Design Process

Curriculum User Guide

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In this guide:

Introduction

Design thinking is taking the school world by storm, and rather than it becoming just another ‘hot education term’ or hashtag for the moment, we propose a learning tool which teachers can use to help instill the maker mindset within their students.

You may be asking questions such as what exactly is design thinking? And what is the importance of students having a maker mindset?

The Teaching and Learning Lab (TLL) supports and develops innovative and effective approaches to teaching and learning at the Harvard Graduate School of Education. According to the Harvard Graduate School of Education, Design Thinking is described as, “a mindset and approach to learning, collaboration, and problem solving. In practice, the design process is a structured framework for identifying challenges, gathering information, generating potential solutions, refining ideas, and testing solutions. Design Thinking can be flexibly implemented; serving equally well as a framework for a course design or a roadmap for an activity or group project. This is a solution based approach to solving problems that students can use a non-linear method to find a solution.

Dunn (2019) describes the idea of the maker mindset is that students develop creative confidence and a sense of agency. That they have the ability to creatively solve problems on their own and with their peers. She continues to describe maker-centered learning is important as it teaches life skills — critical thinking, collaboration, and communication. Our world is changing, we want and need innovators, creators, designers. Individuals who are confident and empathetic. Which we can easily foster and help grow within our classroom environments.

Our design intends to accomplish purposeful reflection throughout the design thinking process. Embedding the design process with curriculum standards will have students take real life problems and construct their own solutions. Within the design process, students will become comfortable in making mistakes and realizing that it is from failures that the best learning takes place; resulting in reflective questions such as, what worked? didn’t work? and how can I make it better? Through emphasis on reflection within the design process, learners develop creative confidence and metacognitive and critical thinking skills they can transfer to real world problem-solving.

Purpose

The purpose of the design is two-fold – to act as an informative guide about each stage of the design process as laid out by the Applied Design, Applied Skills, and Applied Technologies (ADST) curriculum, and to provide an interactive walk through of the design journey via tools like FlipGrid and Google Forms.

Instructors will be able to assess progress through the documentation of student work on FlipGrid and scaffold learning via reflective prompts, surveys and quizzes on Google Forms. Peers are also able to share information on their 'grids' and provide feedback to each other. In this way, we will tap into the scaffolding framework for learning. Users can advance their learning knowledge not only by guidance from the instructor but also collaboratively construct knowledge by feedback from their peers when they share each stage of the design process.

Who is this guide intended for?

Although this guide can be used by anyone interested in learning about the design-thinking process, it will be particularly useful for instructors to aid in project-based learning in either a classroom setting or a public makerspace.

How to use this guide?

While the design stages are presented in a linear fashion, flexibility is highly encouraged. In design thinking, repeating a process to test, improve and design is critical so learners may move *backwards* several times before they move *forward* again in the process. Therefore, please use this guide as you see fit and feel free to adapt to meet your specific learning goals.

Pedagogy

As the world in education continues to change and evolve so should our pedagogies to support design thinking within maker education. In its vision for the future of education in 2030, the Organization for Economic Co-operation and Development (OECD, 2018) views essential learner qualities as the acquisition of skills to embrace complex challenges and the development of the person as a whole, valuing common prosperity, sustainability and wellbeing.

Paniagua, Istance (2018) identify concrete clusters or families of innovative pedagogical approaches, while not getting lost in the myriad of diverse teaching methods. The Six Clusters of Pedagogical Approaches identified are, Blended learning, Gamification, Computational thinking, Experiential learning, Embodied learning, and Multiliteracies and discussion-based teaching, (Paniagua, Istance 2018).

Blended learning

Is defined as rethinking established routines and sequencing of student work and teaching to enhance understanding and relies heavily on digital resources. (Paniagua, Istance 2018). Engaging in the design thinking process, students are given the provocation or assignment that they need to solve. By students constructing their own knowledge, they see themselves as the expert with the teacher and classmates to help scaffold their understanding. With our design thinking tool, it combines the online learning tool for planning and reflection along with traditional classroom methods of discussion and dissection of what is design thinking. This is changing the way both teachers and students approach learning. Creating confident, risk taking learners that are engaged with their learning.

