Startable Insights Retrospective

Summer 2018

About the Project

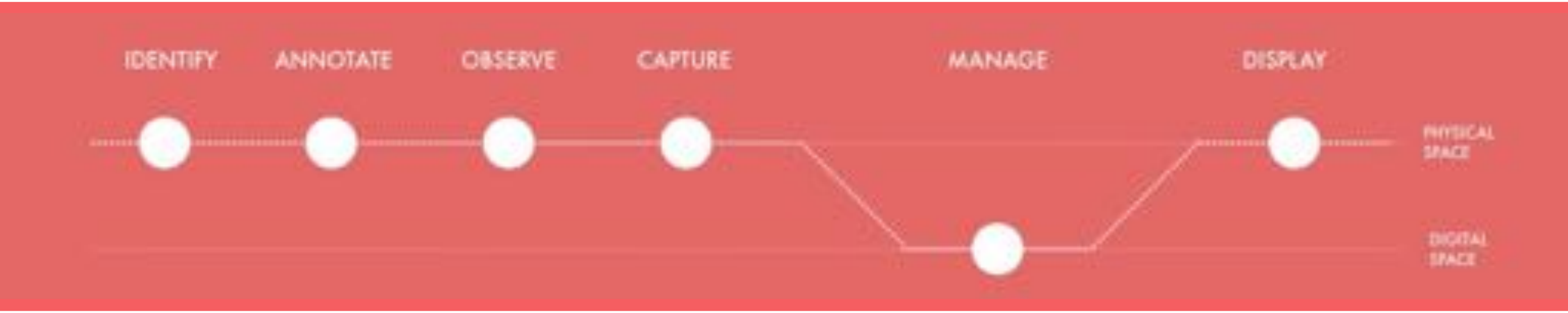
The way that students learn, use, and create technology has evolved dramatically in the past 10 years. Yet, the educational spaces we provide in libraries, schools, colleges, and universities for creative, project based learning have seen little to no innovation in decades. The introduction of **Maker technologies** like Arduinos, 3d printers, and laser cutters, enable students to create sophisticated looking artifacts, but they **are often disconnected from deeper learning processes.** The spaces and platforms need to evolve in ways that better support the children's creative inquiry and constructive learning. Drawing on arts-based practices of documentation and critique, this work will pioneer **an integration of technology, space, and education to better connect students with their creative processes to strengthen and deepen learning.** Ultimately, this exploratory project will not only develop an integrated set of situated documentation tools, but also will help us develop hypotheses for how documentation as a mediating process productively supports learning.

Our approach

Conjectures	Design Embodiment	Mediated Learning Processes	Learning Outcomes
I. In the Moment If documentation has a low threshold for enactment, then learners would document more.	**Space** Intelligent systems record traces of use and activation of space and tools by learners (time at tables, checkins, etc.)	**Noticing** Learning to attend to salient moments in performance, process, and progress.	**Fluency with Tools and Materials** Assessed by measuring ability to produce an outcome; accreditation by an expert; and indicators of craftsmanship.
	Process Overhead cameras capture time-lapse and ready-at-hand tangible buttons enable in-the-moment annotation.	**Articulating** Learning to use language and expression of performance, process, and progress .	**Presentation Skills** Assessed through presentations of work focusing on selection of appropriate examples, organization, clarity, conciseness, and completeness.
II. Retrospective If there was a low threshold for reflecting upon documentation, then learners would reflect more.	**Reflection** Video booth preserves a first-person reflective account of project work and progress towards outcomes.	**Reflecting** Learning to review, assess and use salient moments to advance performance, process, and progress .	**Motivation and Affect** Assessed by measuring identity, interest, self-efficacy, and persistence.
III. In the Community If the community had access to documentation and reflection, then there would be more productive sharing and facilitation.	**Network** Process Artifacts gathered, coordinated and reintroduced on networked displays for in-situ review and distributed critique.	**Critiquing** Learning to enact shared language to evaluate performance, process, and progress within the community .	**Practices Valued by the Learning Community** Assessed by observable evidence of self-directed inquiry, problem-solving and community engagement.

increased load for user enactment;
increased distance from production;
increased value of process data.

Technologies of Interest



As part of this work, we're interested in developing new **tangible tools** or tools that have both a physical and a digital component that can help support maker and studio-based learning through documentation. We want to explore technologies that are:

1. Situated around learning,
2. At home in a makerspace; and
3. Make documentation better

With this in mind, our goal is to create tools that help to **trace processes through in-situ documentation activities.**

We see five key documentation activities that can be better supported with new digital tools:

- **Identify**: Tracing activity, resources, and people
- **Annotate**: Marking moments in learning
- **Observe**: Recording activities as they unfold
- **Capture**: Recording made artefacts
- **Display**: Presenting learning processes in-situ

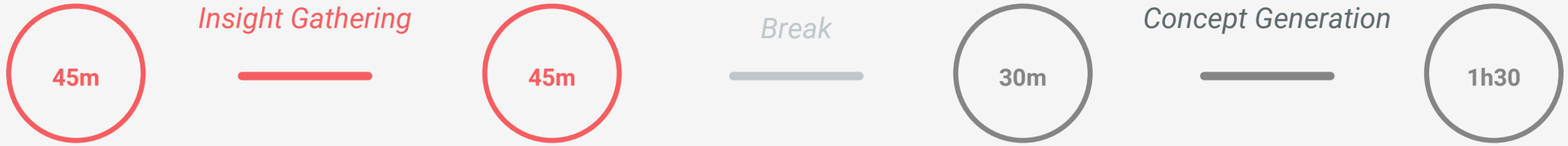
While **management** is an essential component of good documentation practice, this often occurs in digital environments. We plan to embed it in our solutions but our focus is on making documentation activities *tangible* and *ready-at-hand* in learning spaces.

About the Workshop

On Wednesday June 20th, 2018, we conducted a small workshop with Startable staff: 3 lead educators and student mentors and one project administrator and program director. As part of this workshop, we asked these participants to take part in a series of generative co-design activities to envision how documentation could support personal growth and professional development through program activities.

Participants mapped and discussed their perspective on what good documentation means to them as well as shared the challenges they faced in building a culture in their classroom that valued documentation. After reviewing a set of exemplar documentation tools, the group then brainstormed a series of potential technology-enhanced concepts to support documentation at Startable's summer program.

Workshop Process and Goals



Purpose

- Engage real world users in co-design activities in order to uncover new ideas, priorities, and possibilities for enabling meaningful documentation in learning environments.
- Identify opportunities for prototypical or probative technologies that can be deployed quickly to learning spaces to support documentation practices.
- Build buy-in with key stakeholders at test-sites and develop a shared terminology and set of project objectives early in the design process.

Intended Outcomes

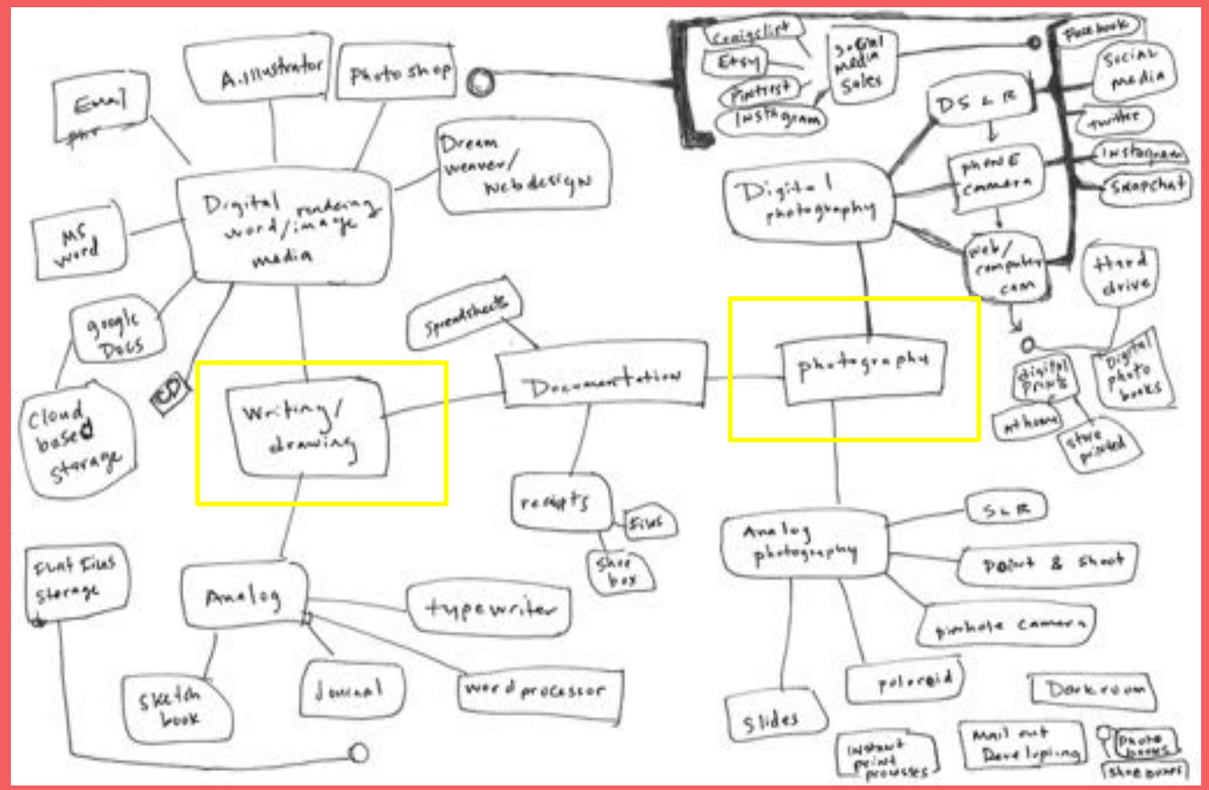
- Positively engage relevant educators at collaborating sites to participate in the design and study of smart documentation technologies.
- Establish more clarity about strategies that address the needs and concerns of key stakeholders.
- Generate new ideas for documentation technologies based on direct input from relevant stakeholders

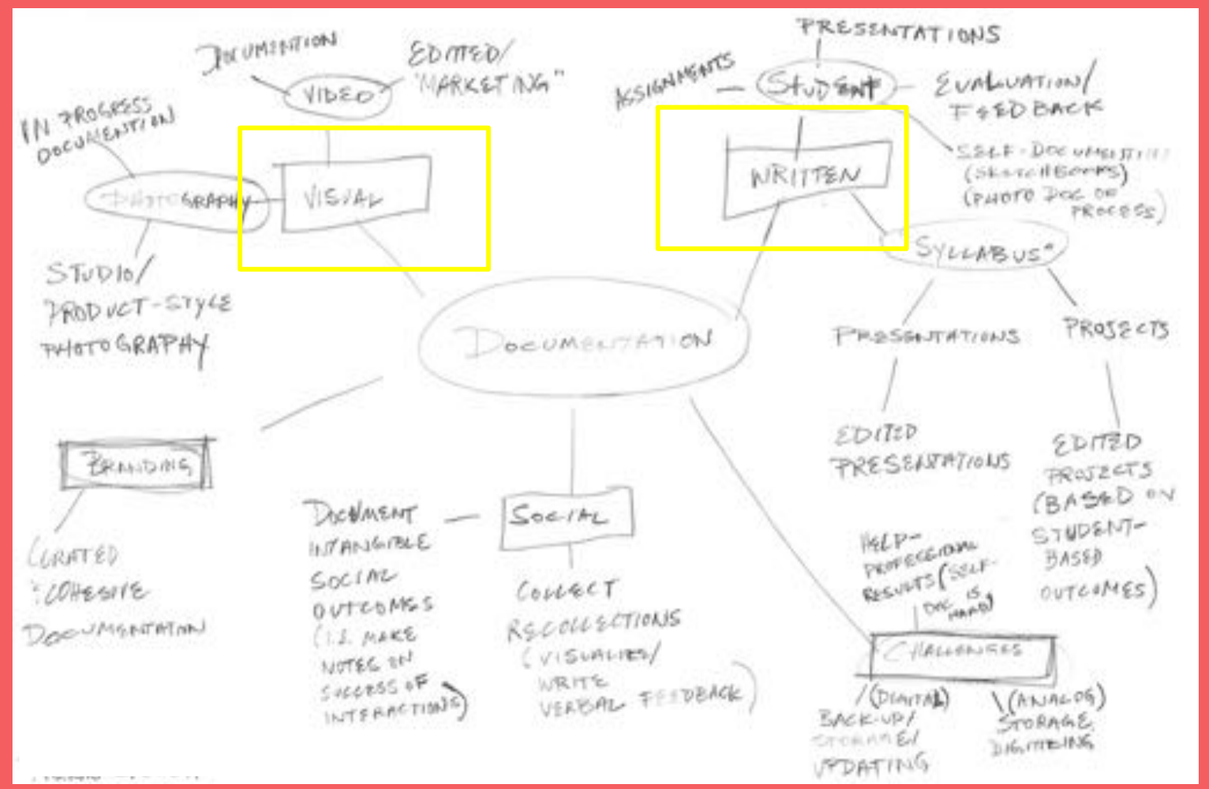
How Do You Define Documentation?

To start the workshop, participants were asked to think about documentation as a concept and a practice, and then asked to develop a mind map outlining their ideas. This activity aimed at helping the group develop a shared understanding of each person's views on documentation and the role each sees it playing in teaching and learning.

Some thematic areas that emerged include:

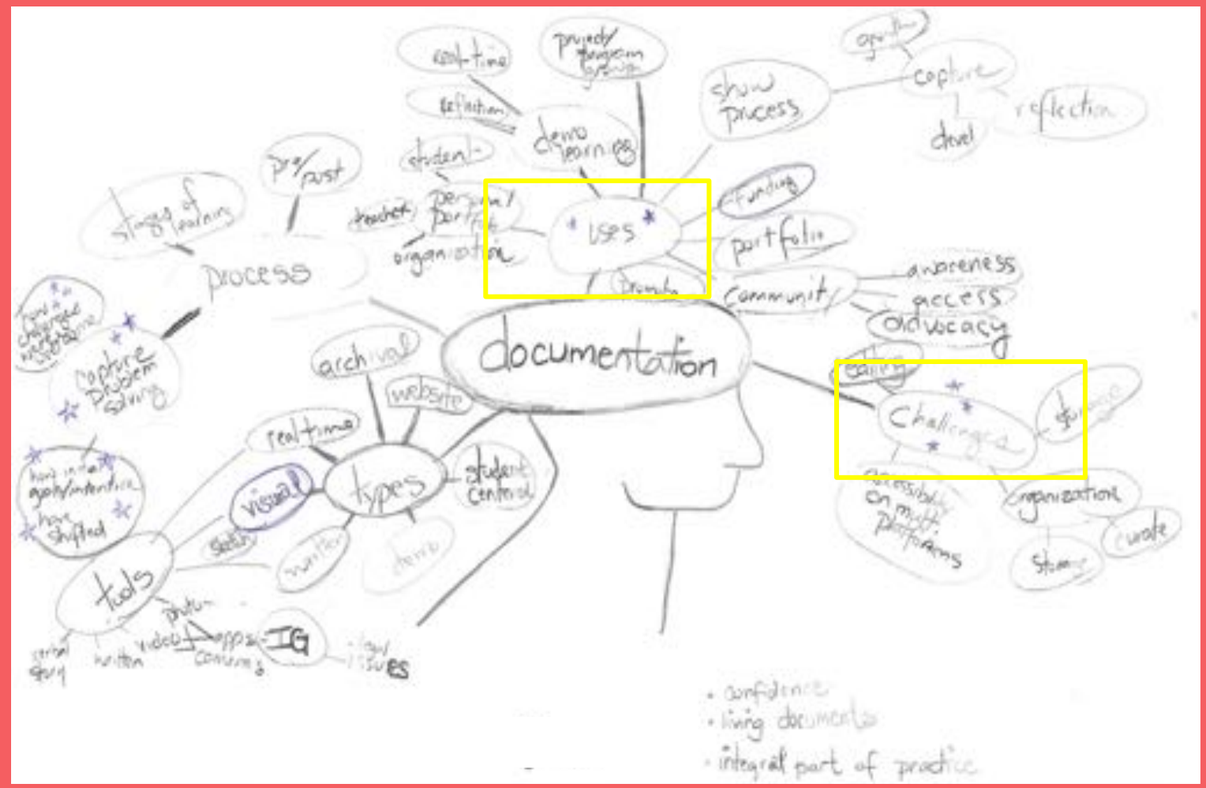
- Documentation is a word and image-rich activity that requires both digital and analog media capture, composition / processing tools, and display formats.
- Documentation is challenging on many levels including the storage, organization, and management of assets, and requires media making competencies and writing skills to achieve desired professional results.
- Documentation enables a window into student process and allows self and peer assessment of progress and critique of artifacts.
- Documentation has a social component that enables rich feedback, and can be shared via social media platforms.
- Documentation supports branding and communicates a Maker's values, craft, and creative process.

