
STEMS AND LEAVES

USABILITY ASSESSMENT 2

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The first usability assessment provided insight into the design from the perspective of educators. Based on this feedback, I was able to develop the following list of design elements to guide the development of a single concept for further testing.

THE SYSTEM

- + The system *must* be easily mapped to lesson plans based on Common Core standards.
- + The system *should* come with information for teachers on how to successfully use the system within their classrooms.

THE PHYSICAL PLANTER

- + The physical planter *must* allow students direct hands-on access to their plant (to “get their hands dirty”).
- + The physical planter *must* include accessories for data collection, such as containers to control the amount of water given and a ruler to measure plant growth.
- + The physical planter *should* be stackable
- + The physical planter *should* be designed to be space efficient, making it feasible for each student to have their own planter.
- + The physical planter *should* have simple technology to control lighting.
- + *It would be nice if* the physical planter was customizable, allowing students to decorate their planter.

THE DIGITAL INTERFACE

- + The digital interface *must* be simple in design.
- + The digital interface *must* work in a standard web-browser.
- + The digital interface *must* allow students to access previous data and compare with other students plants without having to input data.
- + The digital interface *must* include a feature for written data.
- + The digital interface *must* include both quantitative and qualitative data relating to the plants.
- + The digital interface *must* allow students to manually enter data relating to their plant care, at any given interval.
- + The digital interface *must* include a page for teachers that allows teachers to track individual progress and see the work done by each student in their class.
- + The digital interface *must* allow students to connect to a class page without a QR code.
- + The digital interface *should* provide a self-guided task for understanding personal data with basic activities relating to understanding and analyzing graphs.
- + The digital interface *should* allow students to track their progress as they complete certain tasks.
- + The digital interface *should* allow students to name their plant.
- + The digital interface *should* have a mascot or guiding feature to keep students on track without inhibiting personal exploration of the app capabilities.
- + *It would be nice if* the digital interface allowed students to include photos of their plants.
- + *It would be nice if* the digital interface worked on touch-screen devices such as iPads or smart phones.

THE PHYSICAL PLANTER

Designing a final physical planter for further testing required a couple iterations.

The first iteration, and arguably the simplest in design, was a simple cardboard box, lined with aluminum foil and a lid of foil. Plants rest in the inside of the box, which is lit by a standard lamp, plugged into a timer to control the hours of light given to the plants.



PROS

- + Cheap and easy to assemble
- + Allows many plants to one planter
- + Controls for confounds, limiting outside light

CONS

- + Not space efficient
- + One planter to many students
- + Not easily stackable
- + Does not provide students direct access to their plants, nor does it offer easy viewing

The second iteration included a cubby-like structure which has a box for lighting at the top and a place for plants to stand underneath. Lights can be plugged into a timer to control time on and off.



PROS

- + Easy to access and look at plants
- + Each student gets a planter
- + Customizable

CONS

- + Not space efficient. Especially when used with full grown / starter plants, the planter must be fairly tall.
- + Because of the height, making the planter stackable would require more thoughtful design to ensure the planters were stable

The third iteration was where I ended up in terms of planters for testing. Made out of folded foam board and lined with paper and aluminum foil, these planters have a divider allowing two plants - one in each section. Lights hang from the top board, allowing for unique lighting schedules for the plants in either section. Like other, lights can be plugged into a timer for defined lighting schedules.

PROS

- + Easy to view and access plants
- + Cheap and easy assembly
- + Sections are customizable
- + Stackable
- + The most space efficient of the concepts

CONS

- + Still fairly tall, so would require a fair amount of vertical space



THE DIGITAL INTERFACE

A testable prototype of the web app was developed for the testing session. This prototype represented the data collection, gardening journal, and data analysis elements of the user task flow. This task flow can be seen in a two page spread at the end of this document.

How much water did you give the plant today?

- 0 mL +

How moist is the plant's soil today?

dry wet

How much light will the plant get today?

- 0 hours + - 0 minutes +

How tall is the plant?

0 0 inches

SAVE

Students input data into this page. Pressing "save" moves to the next page.