Gamification

Exploits how games can capture student interest while having serious purpose, such as fostering self-regulation and the abilities to handle complexity and the unfamiliar (Paniagua, Istance 2018). This build on features of games such as rapid feedback, participation, and progressive challenge, as well as on the human elements of competition (Paniagua, Istance 2018). Gamification and design thinking are human-centered and respond to the students' needs which meets the need for accessibility. Design thinking points out that the prototype is not only a way to validate final ideas, but is also a creative process. In creating gamified learning objects from design thinking, the learning process now has the possibility of applying some of the

concepts proposed by empathy, prototyping and experience design. Using the design thinking tool, students will record and reflect their journey using Flipgrid. Where the teacher and fellow classmates can offer suggestions, or admiration of the students progress while completing their project.

Computational thinking

Paniagua, Istance (2018) explains that the computational thinking approach develops problem-solving by approaching a problem as a computer would and then use technology to resolve them. Our tool helps students break down the design process into steps and document it along the way. Clear documentation makes the thought process visible so that it can be revisited and evaluated with future knowledge to make it better. Within this reflection and break down students can clearly see what failed, and through fixing it and trying again students are using their critical thinking skills to find solutions and realize through the mistakes is where they will learn the most.

Experiential learning

Experiential learning occurs through active experience, inquiry, and reflection. Its four main components are:

- concrete experience that potentially extends existing understanding,
- reflective observation,
- conceptualization, and
- active experimentation (Paniagua, Istance 2018).

In an ever changing society of the 21st century, there is a demand to equip students with meta competences going beyond cognitive knowledge. Education, therefore, needs a transition from transferring knowledge to developing individual potentials with the help of constructivist learning (Scheer, Noweski, Meinel 2012). As educators, we could not agree more. To have a learning environment where students construct their own meaning, using real life problems and challenges, while being innovative is what we need to have successful adults as they leave university to enter the job world. Giving students the tools they need to enter jobs that have not been created yet.

Embodied learning

Embodied learning looks beyond the purely cognitive and content acquisition to connect to the physical, artistic, emotional, and social. Embodied pedagogies promote

knowledge acquisition through the natural tendencies of the young toward creativity and expression, and encourage the development of curiosity, sensitivity, risk-taking, and thinking in metaphors and multiple perspectives (Paniagua, Istance 2018). Our design thinking tool accomplishes this approach, where it is not a tool telling the student what they should do next in their process, but a reflection process to go through as they create their project based. They are taking what they know and constructing new knowledge through a creative process. When a student feels they are in a safe environment then risk taking becomes more natural, but by using the design thinking process they will understand that it is in their mistakes or failures where the authentic learning takes place. This went wrong, now how can I make it better, by identifying what went wrong and improving it is what embodies a risk taker within the classroom. Our students benefit from being risk takers as it displays engagement with their learning, that they are not afraid to make mistakes as they understand authentic learning takes place from learning from our mistakes.

Multiliteracies and discussion-based teaching

This pedagogical approach uses students' life experiences to create meaningful classroom activities, constructive critique to create distance from received knowledge, and encouragement of students to extend their horizons (Paniagua, Istance 2018). By using our tool to navigate through the design process teachers can easily differentiate the tasks based on their students strengths. They can use verbal or written responses or just show their work on Flipgrid using images. Letting the students decide their path on how they want to create their projects, opens up their creativity and knowledge that they want to share with others. This gives an even playing field for all involved. Students are in charge of their learning and the design process supports this.

Content Knowledge

This tool can be applied to any project and will aid the user to create the best possible end product. A user will take their design problem and with this tool, be brought through each step of the design process taught along the way to align their thinking to each design step through information, reflection, sharing, and peer review.

Our design intends to accomplish purposeful reflection throughout the design thinking process. It is intended to have a broad application across multiple content areas while using an interactive digital platform that acts as a walk through of the design process.

The content knowledge is defined below and is the minimum that an instructor should be knowledgeable about to provide ample support to students. There are two elements to the content knowledge needed for the facilitation of this tool:

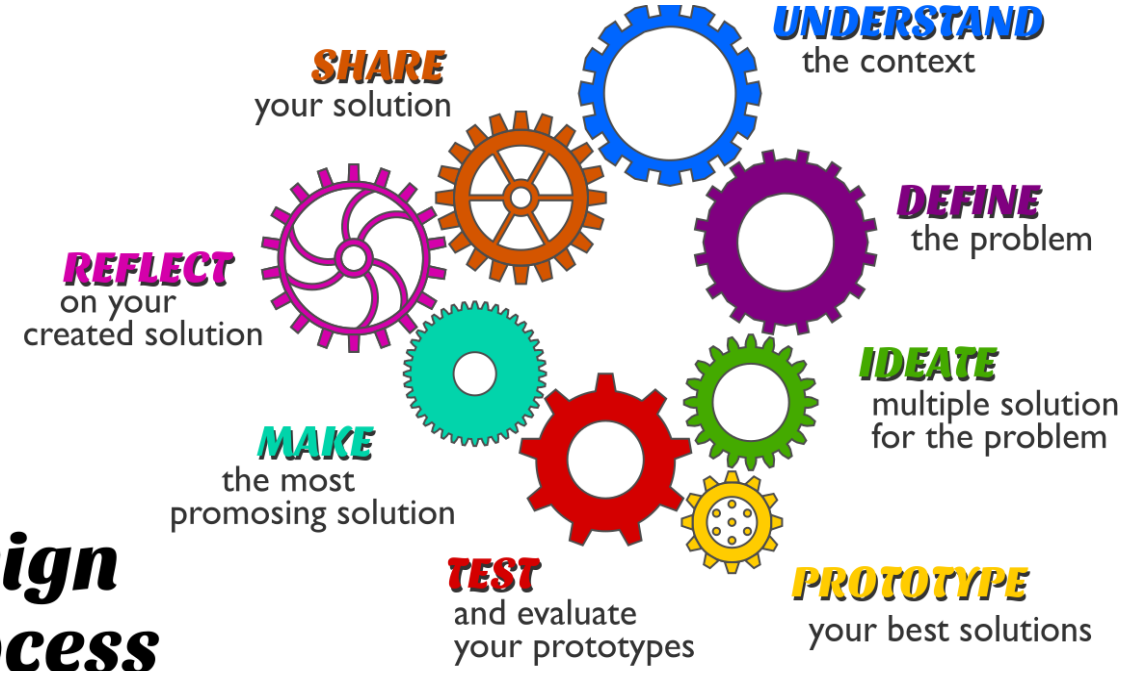
1. **Knowledge of the domain the design process is applied to**

   What you want to apply this design process is completely up to you, you have creative freedom to apply it to everything and anything from an applied science challenge to woodworking, creative writing to debate, or woodworking to soccer tactics. Whatever subject you do apply the design process to, you are responsible to carry with you the necessary content knowledge, technical skill, and technology know-how to support students through their design process.

2. **Knowledge of the design process**

   The design process that this tool uses is inspired by the BC ADST Curricular Competencies: (https://curriculum.gov.bc.ca/sites/curriculum.gov.bc.ca/files/curriculum/continuous-views/en_ADST_k-9_curricular_competencies.pdf)