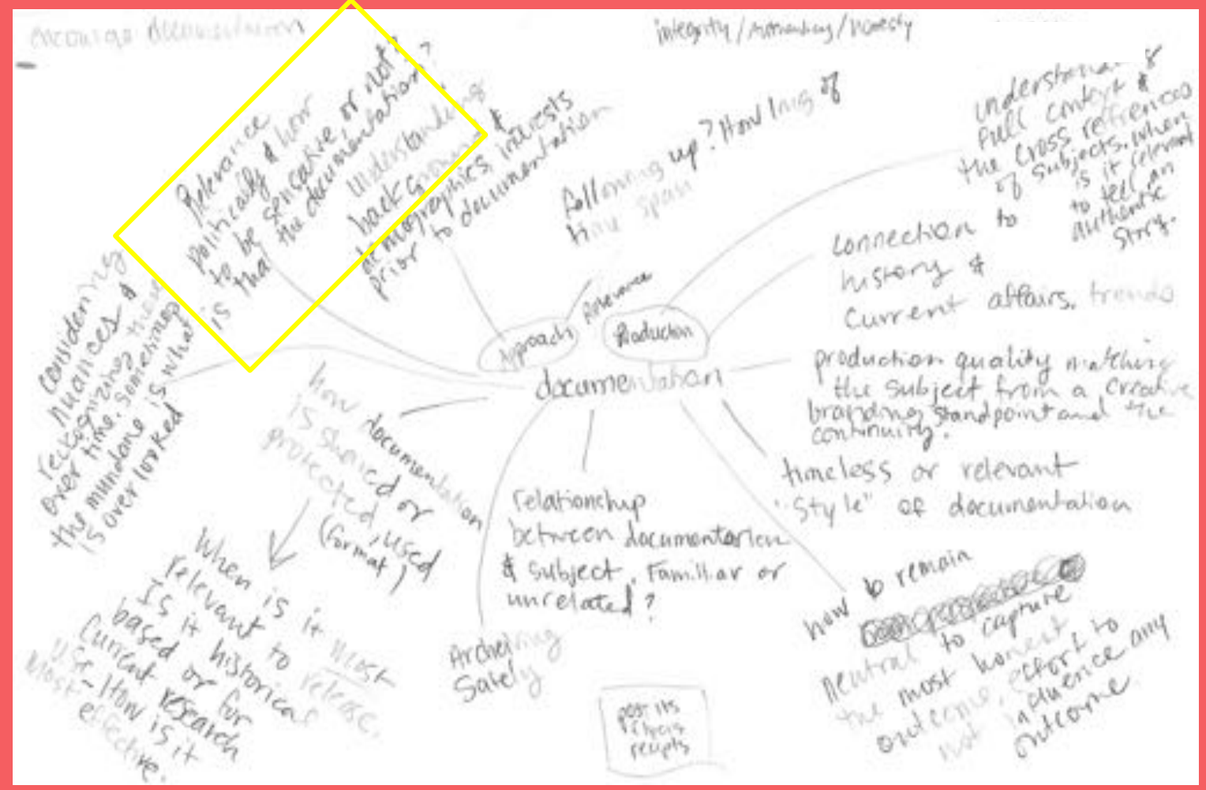




Other thematic areas that emerged from these concept maps included more socio-emotional and political considerations about how documentation practices can help foster the development of reflective makers engaging in a creative process. Some of these considerations include:

- Documentation as a vital means to support learning in project and creative studio-based learning settings.
- Enables learners and mentors to notice and flag moments of learning during process and provides evidence of growth and mastery.
- Slows down the creative process to more deeply notice and reflect on the mundane and unsaid.
- Supports being intentional about one's process and sensitive to the conditions of production and use.
- Recognize documentation has both a highly personal and private dimension, as well as public facing aspect.
- Documentation is an archival and historical reference point. Can provide a holistic view of who you are in an environment/culture over time.
- Documentation is produced with different audience considerations in mind (reviewers, consumers, admissions, employers…).
- Documentation is instrumental for different end uses and desired outcomes (an honest demonstration of learning and performance, a celebration of process, a glossy marketing effort).





Key Paint Points

As part of the workshop, we asked participants to share the key challenges they have observed to getting students to adopt good documentation practices. The goal was to learn what aspects of their teaching spaces, cultures of documentation, and infrastructure create friction for documentation. Below we highlight some of the problems commonly mentioned by this group:

- **Dedicating Time + Space:** A simple but important challenge to making good documentation happen is dedicating time and space to do it. Participants noted the benefits of having documentation stations present in the space to help make the practice visible and valued. Similarly, dedicating specific time for students to document or be guided and trained in the practice was viewed as challenging. With busy project work, it often comes as a supplement to the doing and making time for it can be hard with the pressures of student deadlines, instructional support, or curricular needs.
- **(Breaking) Flow:** While having tools at arms reach is a benefit, sometimes documentation can interrupt a learners flow: breaking them out of the process of doing and shifting them into a mode of capture. There needs to be a balance between engaged inquiry through and with materials and the reflection that documentation brings. Finding the right time to interrupt learners and inject documentation practice can be hard, especially when learners may be at different stages of their work progress.
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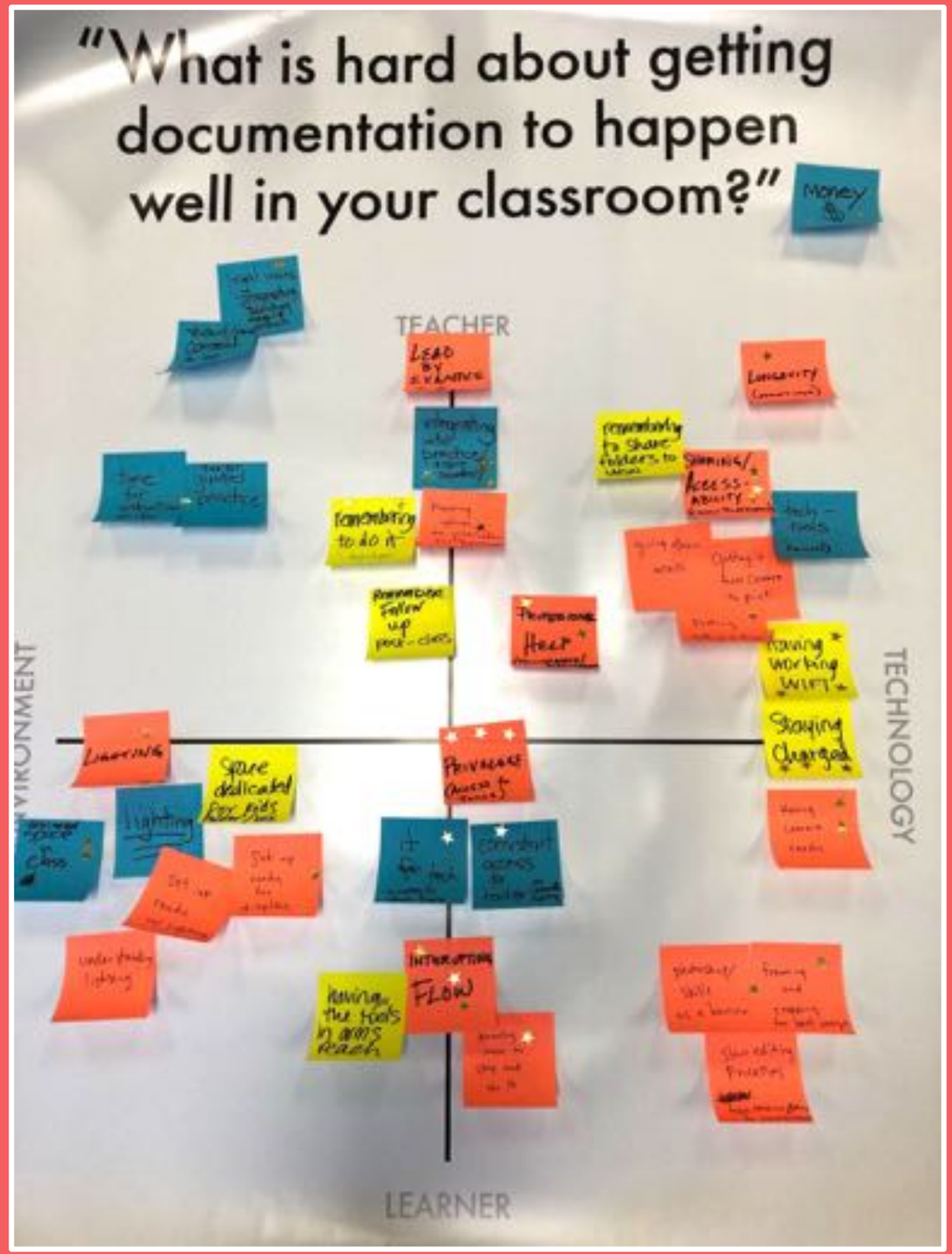


Key Paint Points

- **Integrating into Practice:** Beyond this, documentation requires effort from instructor and student alike to make it a valued part of their work process. Instructors must model good documentation for their students and remember to make it part of instruction - to lead by example. It requires integration into the classroom experience and follow ups with the students to remind them to continue and to nudge them to its value by giving them feedback on their work and progress. Simply put, it requires a lot of effort to make it a valued part of the classroom culture.
- **Professionalism:** The ambition is for students to produce high quality professional documentation that best represents their work. This requires a lot additional skills beyond those needed to complete their project, e.g. lighting techniques, photo and video editing, storytelling, etc. So to achieve this, students need the support of professionals to scaffold the process to provide room to practice and develop these technical skills - which takes time.
- **Accessibility and Privilege:** Tools should be consistently ready at hand but they rarely are. Furthermore, the expense and training needed for many documentation technologies creates issues of privilege and equity in their availability in learning environments.
- **Technology Limitations:** The tools themselves create an array of barriers for documentation practice too. Common devices like digital cameras are often not ready for capture - charged, configured, and with available storage. WiFi availability may make it challenging to move images captured from the devices into storage and finished documentation. In addition, the process of posting the raw content online or giving access to others is unduly complex in most cases. This creates a lot of bottlenecks for even experts.
- **Sharing Access:** Making data available to collaborators or instructors is challenging. There's a variety of platforms involved (capture device, phone, computer, cloud services) and a range of choices to make in where the content is stored (drive, box, dropbox, etc.) It's not always easy to see (and remember) who's got access to what folder.
- **Longevity of Access:** A related concern is that there is a lot of uncertainty around how long these platforms will maintain and allow access to documentation once stored there. Additionally, as the volume of documentation increases, it can be harder and harder to maintain and update documentation to keep it current.
- **Legal Concerns:** There can be a variety of legal issues to consider and negotiate when documentation is being used in multiple ways: for the student to show their work publicly, for the instructor to demonstrate their classroom activities, and for program administrators to promote and advertise the experience. For example, gaining permission to publish images of students (especially minors). These often aren't clear cut, taking time and effort to unpack each case.

What If...

Core enabling technologies and possibilities for maker based documentation were introduced as a curated set of videos and projects. This included RFID check-ins, celebration buttons, timelapse and camera based tech, and video reflection booths, for example. Building on this, participants were asked to share inspirational resources and speculate on how these technologies might be embedded into their learning spaces.

After analysis of the concepts presented by the participants, we identified six common themes:

1. Celebration/Reward Buttons: notice and reward important moments
2. Video Booth: ways to articulate ideas, pitches, etc. and reflect
3. Message System: capture and send critiques that can be printed and kept
4. Live Wall: display work and/or mini-challenges
5. Timelapse Video: capturing progression of work/ideas over time
6. Scribe Pen: capture analogue drawings and writing digitally, with audio

Concept Brainstorming

Following this, a set of thought provoking examples that might be applied in makerspaces and learning environments were presented. These included roving documentary robots, wearable cameras, tables that listen to conversations, and cameras that automatically transcribe what they see.

Participants were then asked to imagine new and different ways that technologies might be creatively deployed in your classroom to help improve documentation through a card-based forced-brainstorming exercise.

Design Opportunities

Summary of Concepts

Quick Wins

Celebration & Reward Buttons

A high tech celebration at a moment of accomplishment

Live Walls

Large-format displays to showcase digital work and make inspirations visible

Reflection Tickets

Capture key moments during the day to reflect on and prepare for the next step

Timelapse Lamps

Overhead timelapse video that captures students working for reflection and staying on task

New Propositions

Tangible Messaging System

A tangible output that collects comments and constructive critique from peers

Video Review Booth

A space to record first person video responses about current work and experiences

‘Modeling’ Cameras

Cameras to capture educators completing tasks for students to model and capture themselves

Annotation Cubby

A storage space that captures students’ ideas and reflections

Weird & Wonderful

Material Display

A device that captures information about material use, storage, and quantity

Floor Robot

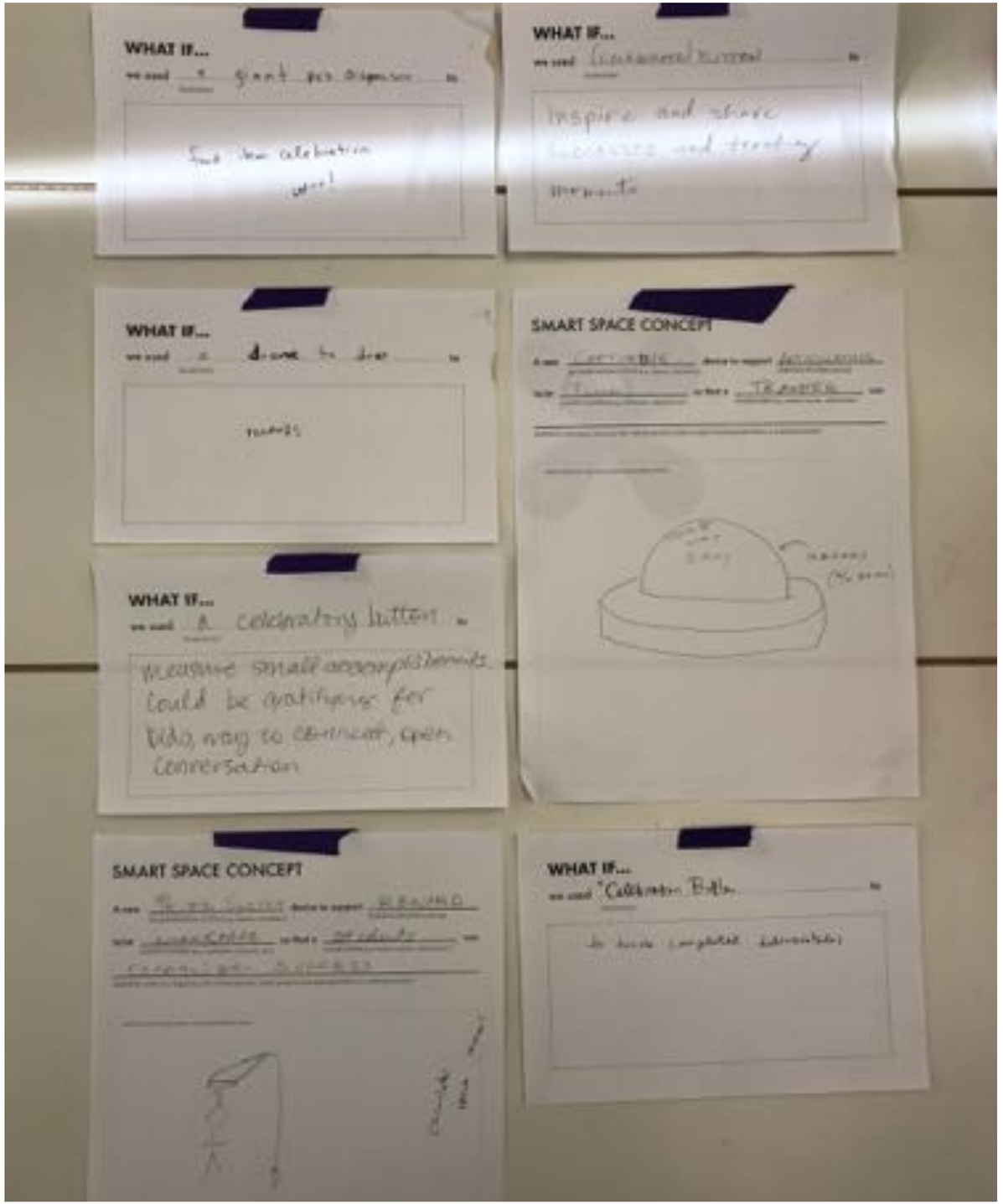
A smart device that detects waste and tracks development of waste overtime

Learner Tracker

Devices that track various student movement and time spent on task to encourage healthy work habits

