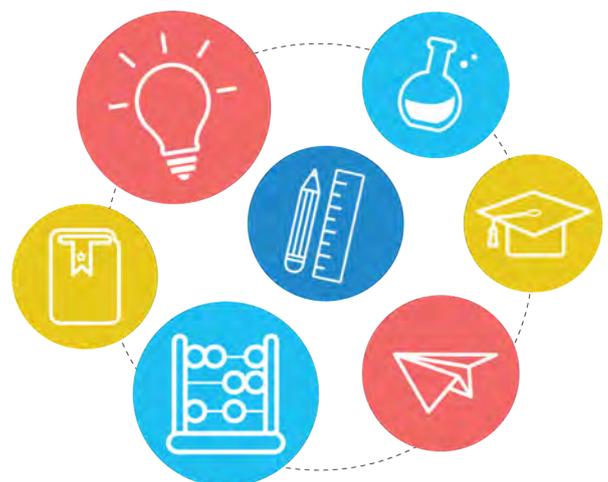


STEAM Education is an education management method that integrates interdisciplinary knowledge, including [Science](#), [Technology](#), [Engineering](#), [Art](#) and [Mathematics](#). By focusing on applying knowledge to solve real-life problems, [Makerspace](#) activities are appropriate to be used in conjunction with STEAM Education in order to effectively develop a learner's potential.

There is consistency in not being committed to studying only one branch of education, but to give learners the opportunity to choose what they enjoy and are most interested in. People like to begin with things that are closest and most familiar to them, because it's easy for students to relate to the context of their daily lives. During the creative process, learners must link all of their knowledge to their experience, which is not limited to just one single area. Learning to solve problems in such a way is a natural way of learning that can be applied in life.

## Makerspace – Learning in the 21st Century

The 21st century is an age of information. There is knowledge and new things happening all of the time. Those who will succeed in the future are those who have learning skills, as well as the capability to live a good life together. Teaching in the 21st century focuses on skills more than knowledge; on practice; on the process of finding answers to questions; on development of an individual's potential.



Learning with the STEAM Design Process through  
Makerspace activities promotes essential skills for  
the 21st century, including



**Creativity and Innovation**



**Critical Thinking and  
Problem Solving**



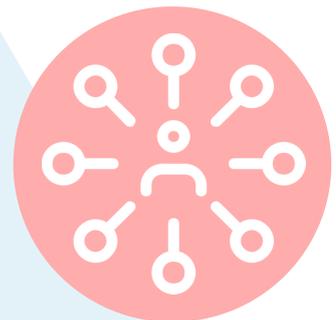
**Collaboration,  
Teamwork and  
Leadership**



**Communications,  
Information and  
Media Literacy**



**Self-Awareness**



**Self-Management**



**Responsibility and  
Decision Making**



**Relationship Skills**

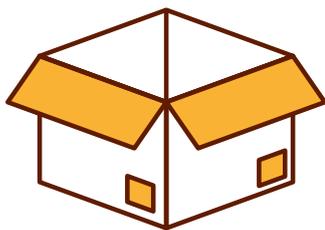


**Social Awareness**



Assessing skills in students can be done in many ways, including observation, oral interviews, quizzes, reviewing student notes, and also self-reported student portfolios.

Makerspace activities encourage students to use the knowledge of multiple integrated subjects (STEAM Education) to solve problems in a systematic, scientific process (the STEAM Design Process) to enable students to develop learning skills and 21st century skills in order to achieve success in the future.



## Managing a Makerspace

The prerequisites and arrangement of a Makerspace are certainly not fixed. Therefore, every Makerspace is different. Regardless of where it is, however, there are things to keep in mind when arranging the space.

There should be a collaborative workspace so that learners can work together conveniently, space provided for working alone (temporarily), and adequate space for the storage of equipment and materials in an orderly fashion. There should be paths wide enough for users to access the area. Decorations should be arranged to create an interesting atmosphere, encourage participation and stimulate learners to solve problems. You may use local materials to create the atmosphere of the space, and these don't have to be new, expensive, or specifically designed.



Equipment, tools and materials should be allocated that make learners feel comfortable. There should be organized storage that is easy to access and organized into categories so that learners can pick up, use and store materials on their own. This builds the self-management skills of the learner, and also makes it easy to check the amount or availability of equipment for the next time the space is to be used.