The Design Process

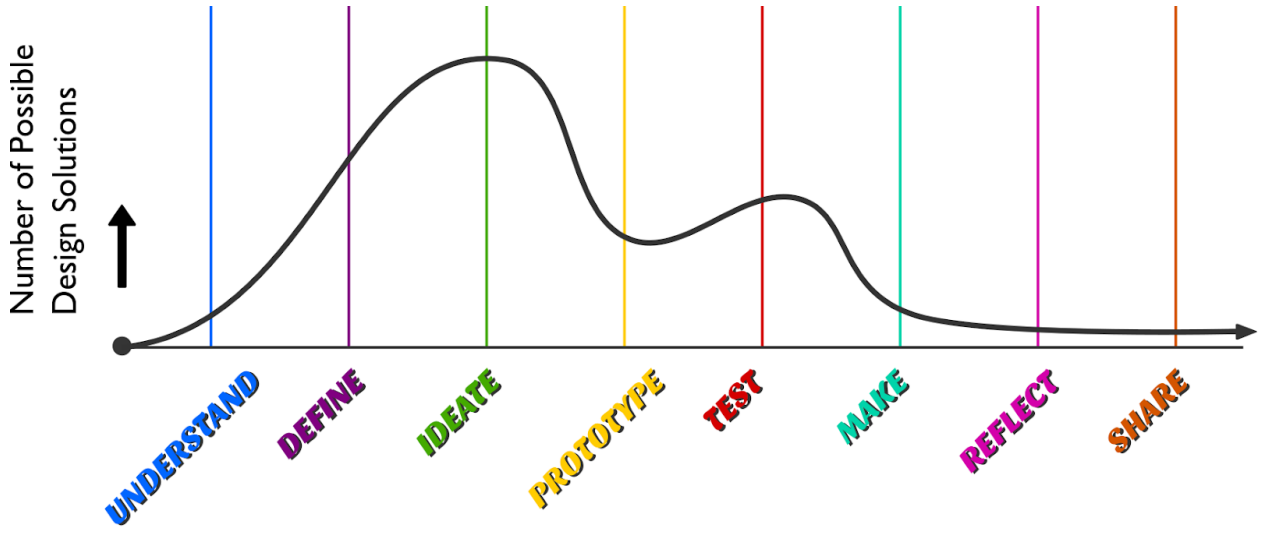


Each step of the design process emphasizes different objectives, areas of inquiry and modes of thinking. The design process demands a shift in perspective and thinking to align with what is required from each step. Below is a brief overview of the design steps:

1. Understanding context
    - Exploratory thinking
    - Understand the problem
    - Learn all context (i.e. cultural, political, economic)
    - Gather inspiration
    - Research what already exists
    - Is there a gap that needs to be filled? Why?
    - List what you already know about the problem
2. Defining
    - Create a value proposition
    - Clearly articulate the problem
    - What are the short- and long-term goals?
    - How will success be defined?
3. Ideating
    - Divergent thinking
    - Brainstorm solutions
    - Celebrate diverse ideas
    - Select the best solution

- Gather needed materials

4. Prototyping
    - Rapid making
    - What are the key parts of the design?
    - What are the challenges with the solution?
    - Follow the plan and test it out
5. Testing
    - The scientific method
    - How is the solution tested and measured against success?
    - Is the end result successful? Why or why not?
6. Making
    - Create the final solution
    - Ensure quality assurance
    - Apply technical skill
    - Discuss what can work better
7. Reflecting
    - Take a step back - how are things going?
    - Is this the best solution?
    - What could be done differently?
    - How could the solution be better?
    - Repeat steps 1-6 to make changes
8. Sharing
    - Promotional thinking
    - Presentation
    - Inform stakeholders
    - What key elements need to be considered (communication strategies, technology)?



"The Design Thinking process oscillates between divergent and convergent thinking modes. It can be helpful to be aware of the mode that corresponds to the design phase you are working through." (IDEO LLC., 2012)

It's okay to move backwards!

The design process does not need to be constantly moving forward and there are many instances where returning to previous steps are important and should be encouraged such as hitting a 'roadblock' or discovering valuable information that question previous design decisions. These iterations are important for the design process to ensure the best decisions are made (Ostafichuk, Hodgson, & Fengler, 2011).

Assessment

Formative:

- Scheduled check ins as decided by the class to assess progress as students move through the design thinking process (daily, weekly, bi-weekly)
- Peer review and commenting on at least two other classmates, providing insight and asking questions for clarification

Summative:

- Presentation of their findings using an online tool such as FlipGrid, Google Forms, etc.
- Detailed self-assessment of each step of the process (What worked well, what was difficult, goals moving forward)

The following single point rubric can be used to reflect each step of the way and as a summative assessment. This assessment is available on the webpage as a fillable PDF.

What do I still need to work on?	Steps of the Design Thinking process:	What is going well? Connect on Flipgrid
	Understanding context: ● What problem are you trying to solve? ● Learn all context (i.e. cultural, political, economic) ● Gather inspiration and research what already exists ● List what you already know about the problem ● Is there a gap that needs to be filled? Why?	
	Defining: ● Can you clearly describe the problem? ● What are the short- and long-term goals? ● How will success be defined?	
	Ideating: ● Brainstorm ideas and choose the best one ● Celebrate diverse ideas and select the best solution(s) ● Gather needed materials	
	Prototyping: ● This is a stage of rapid making ● What are the key parts of the design? ● What are the challenges with the solution? ● Follow the plan and test it out	
	Testing: ● Test the potential solutions to the problem. ● How is the solution tested and measured against success? ● Is the end result successful? Why or why not?	
	Making: ● Create the final solution to your problem based on the testing.	