Vocabulary Display

A visual display of works and language surrounding program culture



Celebration & Reward Buttons

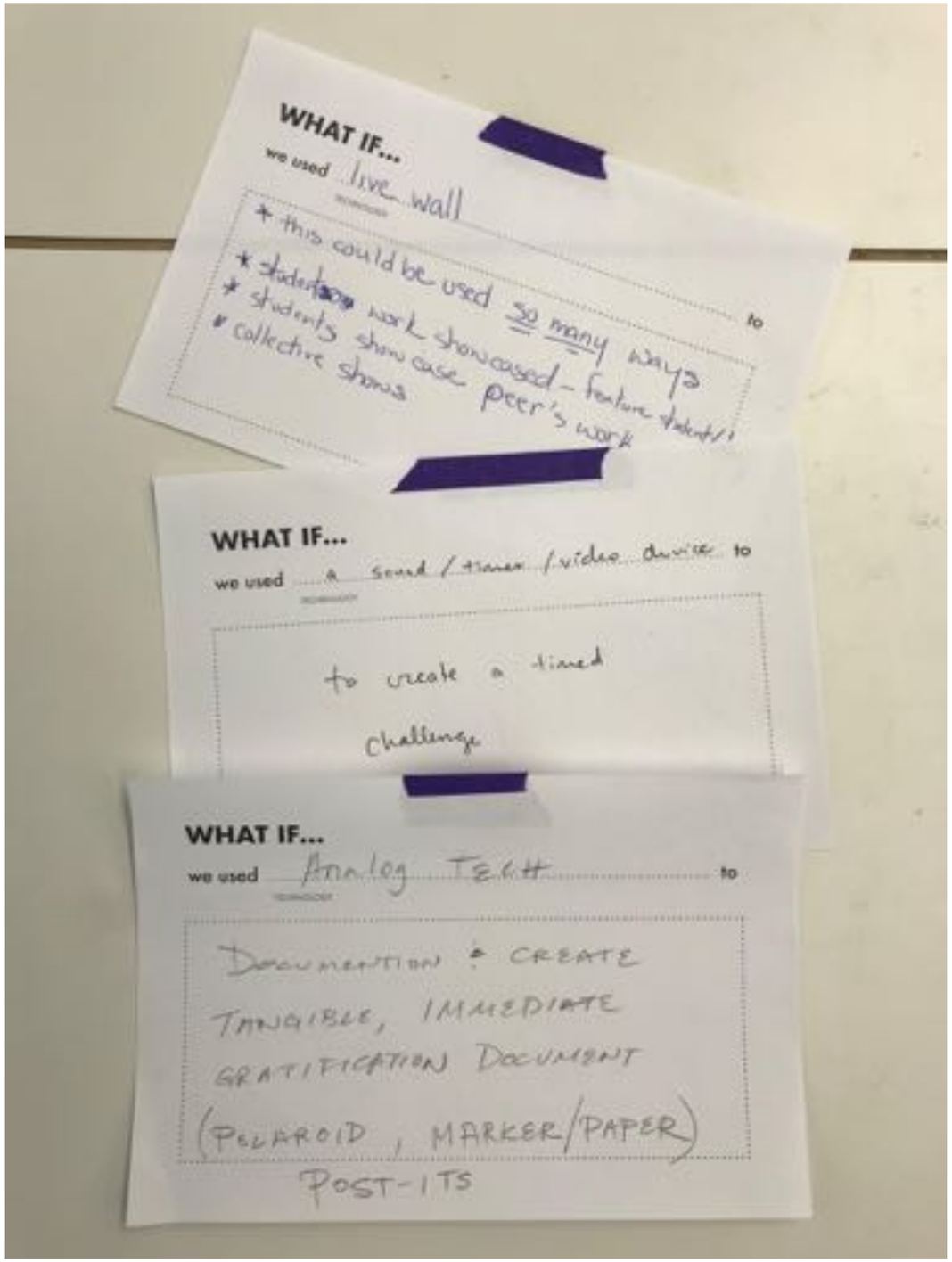
Participants **shared six concepts** that related to interactive tangible buttons. There are a variety of potential enactments of this technology - from pushing the button that records a moment of success, to the button releasing candy or rewards to the students. Whatever the format might be, at its core this idea represents a desire to make accomplishments visible, to recognize students during moments of success, and to create a culture where the learning community is attentive to and supportive of each other's wins, big and small.

Precedent Project

IDEO's Big Green Button

https://labs.ideo.com/2016/07/21/the-big-green-button

"It's attached to the wall near those massive monitors we use to track projects. When a project is complete and a team member hits it, a signal is sent to the the server where the tracking system lives. The signal triggers the system to display a random animated gif, and to play about five seconds of the theme song from The Price is Right. It's fun, it's enthusiastic, and it prompts everyone to cheer. Plus, there's an added element of surprise, because no one knows what the gif will be."



Precedent Project

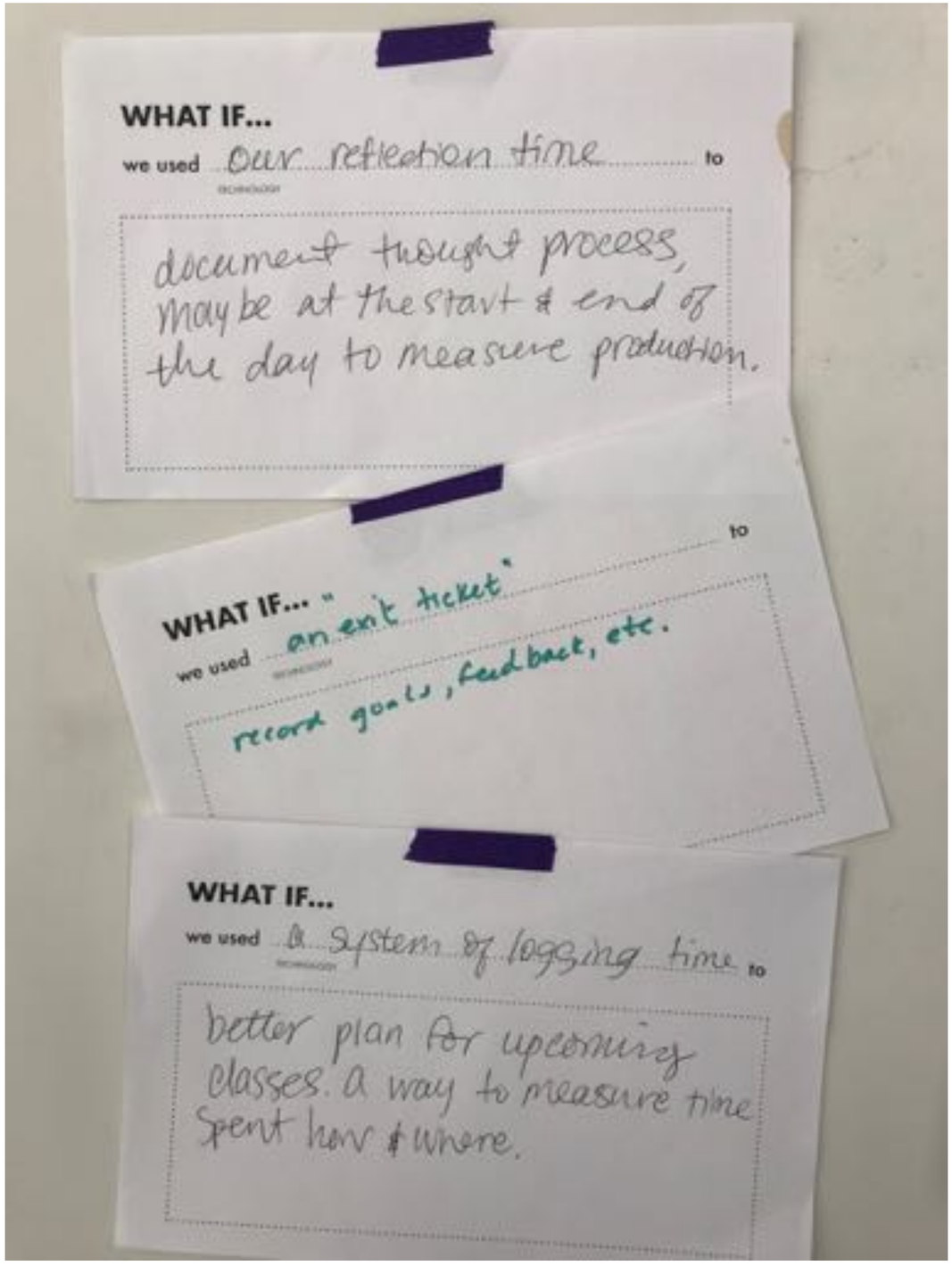
Adobe Discovery Wall

getwrecked.com/work/discovery-discovery-installation/

"Adobe wanted the experience of visiting their HQ to be something truly worthy of the Adobe Brand. So they .. design[ed] & developed] an application delivered via touchscreen video walls and video monitor arrays.... users of the Behance Discovery app can browse the vast collection of amazing creative work produced ... The application is scalable to fit virtually any size screen, or any type of multi-screen array, and has been installed in a variety of configurations within Adobe offices worldwide."

Live Walls

During the workshop the participants discussed several opportunities for large-format digital displays to enhance the learning experience. These included: a) showing a **feed of social media posts** students in the program were making; b) making progress visible by c**urating and showcasing slideshows** of milestone outcomes; c) a **countdown timer** for timed challenges; d) supplementing tangible and physical scrapbooks by showing pinterest feeds and creating shared **digital moodboards** in the room; and e) showing **feedback** on work. *There's lots of possibilities here!*



Reflection Tickets

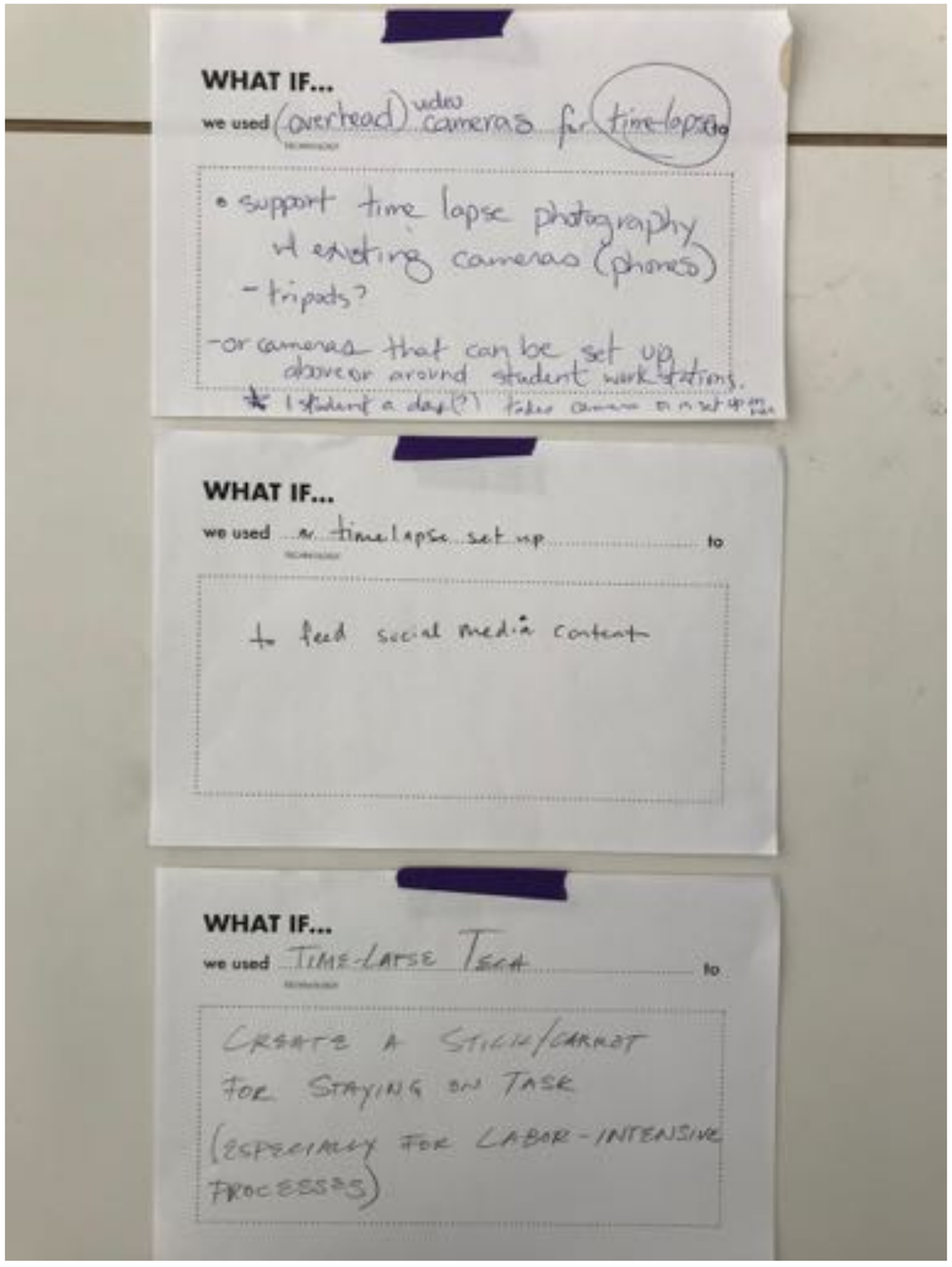
Participants gathered on the idea of introducing tools to support reflection on practice. The beginning and end of the day were seen as suitable moments where students could take time to look back over the day, examine their work and progress towards goals, as well as give and receive feedback. Built into this idea is the need to be able to a) describe and measure milestones or time on tasks; b) presenting that information back to students to foster reflection and c) mediating some time after work is completed to 'look back' over the day

Precedent Project

Memory Shapes

http://fregment.com/?cat=0&p=512

"Memory Shapes are data-generated physical objects functioning as personal memory storages which emerged from individually recorded statistics of a person. All together they form a sculpture that grows along with a person's life like some sort of arbor vitae." … "Based on the gathered information of the collectors, each shape is being calculated and custom-made. The gradually evolving archives serve as individual life documentation for oneself, for others or for following generations."



Timelapse Lamp

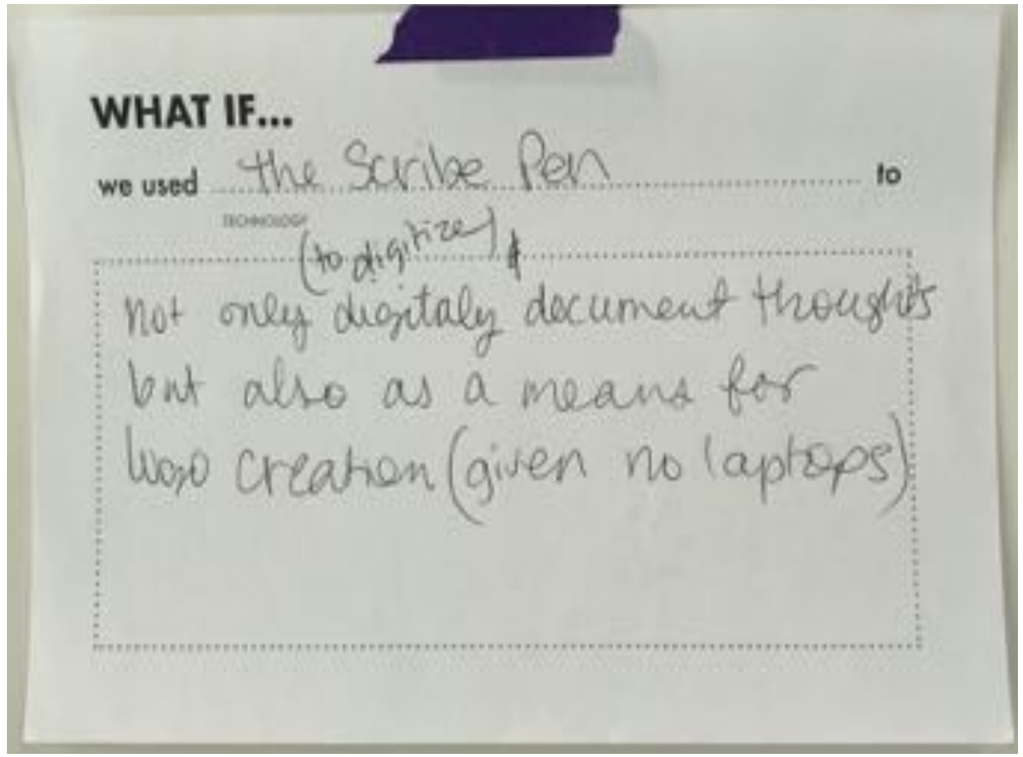
Professionalism of capture was discussed early on in the workshop as a value and a need for students in their documentation. During brainstorming, the group suggested three related ideas around overhead cameras to support timelapse capture of workstation activity and high quality perspectives on work products. The timelapse tech would be mounted above the learner while they're working, include good lighting, and allow the student agency over when and what it captured (in case they didn't want to be recorded!) The group believed this form of capture would create incentives for the learners to stay on task and give them rich content to share their work on social media.

Precedent Project

Brinno Timelapse Camera

http://brinno.com

It "performs time-lapse photography and instantly creates HD videos at 1280 x 720 resolution from the captured still images. .. Choose a time interval of 0.3 sec or select one of many intervals from 1 sec - 24 hr to see change over time, whether you're recording events, projects or the natural world. There's also a setting for shooting 3-5 photos in 1 sec. Videos are compressed into smaller files for easy playback on smart devices.