For the creation process and for stimulating creativity, there should be boxes, shelves or areas where learners can put inventions that they do not use or do not want to throw away or separate into pieces for storage. These things may be modified in the future to be more useful, or can inspire other creators to make something new. Meanwhile, finished works can be stored on a shelf that can be shown to stimulate the minds of other learners in the future.

Baan Pla Dao School uses the “Uncle Dick” Building, a one-story building located near the main entrance of the school as a location for its Makerspace project. Spaces are divided by activity and materials: a room for Arts & Crafts, a room for activities about Food, a room for Sewing and Fabric, a room for Electronics, a Storytelling room, and a room for Technology Media. Learners are free to choose equipment and materials from one room and use it in another room.



# Freedom To Create, But You Must Be Safe

With all activities, there are associated risks included. Therefore, providing understanding and awareness about the dangers of improper use of tools or a lack of care is absolutely necessary. Tools should be explained in detail. The use of powerful equipment that can cause considerable bodily damage, or tools that are very complex should be explained carefully, because there is a chance of accidents happening otherwise. For safety, staff should focus on prevention. If an accident occurs, a correct and systematic approach to managing the situation can reduce the negative results.

## Planning For Danger Prevention



Accidents and hazards during operations may be due to two main factors: **equipment**, and **equipment users**. They can be caused by insufficient capabilities of a user, or the negligence and disregard of a user.



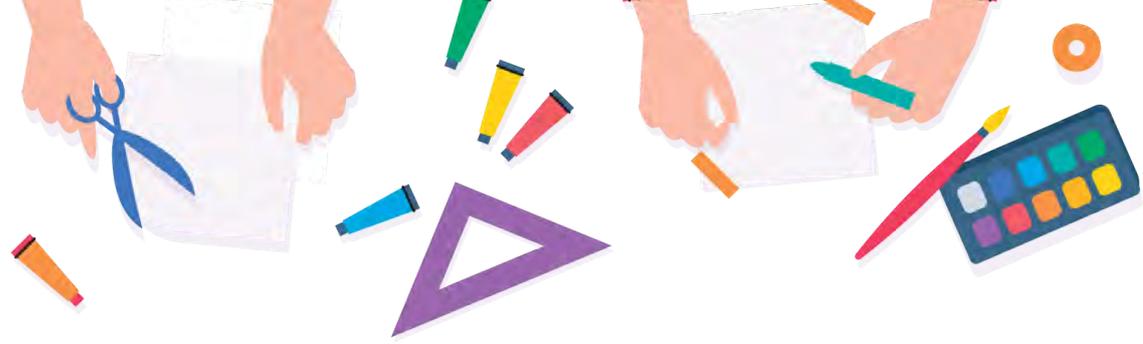
### To prevent dangerous situations that may occur with tools and equipment

Tools and equipment must be in good working condition, have regular maintenance, and not be damaged;

The installation of tools must be in a suitable place for operation – easy to access, not too narrow of a space, not obstructing the operation of other tools, with sufficient light, and not too hot or too cold;

A brief description of the components and operation of a device must be provided to the operator, for their understanding and in order to use carefully;

Users of tools should understand the probability of danger arising from use, reasons that may lead to a dangerous situation, and should be advised of the risks involved during use of the equipment.



## To prevent dangerous situations for the users of tools and equipment

Be sure to include a detailed teaching and demonstration of tools. Follow up with this until users can work skillfully and safely;

The user should be protected by wearing appropriate protective equipment;

Do not allow use of tools and equipment while alone, while not familiar with said use, or not skilled in said use;

Use a segregated area for using at-risk equipment and arrange for close supervision from staff.



## To prevent dangers caused by negligence

Use tools that are correct and suitable for the type of work being performed;

Be careful when working. Do not allow teasing between users;

Place warning signs in easy-to-see spots, to promote caution when using tools;

Create the understanding that the upkeep of a safe environment is a duty that everyone must participate in, by placing labels to reinforce awareness and understanding, which can include

- Safety is everyone's responsibility, keep this in mind at all times.
- Safety is important if you are unsure of how to safely do something, ask.
- All members are expected to maintain a safe and clean environment at all times.