	• Ensure quality assurance and apply technical skills you may have. • Discuss what can work better	
	Reflecting: • Take a step back - how are things going? • Is this the best solution? • What could be done differently? • How could the solution be better? • Repeat steps 1-6 to make changes	
	Sharing: • Present your idea to peers and key stakeholders. • What key elements need to be considered (communication strategies, technology)?	
Goals moving forward: Teacher feedback:		

Ideas for assessment questions and rubrics

- *https://www.designsociety.org/publication/40597/MEASURING+DESIGN+THINKING+MINDSET*
- *https://dschool-old.stanford.edu/sandbox/groups/k12/wiki/e04cb/attachments/8bfb7/dt%20basic%20rubric%201%20point%200.pdf?sessionID=3d3a881db7041a8d8f943914d1a5df4678223b9f*

TECHNOLOGY Knowledge

Here is a quick introduction to the platforms we will be integrating and how to use them. As the instructor, it is your responsibility to set up the platforms, ensure your students have access, and work through any technological hurdles you or your students may encounter.

The design process toolkit platform is a dual-purpose platform that can be adapted to many different educational environments. Hosted in Weebly, the website will contain resources for learners and educators as well as linking out to various tools used to enhance student learning.

Site Access

From the learner perspective a one-to-one device interaction would be ideal, although it is not always feasible. Learners working in groups can access the site via one device. Although not designed to be a mobile first platform, all Weebly sites are optimized for mobile devices and learners can access platforms via their mobile devices. Plugins such as Flipgrid are available as a mobile app.

Although ideal, one-to-one access is not always possible, however, the site can be viewed by a group of learners in a classroom environment. Where an internet connection is not stable or present, web pages can still be utilized by downloading for offline use. This can be accomplished by using a file menu available on most internet browsers.

Accessibility

The content on the site will be written with a focus on accessibility by doing the following:

- Text will be easy to read when zoomed in or enlarged
- Providing white space between each line of text
- Contrasting text and background colours
- Content written in clear and simple language
- Links easily distinguishable from surrounding text
- Providing descriptive titles for each page

Accessibility – videos

The focus of our site will be walking students through the design process. In addition to written content there may be some video content that requires sound. Some computers or user devices may not have the option for sound. For these situations the instructor can show the video to the class as a whole. Alternatively, closed captioning can be enabled for students to read videos without the audio on using video platforms such as YouTube. Closed captioning can be enabled by clicking on the CC button on the bottom right of the video

We will be integrating Flipgrid into our site. By default, all new Grids have Closed Captions turned on and all new videos automatically have Closed Captions added. Students are urged to speak clearly and reduce background noise as much as possible to ensure efficient functionality. Instructors can edit closed captions within their educator account.

Microsoft's Immersive Reader is built into Flipgrid to help young learners, students with dyslexia, and to translate text. The Immersive Reader helps students with features like reading text out loud, breaking text into syllables and increasing spacing between lines and letters

Students can include their own transcripts as an attachment link. The final step before submitting their video is that they can edit their display name, add a Title, and attach a Link. They just need a URL to a document of their transcript (Google Doc, Word online, or something similar).

1. **Text with Video** - Students participate using video on Flipgrid and they have a number of options to add text to their video submissions. In addition to attaching a text file, students can style their video with text or drawing. Additionally, students can upload a picture of their text transcript as a sticker to place alongside their video.

2. **Accessibility best practices** - Flipgrid is navigable by keyboard, works with voice-over & screenreader technology, font sizes can be increased, and other best practices for accessibility.

Google Forms

Google Forms are made accessible to screen readers IF a person using a screen reader turns on Google's screen reader support.

To turn on screen reader support for Google Forms, press **Control + Alt + z** (on Windows) or ⌘ **+ Option + z** (on Mac) when in the form.

Creating an accessible Google Form

Provide an introduction by telling your audience what the survey will be about in the description box. Activate a progress bar by clicking the cog in the upper right corner and clicking the "Presentation" tab and selecting the "Show progress bar" option. It may also be helpful to clearly state how many questions there are in the description box. If you have a lot of content, it is helpful to try and split it up into different sections using the "Add section" option shown here: Make sure to incorporate the alternative text guidelines if you are using images in your Google Form.

Privacy

Flipgrid

- Does not use personal information to market or advertise to instructors or students, nor do they permit third parties to do so.
- Does not sell user personal information.

Flipgrid does use personal information from the instructor for certain stated purposes, such as providing and improving the service and communicating with Grid Owners (but not students) about new Flipgrid features and events. The complete Privacy Policy can be found here.