Magic Scribes

There's a lot of analog work that happens to help brainstorm, iterate, and plan work in a makerspace. This can happen in notebooks, on paper, and on whiteboards - independently or collaboratively between peers and/or instructors. This work is necessary and helpful but often needs to move into a digital space, e.g. sketching a logo will move into illustrator, or project brainstorming on a whiteboard might get moved into a project plan document. Digitizing work is helpful but cumbersome. The group imagined that new tools could help digitize learner's sketchbooks and notes to seamlessly move them into digital spaces.

Precedent Project

Conversnitch

https://vimeo.com/87564506

"A small device that automatically tweets overheard conversations..."

"A small "light bulb" plugs into any standard fixture, and via a microphone and wifi connection audio is streamed to Amazon's Mechanical Turk, where it is transcribed by anonymous workers and posted to Twitter."

Build is less than $100, resembles a lamp and integrates into any space seamlessly.

Precedent Project

Livescribe Pens

https://www.livescribe.com/en-us/smartpen/

Designed to work and write like a premium ballpoint pen, the Livescribe 3 smartpen uses Bluetooth Smart to send everything you write to your smartphone or tablet.

Livescribe notebooks feature an innovative dot pattern that tells the smartpen precisely what you've written or drawn. Livescribe paper is available at competitive prices in a variety of sizes and styles, and can even be printed for free with a laser printer.

Precedent Project

Turtle Mail

https://aedreams.com/turtle-mail/

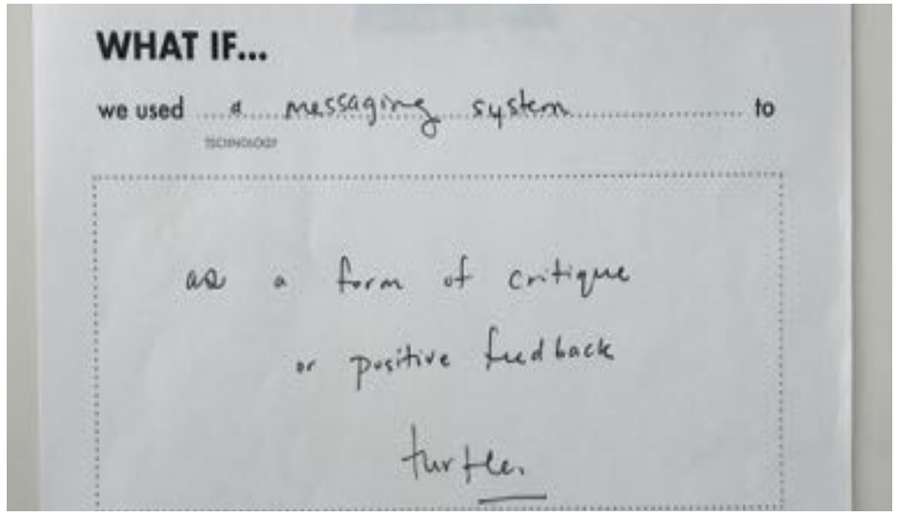
Turtle Mail is a wooden mailbox for kids. It contains an embedded thermal printer and is WiFi connected. Family and friends can send the children they love special messages from a mobile or desktop device. Parents can also sign their children up to receive daily activities and subscribe to content from fictional characters and toys.

Precedent Project

Little Printer

http://bergcloud.com/littleprinter/

The $199 Little Printer was launched in 2012 as a cute way to deliver news and messages using a small, desktop printer. The device built a small but loyal group of followers due to its perpetually smiling face and expanding collection of news, puzzles and other messages that it would print out on a regular basis. Among the daily print-outs on offer, the Little Printer could print out your Facebook News Feed, Instagram feed, or top headlines from The New York Times.

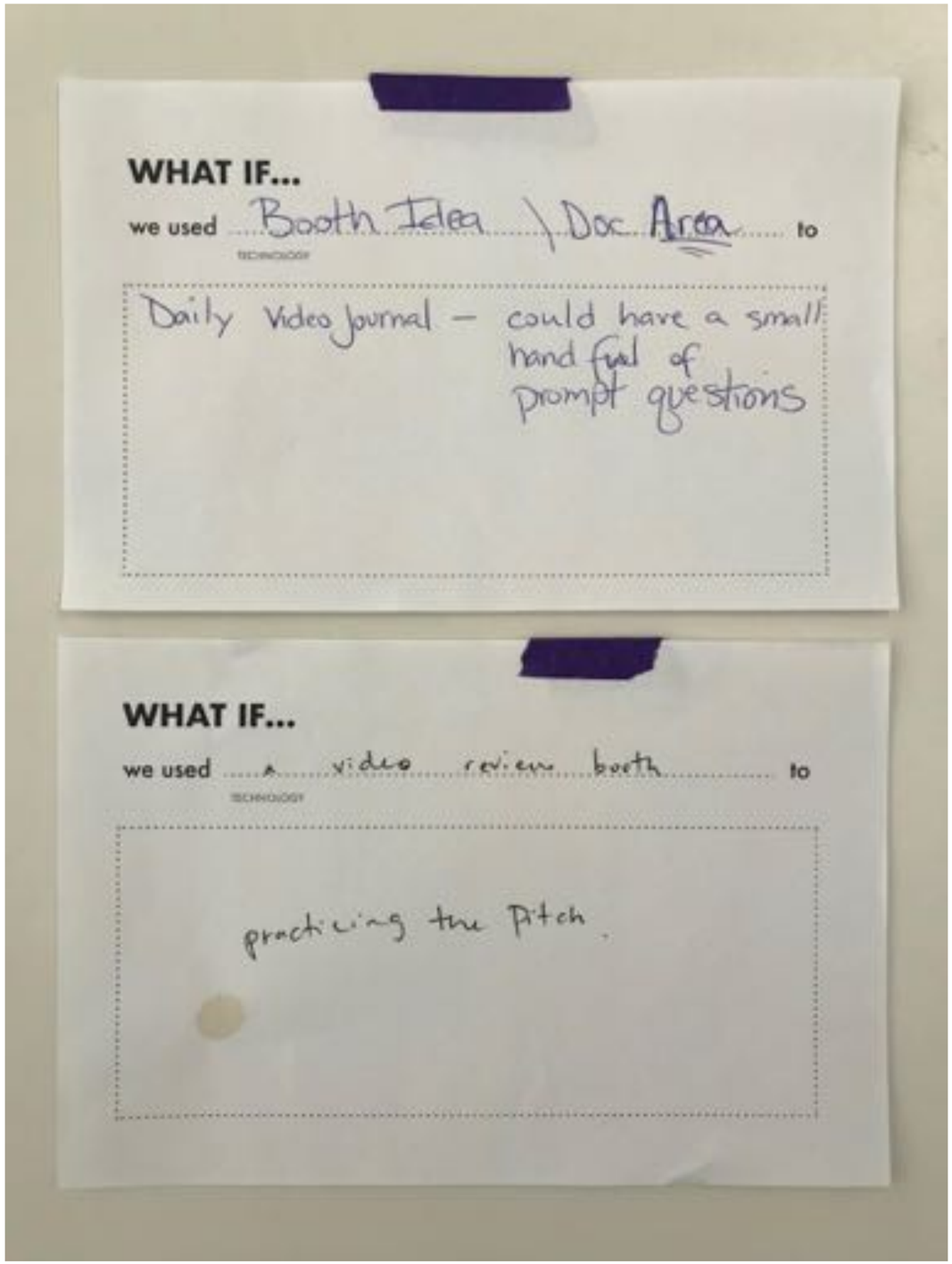


Tangible Messaging

The group suggested that learners could use a thermal printer or mini-printer system for feedback on work and process.

At a time of convenience, students could share feedback on another person's work. Each morning the printer would (potentially anonymously) deliver this feedback when the learner arrives. This would give a means for responsive, regular feedback without the pressure of formal critique or review of work as a group in-class.

Sidenote: The group discussed the potential waste from a system like this. It could generate lots of unused paper. Additionally, it was noted that thermal paper is often environmentally unsound. If produced, we should make sure its BPA and toxic free.



Video Review Booth

A big part of the Startable experience is being able to explain your work. Participants suggested that it would be helpful for students to have a place where they could practice their pitches, watch or hear back how they presented their work and use this to refine over time. *An alternative suggestion* was to make this practice part of a daily exercise where students would be prompted with a small number of questions. Over time this would help them see how their work is developing; as well as how they explain their work at various points.

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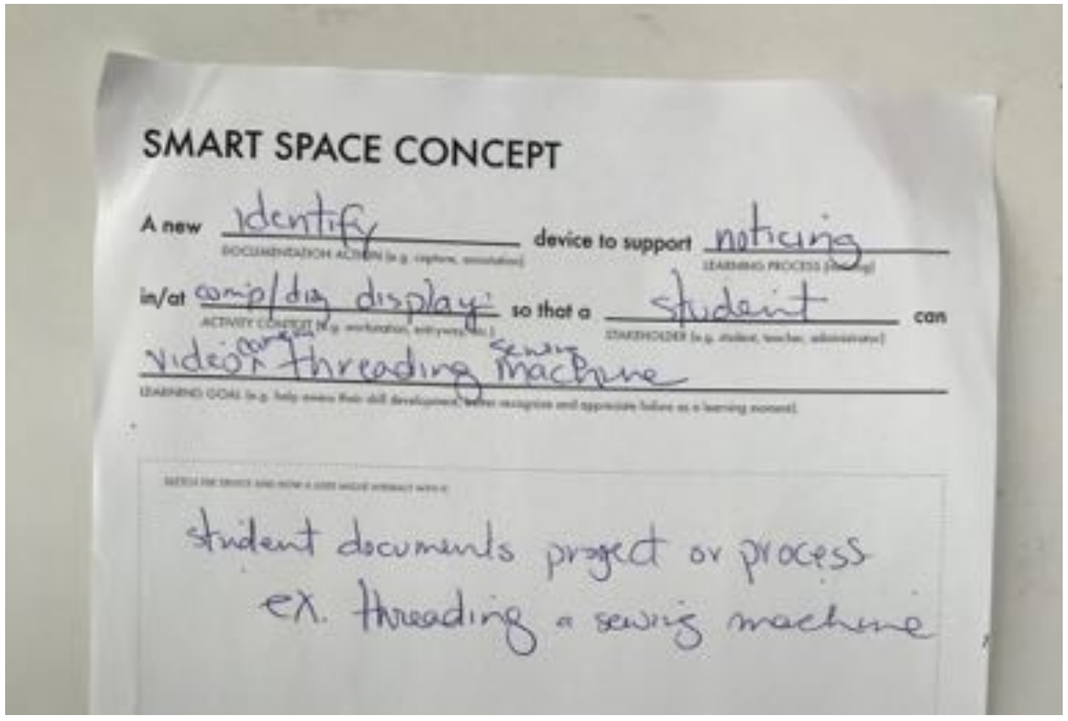


Precedent Project

Snapchat Spectacles

https://labs.ideo.com/2017/06/14/how-we-did-it-snapchat-enabled-safety-goggles/

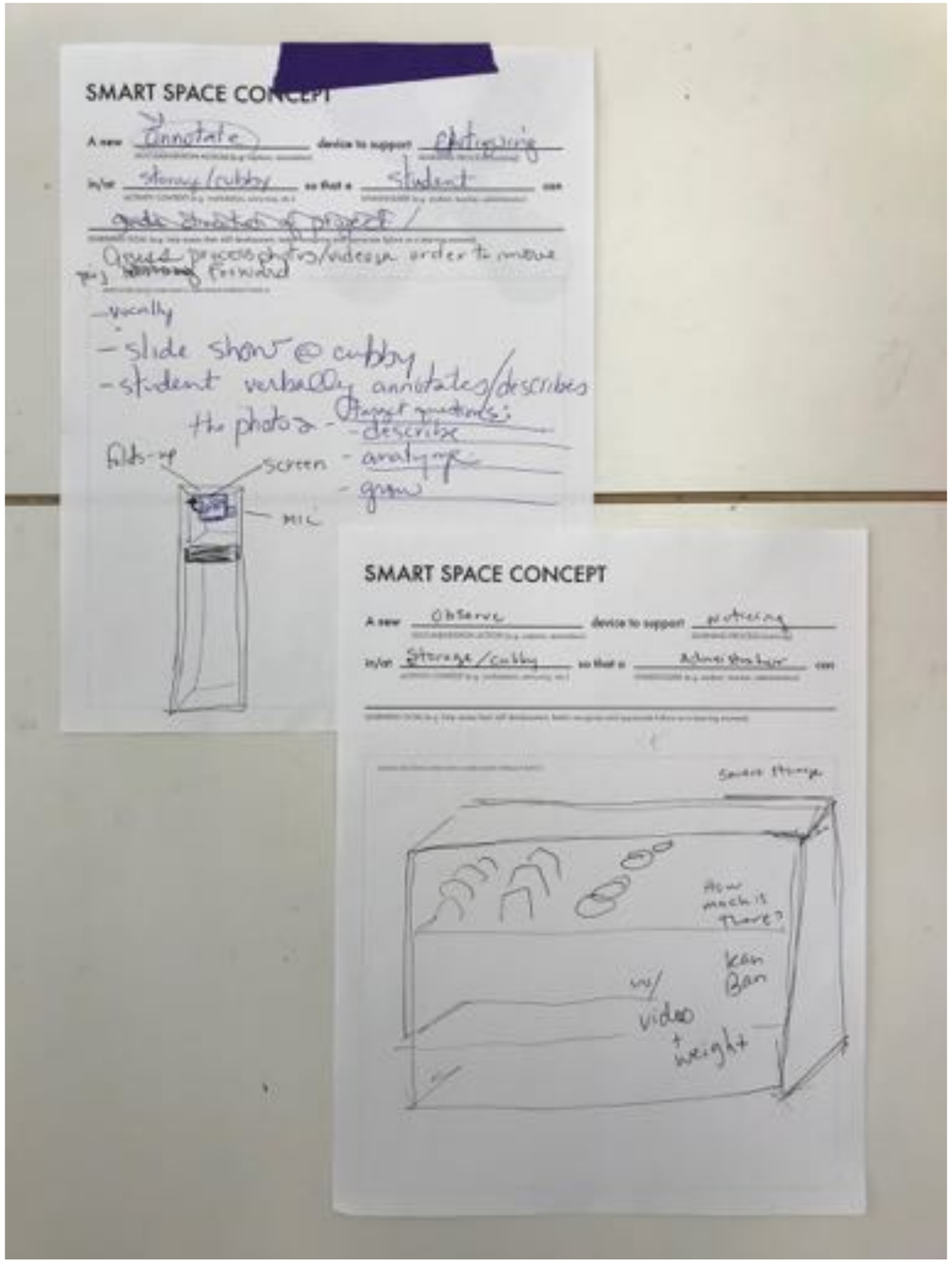
These spectacles have a built-in camera that can record up to 10 seconds of video from the viewpoint of the wearer. Dave Vongle of IDEO hacked them to become shop safety goggles: *"If I could modify Snapchat's Spectacles into a pair of safety goggles, I could document our projects without ever picking up a camera." This lets them easily post work in progress, save videos for documentation, and create structured build logs and instructable guides.*

'Modeling' Cameras

It was noticed by one of the participants that when they 'modeled' activities for learners - like threading a needle - that learners would often use their cellphones to record the experience. This allows the learners to review the demonstration on their own time (e.g. at home), and refer back to it when they need to put it into practice for themselves.

Performing and modeling skills is an essential part of learning new skills, but it's not always easy to capture and make available. Having a resource, such as a first person video of the ideal enactment, would be incredibly helpful.

The suggestion is to use wearable cameras so the instructors can take point of view (POV) demonstrations of key skills *and* the students can capture and assess their one enactment of it.



Annotation Cubby

Storage spaces (like cubbies and resource lockers) were seen as opportunities for documentation too.