Gardening Journal 4/12

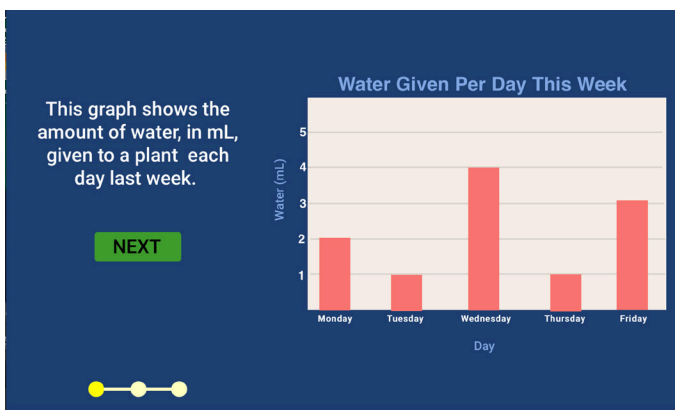
4/12 Data for 4/12/18

Water	0 mL
Soil Moisture	dry
Light	0 hours 0 minutes
Height	/ inches

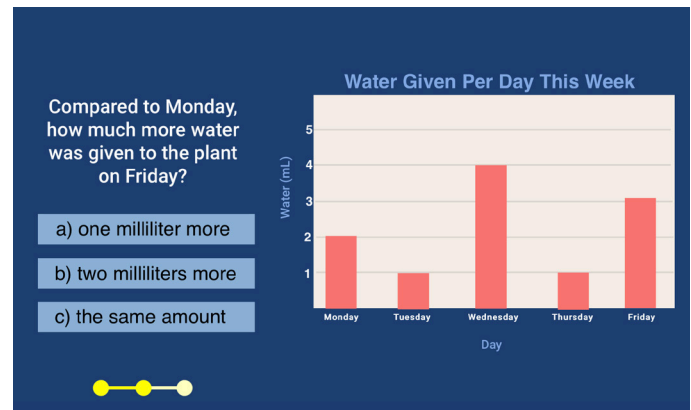
How is the plant looking today?

SAVE

Data from previous page autofills in the table. Students type in journal to add new entry. Pressing "save" moves to the next page.



Pressing "next" moves to next page.



Students select answer by clicking. Depending on response moves to one of two pages.



If students answered question incorrectly, this page comes up. Pressing “try again” moves to previous page.



If students answered question correctly, this page comes up. Pressing “finish” moves to next page.



End of module.

THE TESTING SESSION

The first usability assessment provided feedback from the user group of educators. The second usability assessment aimed to collect feedback from students. The testing session was completed during a session of the CEEO's E-Team, a free after school program for students to test new technologies in STEM.

Thinking about the kind of feedback I hoped to get from the student user group specifically, I designed the testing session in stages. These stages included:

SET UP

Students would be given a terra-cotta pot to decorate and personalize. Then, using syringes, students would measure out 10 to 15 mL of water to hydrate pellets of growing medium. The hydrated growing mediums would be placed in the decorated pots and students would plant seeds of one of two plant options (tomato or sugar snap pea plants) in the medium. Students would learn how much water and light their plants need as well as see examples of what these plants look 3 weeks after planting. Following the session students would take their pots as well as a basic care sheet home with them.

LESSON: THE PLANT CYCLE

Following planting seeds, students would be given a hands-on lesson of the plant cycle. Students would be given illustrations of a plant at different stages of growth and labels for each stage. Students were asked to order the illustrations to represent the plant growth cycle and label them accordingly. Using these illustrations and labels students would make a collage of the plant growth cycle.

DATA COLLECTION AND ANALYSIS

Students would be presented grown plants, in the physical planter prototypes. Students would be asked to reason about how much water to give the students and how much light the plants might need, rate how dry the soil is, and measure how tall the plant is. The plants would be watered using 1mL syringes and the amount of light would be set on a timer. These decisions would be recorded on the web app. Students would then be asked to write a couple sentences about the plants in the web app gardening journal. Following this data collection, students would complete a shortened data analysis module which presents a single graph and one question regarding understanding this graph.



As one would expect from an after-school testing session with ten 5th grade students to go, the testing session was high energy and a bit distracted. However, it provided valuable insight on the project from the perspective of students.

- + Students enjoyed learning how to use and using the syringes as a means of measuring water amounts
- + The timers were complicated and require a fair bit of instructor help.
- + Decorating the planters was a fun and exciting activity for all
- + Students like to use their hands to examine the plants. Giving them easy access to plants is important. This was reinforced by the testing session
- + Planting seeds was fun, something that previously was a concern would not be engaging for students of this age.



From this feedback, I will go on to develop a finalized system, that satisfies the requirements and the user needs that have been defined by each stage of research.

USER TASK FLOW