Set-up Instructions for Users

As discussed, we will be integrating Flipgrid into our learning resource. Flipgrid is a free video discussion platform that helps instructors see and hear from every student in the class and foster a fun and supportive social learning environment. Instructors can post discussion prompts and students respond with short videos. To use the platform, you will first need to set-up an educator account at Flipgrid.com. From there, you will create a **Grid** for your class. Within your Grid you will post discussion prompts for your students, called **Topics**, which serve as the stimulus for your students' video **Responses**.

Step 1: Create a Grid

A **Grid** is the "home" for your class in Flipgrid, and you can create as many Grid's as you want. Within your Grid you can post unlimited discussion prompts. These are called Topics.

Grid Community Types

When you set up your Grid, you will choose how students access it by selecting a Grid Community Type.

1. **School Email:** if your students use a school email, choose this option to allow only those within your school domain to access your Grid.
2. **Student ID List:** if your students *do not* have a school email, choose this option to create a class list. Students will authenticate using a unique student ID of your choosing, which can be as simple as 2+ letters or numbers.
3. **PLC and Public:** if you are creating a Grid for adults outside your school district, choose this option to allow any person with your Flip Code access to your Grid. Participants will need to authenticate with a Microsoft or Google email in order to post a video Response.

Step 2: Add Topics

Topics are the stimulus for conversation. Within your Topic you can include anything you would like your students to reference, such as videos, links, GIFs, and emoji, prior to recording a video Response.

Discovery Library

Explore the Discovery Library for thousands of age- and subject-specific Topic prompts that you can add to your Grid. For example, check out the Conversation Starters Playlist!

Step 3: Share your Grid and collect videos from your students.

Once you have set up your Grid and created your first Topic, share your Grid's Flip Code with your students. You can also copy/paste a link to your Grid in Google Classroom, Microsoft Teams, Schoology, or whatever you use to communicate with your class.

Student Instructions

Joining a Grid

With Flipgrid, **students do not create accounts**. Educators create their Grid and then share the Flipgrid URL (e.g., flipgrid.com/**FlipCode**). Students are then prompted to join

the Grid using their school email or a Student ID. Have students check “Remember Me” so they only need to do this once.

Recording a Video

Once in a Grid students click the green plus to record in three easy steps

1. **Record a video** - Students can pause, draw on a whiteboard, or add stickers.
2. **Review or Edit the video** - trim, rearrange clips, or add more.
3. **Take a selfie** - customize the image to add style.

Students can also record their own custom video (like a Screencastify) and import to Flipgrid using the button just to the right of the record icon.

For more help, check out these great Flipgrid resources.

Using Google Forms

Instructors will have the opportunity to use google forms to create online surveys and quizzes and send them to other people.

It should be noted that any Google product would be considered non-compliant under FOIPPA, unless the school district hosts a G-Suite For Education service.

How to Use Google Forms

Computer AndroidiPhone & iPad

Step 1: Set up a new form or quiz

1. Go to forms.google.com.
2. Click Blank .
3. A new form will open.

Create a form from Google Drive

Create a form in Google Sheets

Step 2: Edit and format a form or quiz

You can add, edit, or format text, images, or videos in a form.

- Edit your form
- Create a quiz with Google Forms
- Choose where to save form responses

Step 3: Send your form for people to fill out

When you are ready, you can send your form to others and collect their responses.

Conclusion

This technology-supported learning tool is a tool for the 21st century, inspired by the maker movement. One that builds important skills for active and constructive real-world problem solving through collaborative media (Kim, 2012). Such a tool has the potential to deepen any design process and empower communities to design solutions collaboratively.

This learning tool will allow users (students in our application) to experience how a collaborative effort will do the following: produce a greater understanding of the problem itself and its context, multiple ways to solve the problem through brainstorming collaboratively, how to work through the solutions to chose the most viable solution, forward and backward analysis, creation and testing of a prototype, reflection of the processes required from beginning to end to achieve the solution and finally sharing their solution. When the time comes to share the solution we would expect a sense of accomplishment and confidence in the solution in each of the collaborators resulting from being a part of the entire process. This type of educational tool also contributes to teaching how to handle: frustration, failure, success and achievement and much more.

As we travel through our own design process of this educational tool, we expect our intentions, concepts, and scope to evolve.

> “Design itself is a process of constant education” (Pilloton, 2010).

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