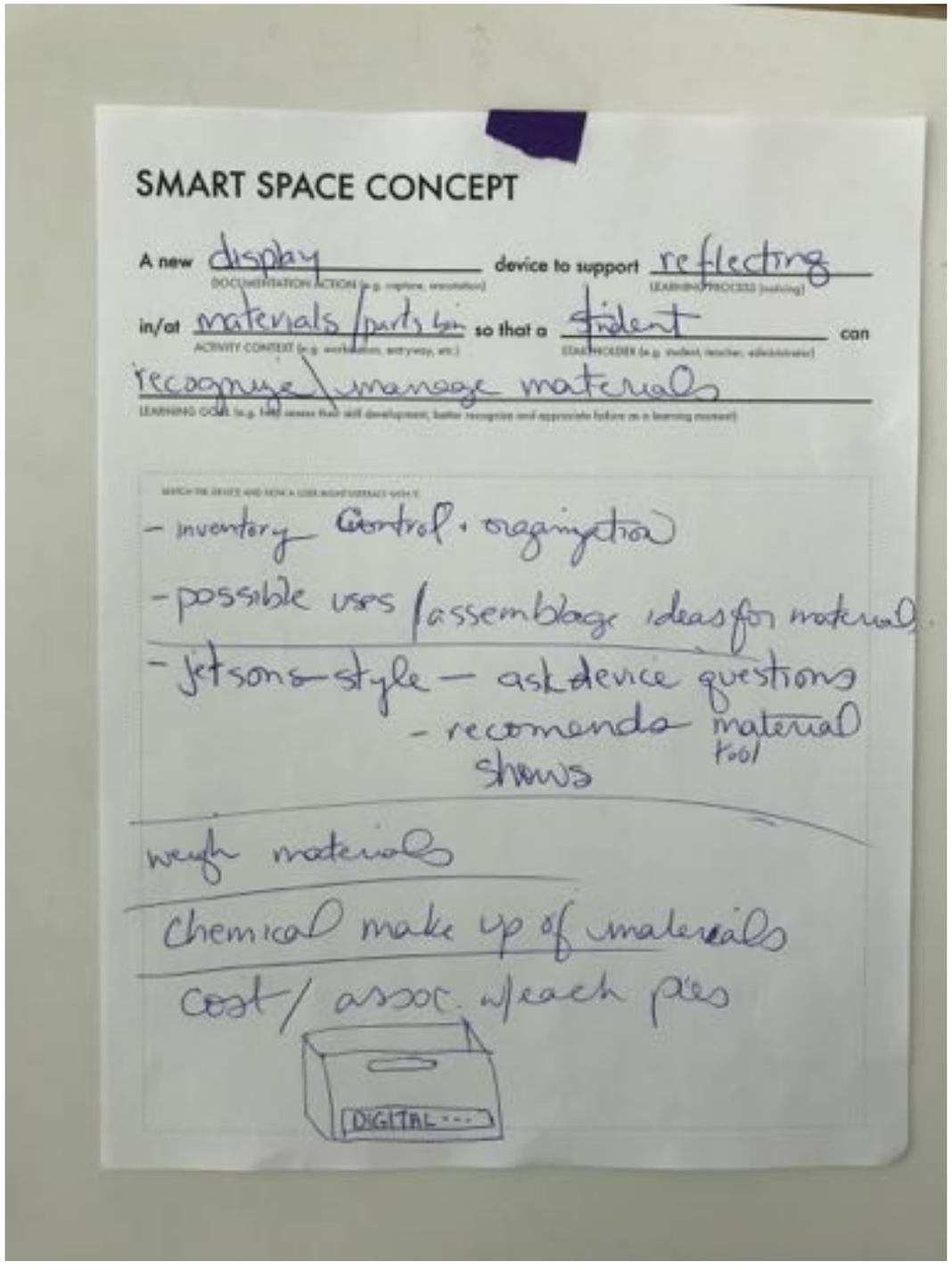
One suggestion illustrated a smart locker. When project work was placed back inside the locker, it would automatically capture the work (to help show how it's developed) and engage the learner in a conversation about what they produced during that work session. Another suggestion saw an opportunity to encourage noticing of what resources were available and how these resources could be used within their projects.

Precedent Project

RFID Smart Cabinets

http://www.southwestsolutions.com/

"Medical device inventory control is easily accomplished with RFID Smart Cabinets for procedure room storage. Logitag RFID Smart Cabinets allow hospital staff to know when medical devices are checked out, what patient used a device, and the expiration dates of devices to better manage costs. From Smart Cabinets to RFID medical supply inventory systems, we can help you design and install inventory control systems in make your medical facility efficient"



Material Display

The material display was seen a way for students to identify potential project resources. The system would track inventory and their organization. Then as a user wants to work on a particular project it can recommend suitable (and available) materials. It could also suggest possible use cases and precedents that would be relevant to the project the student wants to develop. In this concept, the system blends inventory management with a recommender system that can account for material qualities, costs, and other factors the student may need to consider for their projects.

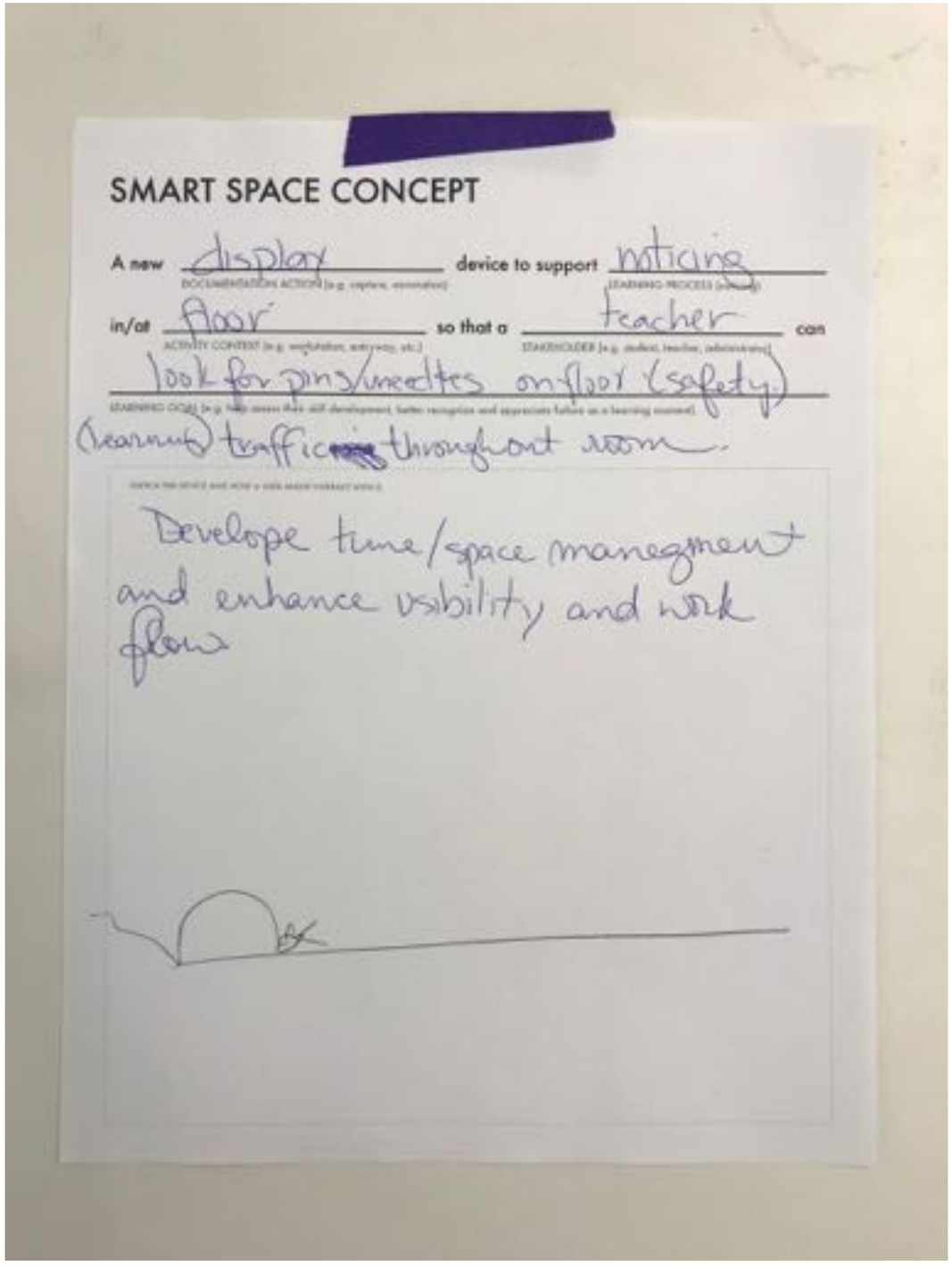
Precedent Project

InvenTower

https://www.inventower.com/

Inventower installs a series of LEDs along parts bins and storage racks. Searching the inventory system then allows you to highlight and locate where relevant resources are in physical space: the lights below the item turn on!

The Carnegie Mellon IDEATE physical computing lab uses InvenTower to add smart searching to two walls of electronics components.



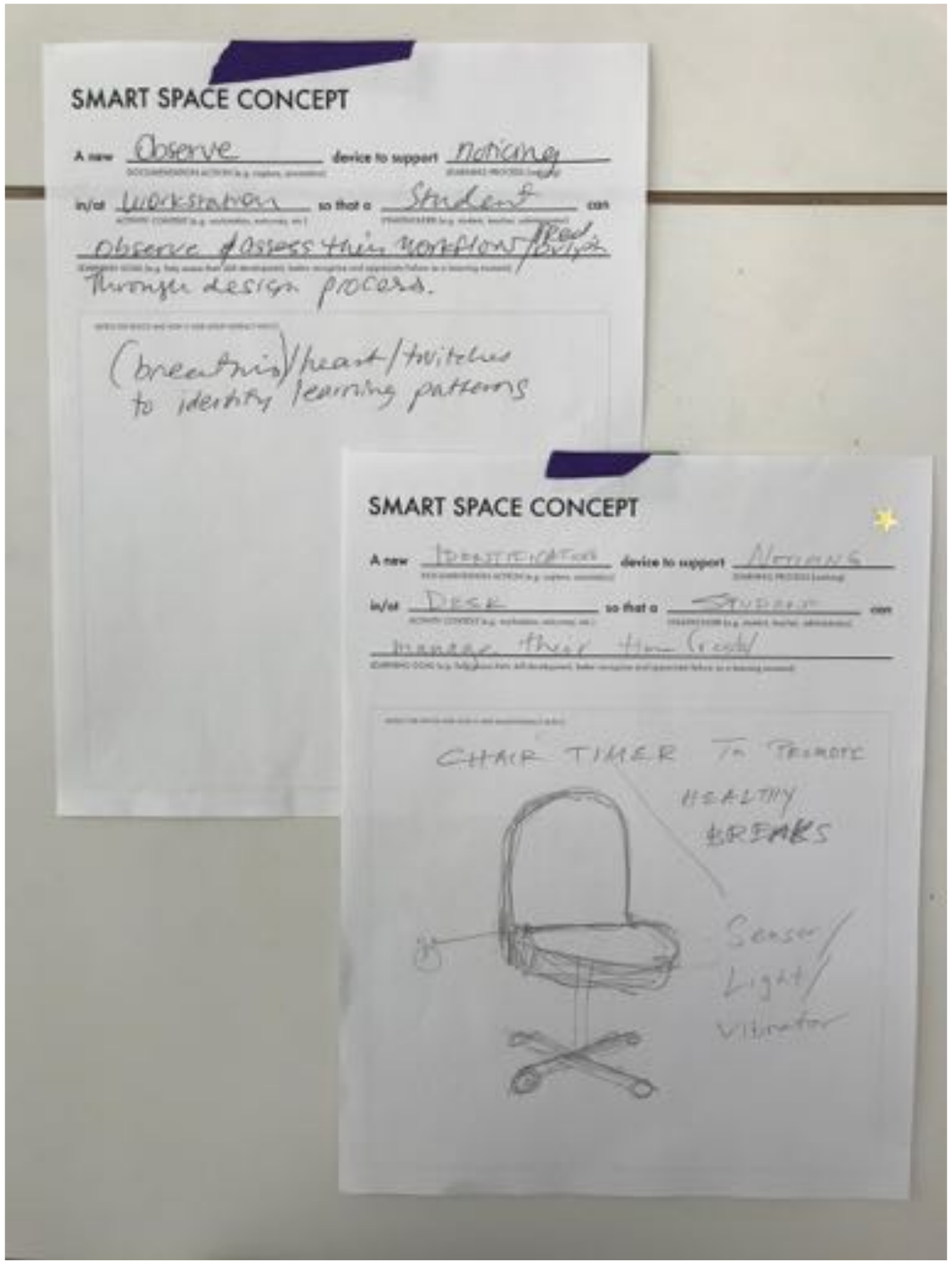
Floor Robot

A playful concept suggested that a roving floor robot might 'look for pins and needles on the floor' to create increased safety for people in the space. It was also suggested that it could learn the traffic patterns in the room and be a resource for illustrating the flow of activity within the workspace. Perhaps not the most practical concept, but it highlights some important needs and considerations within the space: a) small items often find their way to the floor and these are potential hazards that need to be attended to; and b) the spaces are busy and well traversed; highlighting how the physical space is navigated could offer an insightful perspective.

Roomba, 2014-date

Precedent Project
http://roomba.com

Roomba is a series of autonomous robotic vacuum cleaners sold by iRobot. Introduced in September 2002,[1] Roomba features a set of sensors that enable it to navigate the floor area of a home and clean it. For instance, Roomba's sensors can detect the presence of obstacles, detect dirty spots on the floor, and sense steep drops to keep it from falling down stairs.



Learner Tracker

Self care and self regulation of work practices was explored in two concepts. Students often engage in unhealthy work behaviors potentially working for long times without taking a break. The desk and the chair could assist in monitoring these behaviors to help the learner better manage their time and find a balance between work and breaks.

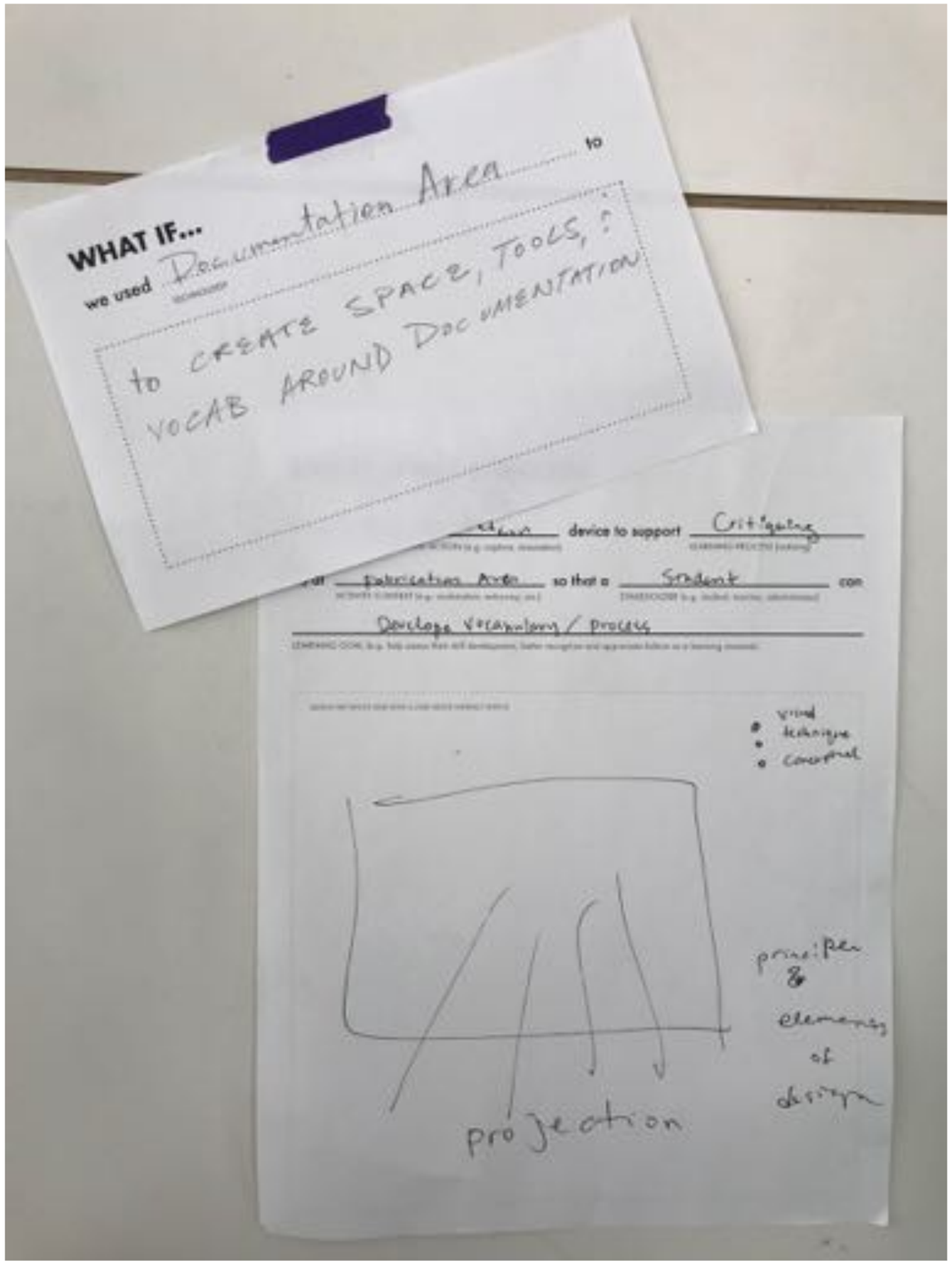
These indicators (time spent sitting, breathing, heart rate or even fidgeting) could also be valuable measures to better understand how students are learning and responding to new instructional material.

Precedent Project

Breakaway

http://dx.doi.org/10.1145/1056808.1057063

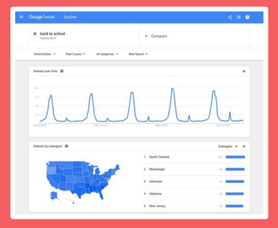
“Breakaway, an ambient display that encourages people, who... sit for long periods of time, to take breaks more frequently. Breakaway uses information from sensors placed on an office chair to communicate … how long the user has been sitting. Breakaway is a small sculpture placed on the desk. Its shape and movement reflect the form of the human body; an upright position reflecting the body's refreshed pose, and a slouching position reflecting the body's pose after sitting for a long time.”



Vocabulary Display

Two concepts centered on the desire to help students better articulate their work. Students new to practices or skills need to be oriented to domain specific terminology as well as the names of materials, tools, or even processes.

Understanding these labels helps a learner identify with those skills, as belonging to a maker community. It can help with building self-confidence and can help them better communicate their work to outside experts as part of feedback.



Precedent Project

Google Trends

https://trends.google.com/

Google Trends shows what words, terms and ideas people are searching for. These concepts could be linked inventory or instructional resource searches to develop a lexicon for a makerspace.

Precedent Project

Semantris

https://experiments.withgoogle.com/semantris

An AI experiment that lets you talk to books and test word association skills.

Selecting Concepts for Development

Presenting Back

Outcomes from the initial co-design workshop were reviewed. The design team synthesized pain points and explored concepts generated by participants. This was authored into an initial draft of this report.

Each concept in the previous section was then presented back to the Startable team in a 1 hour review session. This session recapped and summarized design needs and insights. It also asked participants to explore the 16 concepts in more detail by articulating the value it would create, how it would be used, where in the space is would be located, and suggesting scenarios of use.

The conversation generated additional design requirements for Startable. These are next reported.

In addition, the group identified seven of the sixteen concepts as particularly relevant to their needs. They also identified several affinities, potential relationships and synergies that could be explored between concepts.

This section will present out the **design needs,** and present a **conceptual design** and storyboard for the eight selected concepts.

Quick Wins

New Propositions

Weird & Wonderful

Checklists - button and tickets could tick off to-dos
Both are about acknowledging accomplishments
Receipts of what's done, are like sticker stars...

It has to be curated & managed

Create bottom up incentives for posting to social #startablepgh

Tracking wins and showing stage of the process

Important to showcase what they are doing

Can it link to weekly challenges and rewards?

Photo and video too!

Celebration & Reward Buttons

A high tech celebration at a moment of accomplishment

Make it subtle / not intrusive

Live Walls

Large-format displays to showcase digital work and make inspirations visible

"great for pitching"

Video diaries could link up to the live wall

Reflection Tickets

Capture key moments during the day to reflect on and prepare for the next step

Students can demonstrate what they're working on / skills they're learning to the class

Timelapse Lamps

Overhead timelapse video that captures students working for reflection and staying on task

Both also help instructors. First-person v. overhead may be better for demonstrating different kinds of skills and tools

Tangible Messaging System

A tangible output that collects comments and constructive critique from peers

Video Review Booth

A high tech celebration at a moment of accomplishment

'Modeling' Cameras

Cameras to capture educators completing tasks for students to model and capture themselves

Annotation Cubby

A storage space that captures students' ideas and reflections

Needs to be a professional rig

Material Display

A device that captures information about material use, storage, and quantity

Floor Robot

A smart device that detects waste and tracks development of waste overtime

Mirror to see clothes 'live'

Seeing yourself through media

Learner Tracker

Devices that track various student movement and time spent on task to encourage healthy work habits

Giving back and building resources too. About spreading the knowledge

Vocabulary Display

A visual display of works and language surrounding program culture

"Best way to learn is to teach it"

Design Needs and Considerations

The following important needs were shared by educators during the feedback session. These summarize a range of general considerations that apply to any proposed intervention.

- **Immediate Feedback:** In both sessions, there was a perceived need to increase the visibility where students were in their work process from hour to hour and week to week. Given the short time frame (8 weeks) and the pace of production, creating mechanisms for responsive feedback and visibility in this hectic environment are key: *"... jumps out at me as something that was the most important, being able to have immediate feedback"*

- **Build into Value Systems already offered:** Startable already has well developed mechanisms for rewarding and motivating students, e.g. challenges, rewards spreadsheet, etc. Solutions should augment and incorporate these practices rather than invent new approaches:
"Something that we've been doing, we gave the kids two hundred dollars in supply money and then told them they could earn more. And we've been doing it a couple of ways, we've been having challenges where were like "OK we're going to do a dunk and dive challenge. We're going to do (inaudible)and you're going to get a full discount"

- **Manage and Curate Media:** During conversations in both sessions a major pain point and hurdle for digital documentation solutions was noted to be the amount of content it generates in combination with the lack of organization and structure that these tools enforce. Any new tools should be mindful of this. Beyond the ability to tame and distill digital content into meaningful documentation, there's also a need to be able to manage and coordinate it's presentation. Displaying work on screens for example should be a free-for-all, and instructors should have some agency to manage what gets seen in the classroom. The tools should consider this desire to manage the presentation as much as the organization of the digital documentation they produce.

  - *"There is nothing worse than having a ton of images and videos and when you have time to put them on your website you have no idea which ones are which."*

  - *"We talk a lot and it was in some of your challenges is this managing and curating this mass of documentation is really hard but that act of pulling it into a folder, that act of putting a tag or a caption on it is the first step in reflecting on or curating your stuff."*

Design Needs and Considerations

- **Create Cultures that Foster Documentation:** There was much discussion not just of what technologies could be used but how they are involved in the classroom. To be adopted, it was noted that they need to build a culture for documentation and incentivize these practices. An example suggested is to leverage Instagram where "*some [accounts] will have their 'grammar of the day" to* encourage participation from learners: "*we can select a student on certain days when we have them documenting in real-time on what's happening.*"

- **Macro-Micro and Physical Constraints:** While top-down capture is a popular and useful format, activities at Startable happen at many different scales from threading needles and sewing intricate patterns to large scale production. Solutions should consider the need to capture at various granularities, from different perspectives and at different stages - as well as the acknowledging the physical constraints of a relatively small and non-permanent space: *"It's also I think important to think about where those cameras and how those cameras get used because I have seen systems that look awesome. The [system] wouldn't work for sewing because you need to be able to get into a small space.. what would the apparatus look like?"*

- **Don't Interrupt the Flow:** A repeated concern for new technologies was that they might intrude into the learning experience. Devices that create noise have the most potential to break focused work production or shift attention away from learning experiences. This was seen as a concern for concepts like the 'Celebration Button' but also more generally.

  There was consensus that while the learner is really in the workflow of making their projects, documentation tools shouldn't get in the way or distract them in any way.

  - *"Some people just learn to do [documentation]. They're really good about documenting the process. Other people just get into the flow of it and forget. And there's something about having [a phone] ready at hand"*

  - *"If it's disrupting the flow of anyone, then I feel like that's where it becomes problematic. Because we have enough - we have so many people crammed in a room, no matter what teaching environment I'm in. There's just so many disruptions already to add to [students]."*

Design Needs and Considerations

- **Address and/or Leverage Headphone Use:** Discussion with the group noticed that the students were often listening to music and/or on their phones and this posed a challenge for engaging them in the classroom. Instructors were challenged by this on multiple occasions but wondered if this might be an opportunity to used it as an advantage within this system: "*could they tune into notifications or be texted with important alerts?*" Nevertheless, this behavior signals that the learners are already disengaged from the classroom environment and this presents some design challenges and opportunities as new instructional resources are added:

- *"So I've noticed since class has started, half the kids wear headphones all the time. ... I'm always having to tell them to take their headphones out during lectures." … "it seems like that's a potential channel to relay the information somehow, like in auditory [formats]."*

- **Need for Routine:** The new digital tools could be used to add priority and emphasis to documentation as a valued practice. The visibility of these tools by their very presence would help to indicate, establish, and maintain good documentation routines and habits too. However, the format this takes is open-ended and needs to be explored more.

"[Documentation] is a routine. So part of it could be figuring out what it might look like. It might need to be very visible in this space."

Conceptual Designs

Building on feedback we received, the following concepts have been developed into design proposals for Startable.

These (if favored) can be developed for deployment in Summer 2019.

Live Wall

Scenario 1. Instafeed
Social media displays incentivize bottom-up sharing of work in progress.

Scenario 2: Timed Challenge
Countdown clocks create visibility for important challenges.

‘Work Lamp’

Scenario 3: Mentor Demo
Instructor’s station automatically captures demonstrations using overhead cameras that support timelapse, photo, and video capture.

Modeling Camera

Scenario 4: Learning to Sew
At the sewing station, a student can practice and perform new skills and demonstrate mastery.

Reflection Ticket

Scenario 5: Make it work
A thermal printer creates a tangible to-do list for students to track progress and keep on task.

Celebration Button

Scenario 6: Progress Rewards
During project management, celebrate small steps with immediate gratification.

Video Booth

Scenario 7: Daily Video Logging
Capturing thoughts and reflections through video each day.

Scenario 8: Pitch Practice
Rehearse, record, and get feedback on final pitches through video.

Conceptual Design

Live Wall

Learning Processes

NOTICE → ARTICULATE → REFLECT → CRITIQUE

Documentation Activities

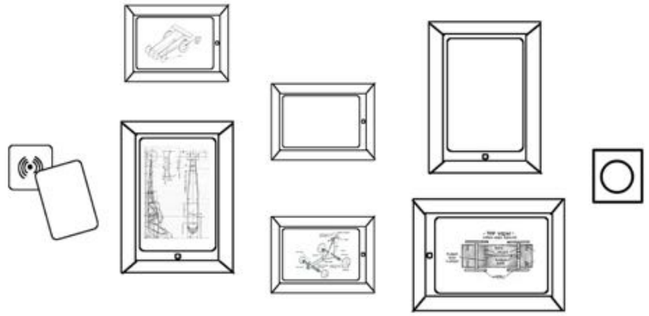
IDENTIFY, ANNOTATE, DISPLAY, OBSERVE, CAPTURE

Feasibility:

Expected frequency of use:

Ease of integration:

Value to learning:



About: A multi-use large-format digital display to enhance the learning experience. Displays can include: displaying social media feeds or inspiration, showcasing milestones, and countdown timer for timed challenges.

Features:

- Always on;
- Live feed of student work;
- Uses existing channels for sharing: Students can submit work to be viewed using a hashtag on instagram;
- and Management console for instructors to review/curate submissions.

When:

- Always active when the room is in use.
- Shows specific content to support daily/weekly activities e.g. during incentive challenges, it might alert the room and showcase challenge entries.

Where:

- In the main room - where the students work - to encourage them to be there.

Why:

- Activate and engage the students.
- Incentivize good documentation.
- Help create a dynamic work environment.

Connections and Interactions

- Present content from Startable Instagram account.
- Activate based on celebration buttons.
- Support tracking spreadsheet with visualizations of it.
- Showcase content from overhead cameras, modelling cameras, and pitch booths.
- Link to Startable or students' digital file storage.

Live Wall

Scenario 1:
Instafeed

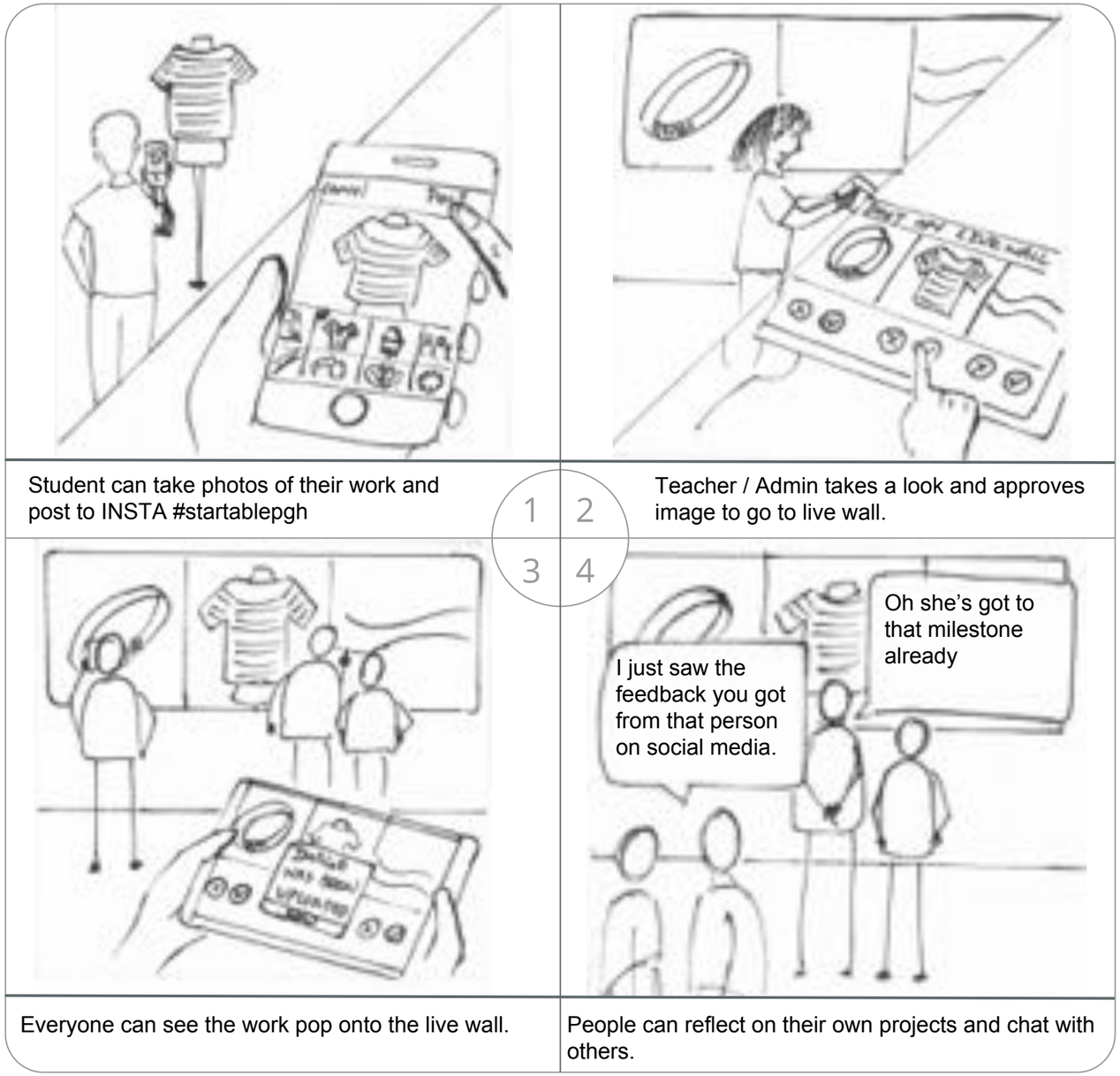
Description of Scenario:
Student takes photos of their work and posts to Instagram using the Startable hashtag. A mentor or administrator approves of the photos and it is displayed on the live wall, supporting feedback.

Educator Quotes

*"if you could hook [the live wall] up to be **hashtag related**, then you could **get our kids to start tagging [their work on social media].**"*

*"there's not an incentive for our kids to populate our hashtags. **It would be nice if it wasn't just top down [content].**"*

*"Having the ability to **curate** that in some way on our part would also be extremely important because.. if we let them just post whatever images they want, it could turn not the direction we want very quickly."*



Considerations and Questions:

- How can content for display be generated "bottom up" from students rather than "top down" from teachers?
- What cultures of participation and documentation could this enable e.g. showcase a documenter of the day?
- How is the content curated and who manages it? How to minimize extra workload?
- What work shouldn't be seen? Are there constraints around visitors to the space, times of day, or other use cases that a digital display would need to account for?

Live Wall

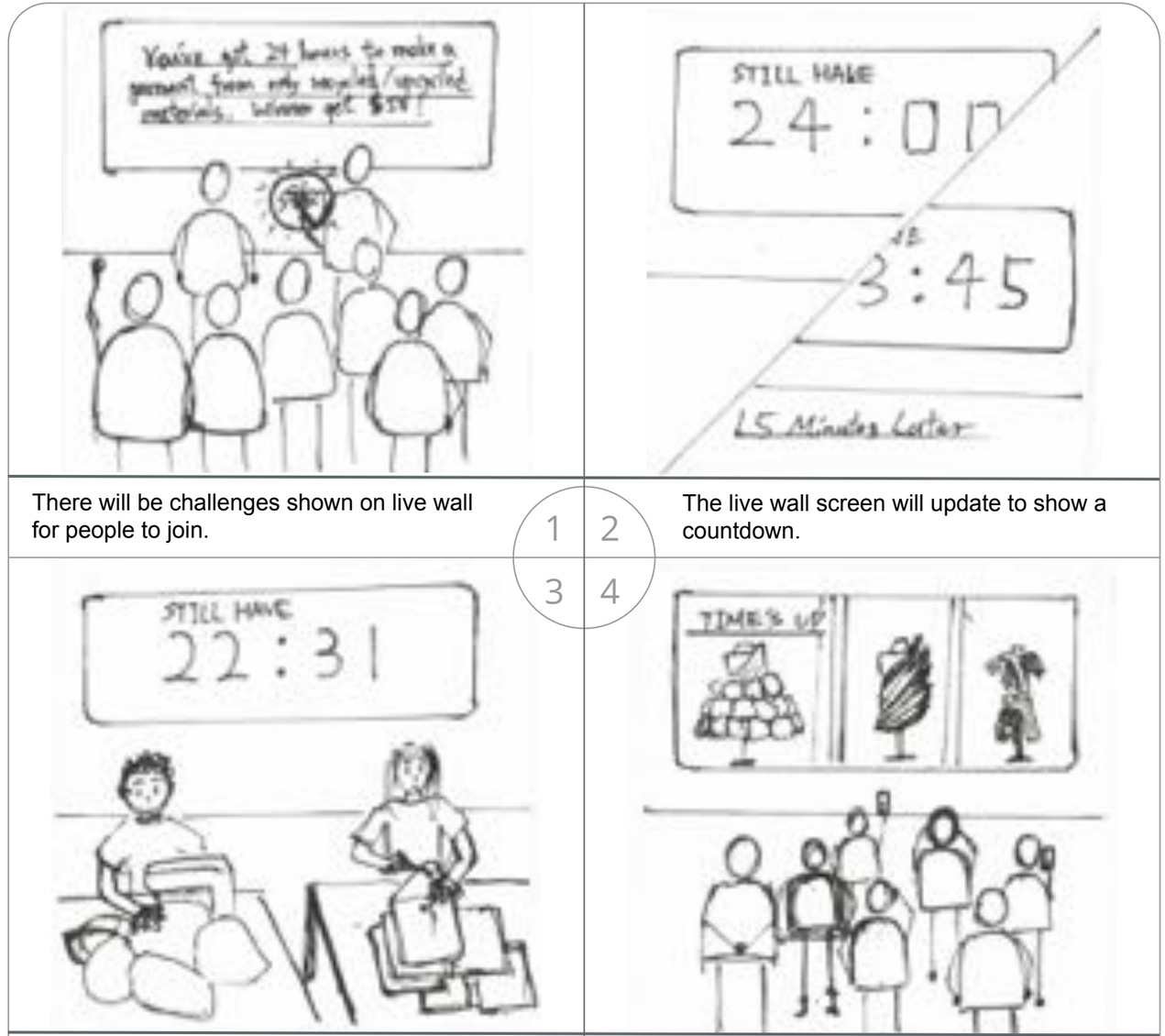
Scenario 2:
Timed Challenge

Description of Scenario:
Mentors present a challenge to the students.
The live wall displays the challenge and countdown.
Once the time runs out, a celebratory image or video is shown and the winning student's work can be displayed on the wall.

Educator Quotes

*"using a live wall to **showcase what they're doing would motivate [them]** if it's something really dynamic. The live wall could be used for when the image comes up, it's **challenge time or it's reward time.**"*

*"When it's pitch week, we could **showcase pictures from past years pitches** and all the students' videos and photographs to help **motivate them**."*



There will be challenges shown on live wall for people to join.	The live wall screen will update to show a countdown.
Everyone works on their project and try to beat the clock.	After time is up, all challengers can see others' final work on the live wall.

1 2
3 4

Considerations and Questions:

- Could this create too much pressure for the students?
- How will students respond to the countdown timer? Is it demotivating for some students?
- What content should display while the challenge is on? Should this get priority and be the only focus or should feeds also display while the challenge is happening?
- How does this integrate with existing strategies and tracking, such as the main rewards spreadsheet?

Conceptual Design

Work Lamp

Learning Processes

NOTICE | ARTICULATE | REFLECT | CRITIQUE

Documentation Activities

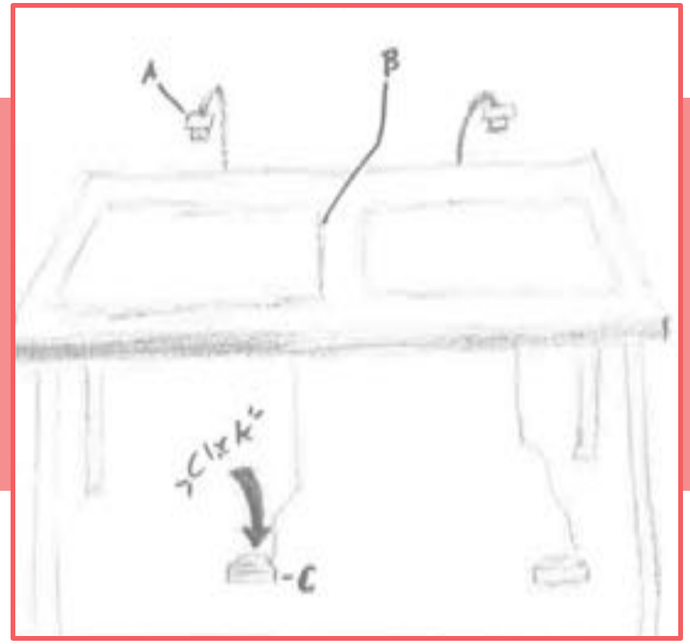
IDENTIFY | ANNOTATE | DISPLAY | OBSERVE | CAPTURE

Feasibility:

Expected frequency of use:

Ease of integration:

Value to learning:



About: An overhead smart camera that can be mounted over a workspace. It supports timelapse, photo, and video capture. It's activated using a foot pedal, a desktop button or build-in sensors depending on its mode. It includes high quality lighting automatically activated when capture starts.

Features:

- Mounted overhead;
- Includes professional lighting;
- Easy to reposition;
- Convenient floor foot-pedal to activate;
- and Supports photo, video, and timelapse capture.

When:

- *Instructors:* as needed during class time
- *Students*: variable depending on work time; when an instructor is teaching them a new technique 1-on-1

Where:

- *Instructors*: one dedicated workstation for demonstrations
- *Instructors*: at each situated workstation

Why:

- To capture instruction as photos or videos for documentation.
- To help spread skills-based knowledge.
- Promote giving back and building resources for learning.

Connections and Interactions

- Streamed or shared to Live Wall.
- Post to Social Media.
- Builds a database of instructional resources for students.
- As a starting point for Instructables or other online project documentation resources and step-by-step guides.
- Share in Milestone Slidedeck

Work Lamp

Scenario 3:
Mentor Demo

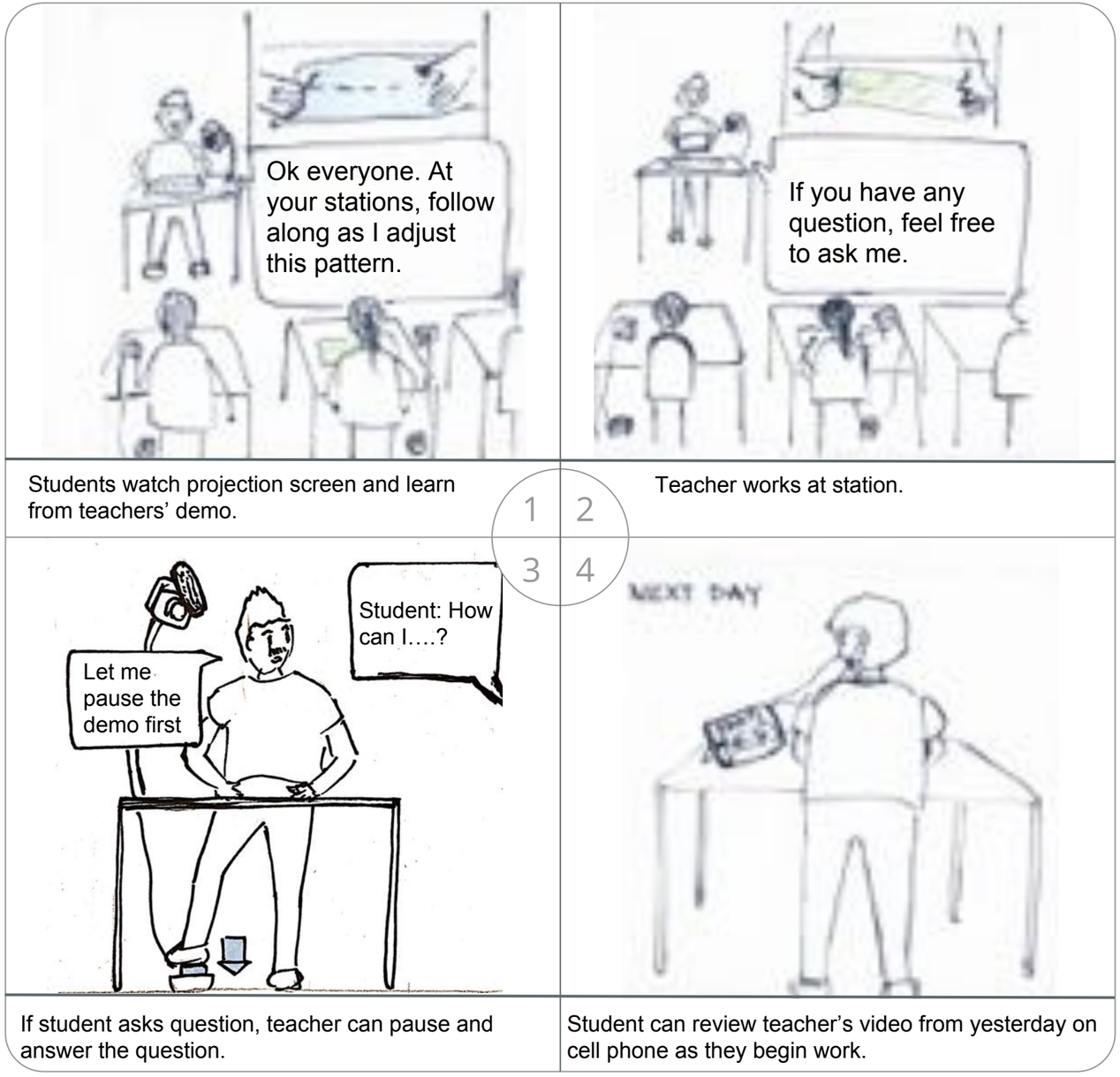
Description of Scenario:
Mentor begins demonstration of skill and records and projects what they are doing. Students can access video later for review.

Educator Quotes

*"It is extremely helpful in **getting the kids to engage in what I presented**."*

*"I broke it down into three areas: **assessment, instruction, motivation**... We can be documenting our lessons and if the students don't remember quite how to do it, **they have access to these files** and can review the instructional videos."*

*"**People also like spreading the knowledge**. It's helping us to understand where the concept gaps are and their strengths are."*



Considerations and Questions:

- How much professionalism is needed for capture? How good does the lighting/image quality need to be? What is 'good enough' for documentation?
- How is professionalism balanced with cost - of assembly and materials - if it's to scale to every workstation?
- How can the overhead rig be repositionable but also quickly calibrated when it moves to make it easy for novices to capture good content? Alternatively, should it be permanently fixed in place and calibrated up front just once?
- Where should how-to guides be stored online? Is there a preferred platform for this?

Conceptual Design

Modeling Camera

Learning Processes

NOTICE | ARTICULATE | REFLECT | CRITIQUE

Documentation Activities

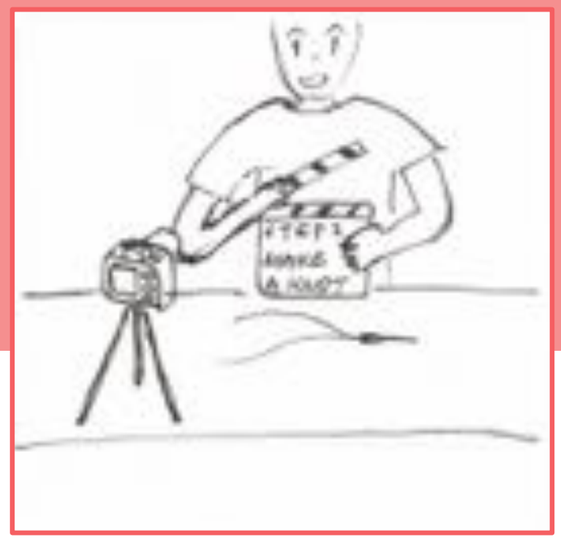
IDENTIFY | ANNOTATE | DISPLAY | OBSERVE | CAPTURE

Feasibility:

Expected frequency of use:

Ease of integration:

Value to learning:



About: Use a first-person camera to capture a process. Make this content available to students to review in-class demonstration on their own time (e.g. at home) to help them when they want to practice for themselves. Students can then record and share their own "how to" videos to demonstrate comprehension and mastery of the skills.

Features:

- From perspective of learner/instructor;
- Conveniently placed near all major tools;
- Initially instructor led practice that allows for participation with students;
- and Convenient and quick to capture.

When: As students are learning new hands-on skills. Also, when they want to demonstrate knowledge (synthesis) and new skills in art- or making- processes.

Where:

- From student's perspective.
- At sewing machine or other machines.
- In front of student, showing student (or their hands) and the interaction with machine and making processes.

Why:

- Motivation
- Demonstrate knowledge
- Assessment
- Promote synthesis of new info / vocab

Connections and Interactions

- Streamed to LiveWall
- Post to Social Media
- Record actions as completed and celebrate small accomplishments
- Builds a database of instructional resources for students.
- As a starting point for Instructables or and step-by-step guides.
- Assessment / evaluation platforms.

Modeling Camera

Scenario 4:
Thread a Needle

Description of the Scenario:
Student is ready to practice a new skill learned in a workshop. Student can review modelled video of the process and then create their own 'how to' video tutorial that demonstrates their comprehension and application of new skills.

Educator Quotes

*"To be able to **communicate a process to someone else** is such a valuable way of **assessing how that person has interpreted [that process].**"*

*"For the students to curate that, the **students would have to show [the skill]** and **articulate it verbally** while they're doing it. I think that could be really thrilling and I think they would really enjoy it."*

*"...students can also make tutorials to start their own YouTube channel. **That's the motivation.**"*

Student can rewatch teacher's instructional video on threading a needle at home.

Student begins to practice and rehearse step- by-step.

After they finish each step, they will get a sense of achievement and start the next step.

Finally, they can build the complete process video of the project and show to others on YouTube.

Considerations and Questions:

- Is the camera mounted on the person or near the station? If on the person, will it be too choppy / produce motion sickness? If on the station, how can the mounting of the camera avoid getting in the way of performing the skill?
- Is low quality capture OK in this scenario?
- How is the media captured, if there is not a stationary location for the camera?
- Where the SnapChat glasses used by the Startable cohort? Is this a good format/ vehicle for presenting skills and hands-on work?

Conceptual Design

Reflection Tickets

Learning Processes

NOTICE → ARTICULATE → REFLECT → CRITIQUE

Documentation Activities

IDENTIFY, ANNOTATE → DISPLAY ← OBSERVE, CAPTURE

Feasibility:

Expected frequency of use:

Ease of integration:

Value to learning:

About: Reflection tickets are used at the beginning and end of the day to encourage students to take time to look back over their progress, examine their work and movement towards goals, as well as give and receive feedback.

Features:

- Physical print out listing tasks;
- Printer integration with project management application to track tasks;
- Print on demand as students arrive / leave for the day;
- and Uses BPA free / non-toxic paper.

When:

- Collect reflection tickets at the beginning of the day.
- Mark tasks complete throughout the day.
- Bring ticket to end-of-day meeting to record what they completed.

Where:

- At their workstations, or a communal space in the studio.

Why:

- Preparing for the day.
- Tracking wins.
- Creating visibility for stages of process.

Connections and Interactions

- Can link to tracking spreadsheet.
- Should relate to Startable's own milestones and spreadsheets.
- Can link to Live Wall or other displays to make progress of each student visible to maker mentors.
- Potential backchannel for anonymous peer-critique to be shared.

Reflection Ticket

Scenario 5:
Make it Work Printer

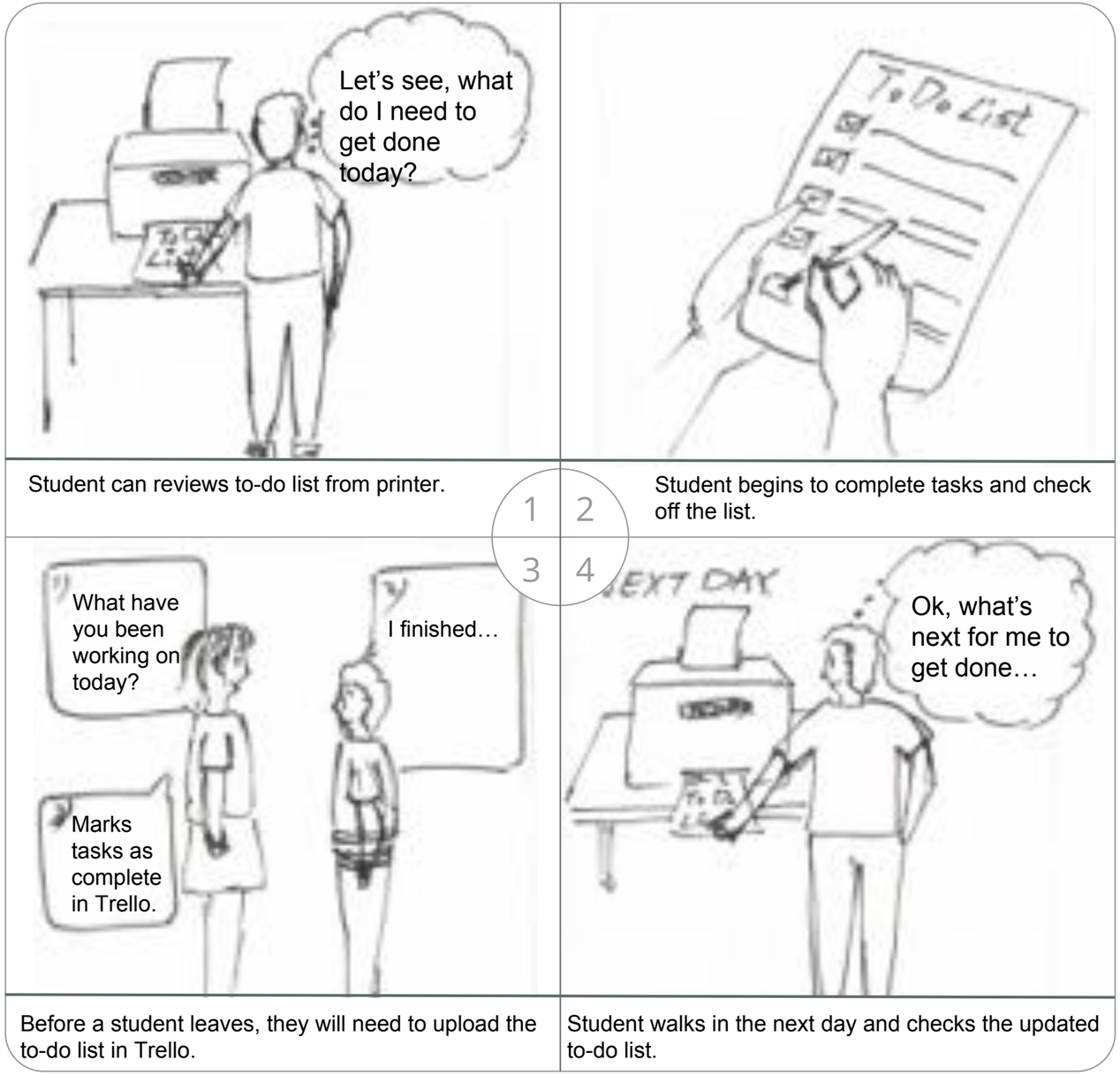
Description of Scenario:
Student arrives to studio and receives a printed slip listing their tasks for the day. The student marks tasks as complete on the form and debriefs with their mentor who records finished tasks in project management application.

Educator Quotes

*"We need a little **more immediate gratification in that process** to just reward process over product ... the **process is so complicated** that it's **a little bit difficult for them to enjoy it**."*

*"There [should be] **accountability publically** for them in their process. And they kind of hide a little bit if they're not where they should be."*

*"I love the idea of having **something physical that I hand to somebody and say, you did a good job today.**"*



Considerations and Questions:

- What is the easiest way to track tasks digitally to send to print?
- Where are the reflection tickets stored or displayed? Do they have as much visual impact in a space as sticky notes and posters?
- What task tracking tools are used already at Startable? What platforms should this integrate with to be most successful?
- How do we avoid this being a waste of paper and make sure it's valued and valuable?

Conceptual Design

Celebration & Rewards Button

Learning Processes

NOTICE → ARTICULATE → REFLECT → CRITIQUE

Documentation Activities

IDENTIFY, ANNOTATE → DISPLAY ← OBSERVE, CAPTURE

Feasibility:

Expected frequency of use:

Ease of integration:

Value to learning:

About: Celebrate moments, big or small, by using buttons to make student accomplishments visible and recognize these important moments of success to create a collaborative community culture.

Features:

- Simple to understand and use;
- Easily accessible button;
- Inviting tangible design that's satisfying to press or hit;
- Can be programmed to perform a range of different tasks; celebration is just one;
- and WiFi connected.

When:

- Celebrate small steps with immediate gratification, during project management.
- Upon completing a project or a task, or at a defining point in a process.
- As often as needed given the project or task.

Where:

- Placed in a communal area out of the way.
- Somewhere between an obvious location and make an intentional trip to use it.

Why:

- Reward steps to push through processes. Showcase students progressing well.
- Create moments of happiness, personal reflection, and a sense of completion.

Connections and Interactions

- Connects to Live Wall to display celebration content; Updates Live Wall to display and chart progress.
- Direct connections to the existing milestones and deliverables for Startable's program.
- Relate to Reflection Tickets could help reflect on milestone progress.
- Add reporting into tracking spreadsheet
- Could be used to start timed challenges, trigger overhead + modeling cameras, or print reflection tickets.

Celebration & Rewards Button

Scenario 6:
Celebrating Small Steps

Description of the Scenario:
Student is overwhelmed with steps involved in making a product. The reward system gives incentive and positive relationship to process (versus getting bogged down with logistics).

Educator Quotes

"I keep looking at the celebration of work button and reflection ticket in combination. I'm looking at the reflection ticket almost like ***checking a box when they've mentally got somewhere in their creative process****. That's also a* ***celebratory moment*** *and* ***taking care of business.****"*

"Maybe in the end we stick up a sticker dollar sign, ***it doesn't all have to be super fancy****. "... "It feels like a potty chart, but that's still kind of what we're asking for."*

Student is overwhelmed with steps involved. He starts to list the tasks.

Student reviews the first task on the list and begins to finish it.

Student finishes tasks and pushes button to mark complete.

Student progress is displayed and celebrated with educators and classmates.

Considerations and Questions:

- How can learners be prompted to use technology in a way that doesn't break their "flow"?
- In training the students to be professionals, is a celebration button too trivial? Does it prepare them for adult interactions?
- How can this create visibility for shared acknowledges of accomplishment without intruding on or disrupting the cohort as a whole, instruction or teaching practice? i.e.. it should play loud noises or klaxons every time its pressed.

Conceptual Design

Video Review Booth

Learning Processes

NOTICE → ARTICULATE → REFLECT → CRITIQUE

Documentation Activities

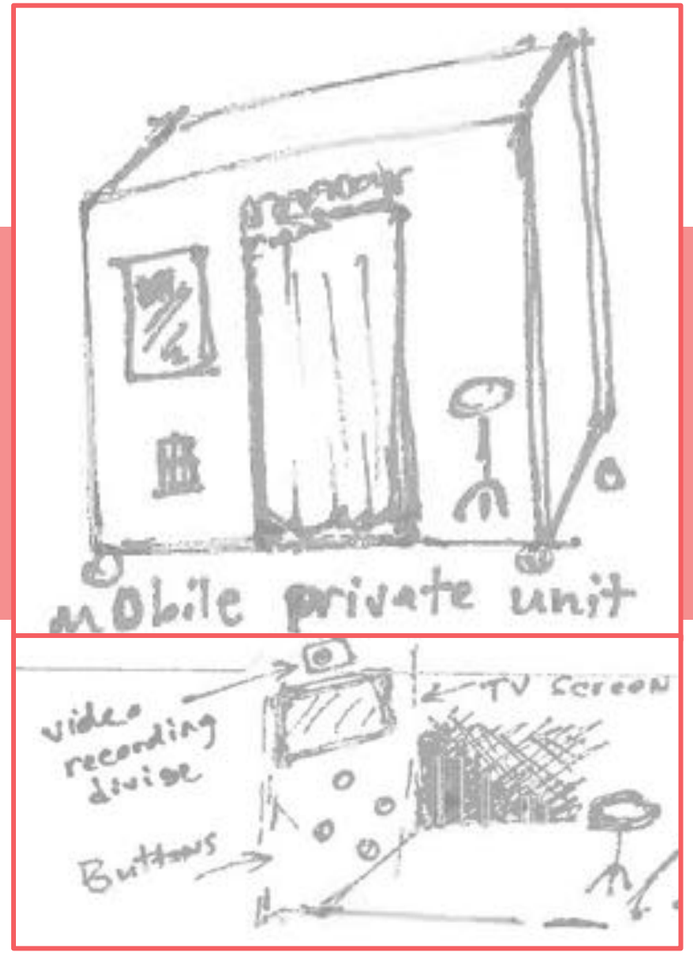
IDENTIFY, ANNOTATE, DISPLAY, OBSERVE, CAPTURE

Feasibility:

Expected frequency of use:

Ease of integration:

Value to learning:



About: Record video articulating thoughts and ideas. Use mirror to view clothes live.

Features:

- Practice in private - allowing students to get used to pitching. A kind of “exposure therapy”;
- Mirror and being able to see clothes live;
- and Lens of media as a highly valued perspective for Startable.

When:
For daily use, as needed or
as requested by an instructor.

Where:
Corner of the classroom but it could also be mobile to push into the classroom or other spaces as needed. Alternatively, private room or space.

Why:

- Practice pitches.
- Review Pitches.
- View fashion looks through the lens of television media.

Connections and Interactions:

- Could have integration with a live wall. Displaying pitches for the class to see, review and critique.
- As videos are created, they could be automatically posted to Instagram or other social media channels.

Video Review Booth

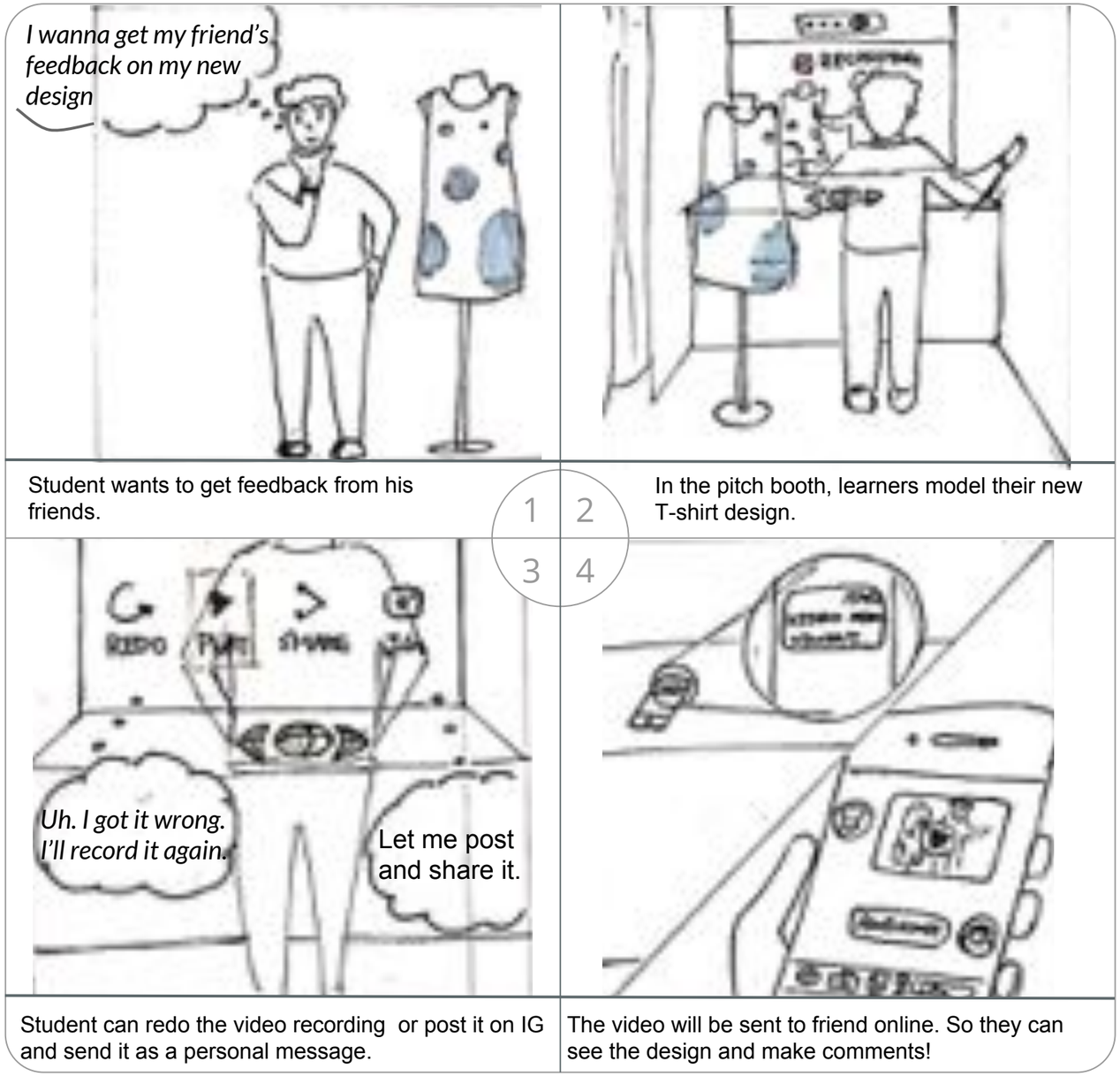
Scenario 7:
Daily VLogging

Description of the Scenario:
Student hopes to share their thoughts, designs, and ideas to reflect and receive critique from others. They utilize a video recording booth to capture their work, verbally and visually.

Educator Quotes

*"I think that their r**elationship to that kind of debrief via video or journaling** or kind of, it's something that they're a little bit **more conceptually aware of** than we might be aware of."*

*"**Seeing yourself through the lens of media**"*



Considerations and Questions:

- Does it reduce the threshold to high fidelity documentation if the booth is made available as infrastructure to support these practices?
- Does the booth leverage student familiarity and interest in "selfies" and "confessional booths"? Will students want to capture and share their daily experiences in this way?
- How can learners be prompted to use technology in a way that doesn't break their "flow"?
- How can one video booth serve many learners effectively?

Video Review Booth

Scenario 8:
Pitch Practice

Description of the Scenario:
Student is nervous about pitching their products for the first time infront of so many people. The use the video recording booth to rehearse, record and get feedback on their pitch. They can review the video by themselves or with teachers or peers.

Educator Quotes

*"It could be a way of **practicing the idea of self** which is just terrifying for some people. We have [students with] body issues. Sometimes if you just get used to it, that could be helpful….It's exposure therapy."*

*"Impress on the **importance of pitching**"*

Considerations and Questions:

- How early should students start practicing pitching?
- What sensitivities may students have to recording and sharing their pitches online (personal comfort, IP, etc.)?
- How do we encourage practice for students that may be averse to it? The students that will benefit the most for this exposure therapy are the least likely to want to use it regularly.
- How is the video used to help improve? What existing feedback practices does it build on? How does practice and recording translate into feedback from peers and instructors? How will this be facilitated to meet student needs quickly and responsively?

Tech Demo & Feedback Sessions with Youth

Tech Demo Session
Gathering feedback from students

After working with educators and students to uncover design needs, the technology team implemented a series of working prototypes. On the final day of their summer program, we invited students to a hands-on feedback session. Prototypes were introduced by the team, the students then got to experience them first hand. After interacting with the devices, they were asked to dot vote on the concepts that would be most valuable to their process and share feedback. Afterwards, the team debriefed with instructors to collect their observations and perceptions of the prototypes.

Above: Feedback and Dot Voting Station to capture perceived value of prototypes

Above: Demo & Feedback Session at Startable .
Left: The Modeling Camera; **Middle:** The LiveWall and **Right:** Celebration Button.

What we learned

- Students showed a strong affinity for ***performative, social and shareable*** capture tools as part of their documentation practice (video booth, overhead cameras and display instagram feeds)
- Tools that reveal process are highly valued by instructors (noticing buttons, etc.) but were less valued by the students. Balancing the documentation needs and values of both populations is a challenge.
- Students also voiced a preference for **tools that were portable** over fixed infrastructure.
  Several youth participants wanted the 'video booth' to be something they could move to their desks or workspaces, emphasizing a preference for tools placed in-situ and reflecting sites of production.
- Both instructors and students **valued professionalism of capture** (lighting, high resolution images, audio quality) as well as reducing the overhead of staging good quality documentation (set up, configuration). They strongly advocated for ready at hand tools; and the approach of the modelling camera resonated as a result.

Next Steps

Using the design insights gathered during the Startable 2018 program, the research team will work to prototype and prepare a series of new documentation tools. These will be designed to meet the needs of the Startable team and are intended to be deployed for the Summer 2019 cohort.

The team will work through Fall 2018 to build initial prototypes. In Spring 2019, these will be refined and tested. Subsequently in May 2019, a series of deployment ready prototypes will be produced for integration at Startable 2019.

The team would welcome and invite continued participation with the Startable team and maker mentors during this time to gather additional feedback, reflections and advise as we prepare these interventions.

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