MEET

At Webe, we're enhancing how young students learn empathy by understanding & shaping social interactions.

WHAT IS IPD?

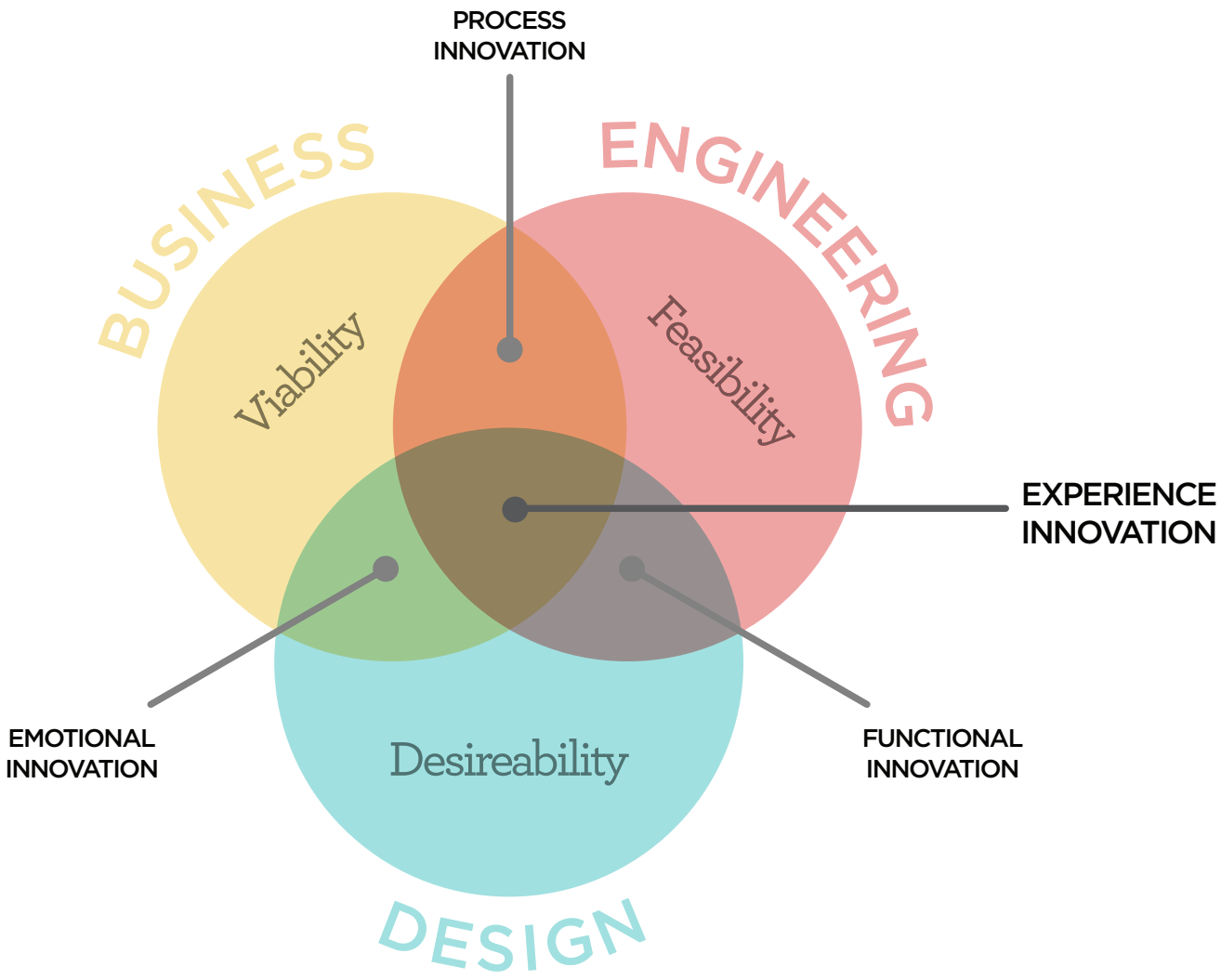
BABSON

Olin College of Engineering

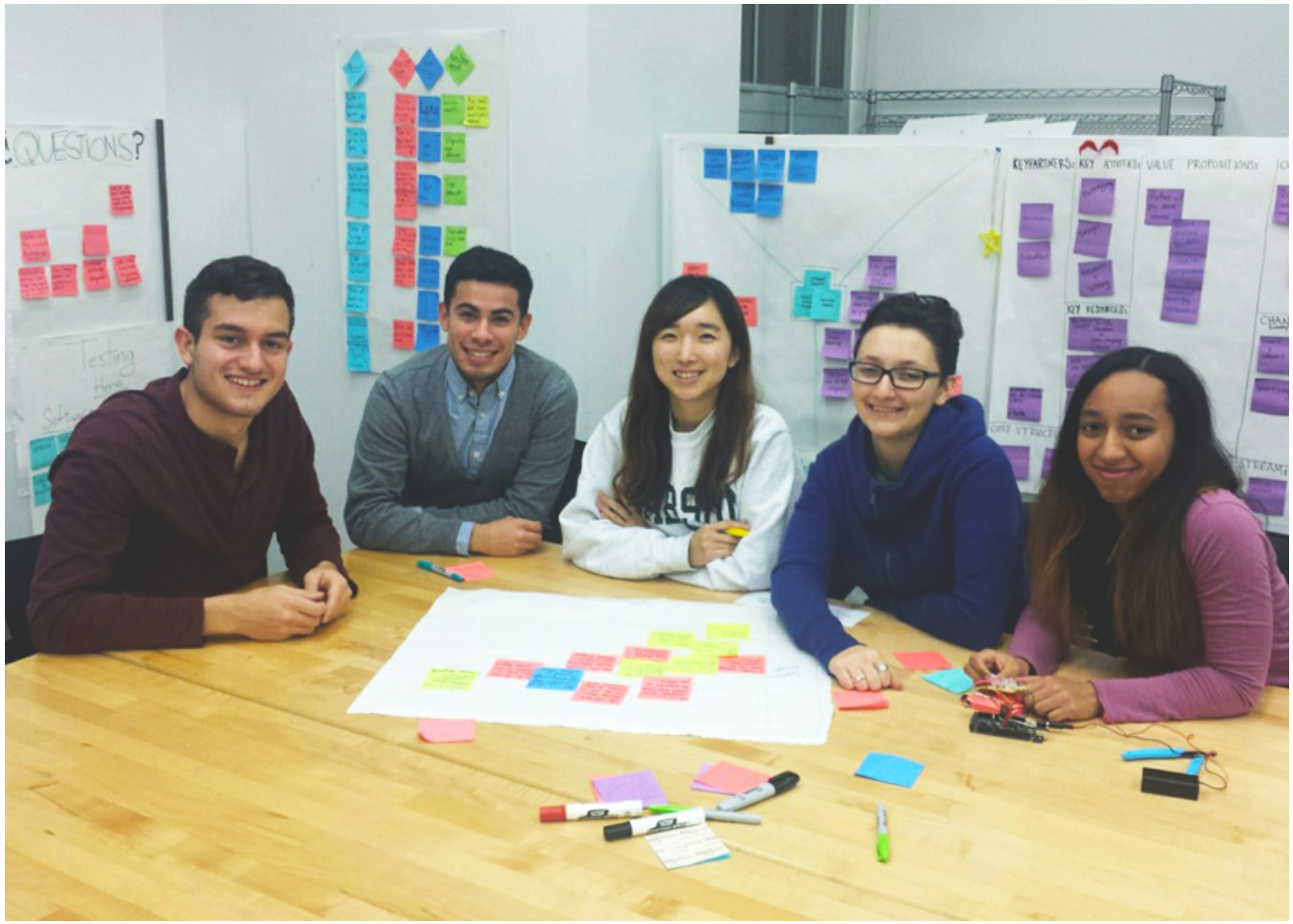
MASSART
MASSACHUSETTS COLLEGE OF ART AND DESIGN

Integrated Product Design (IPD) is a joint course offered to undergraduate students at Babson College, Olin College of Engineering, and Massachusetts College of Art and Design. The focus of IPD is to bring together the disciplines of the business, design, and engineering to forge innovation. Students from each school are put into small groups and given the objective to design and build prototypes of new products while also considering the how a company could be built around these products.

MULTI-DISCIPLINARY APPROACH



OUR TEAM



Gabe Diaz-Barriga
Babson
Class of 2016

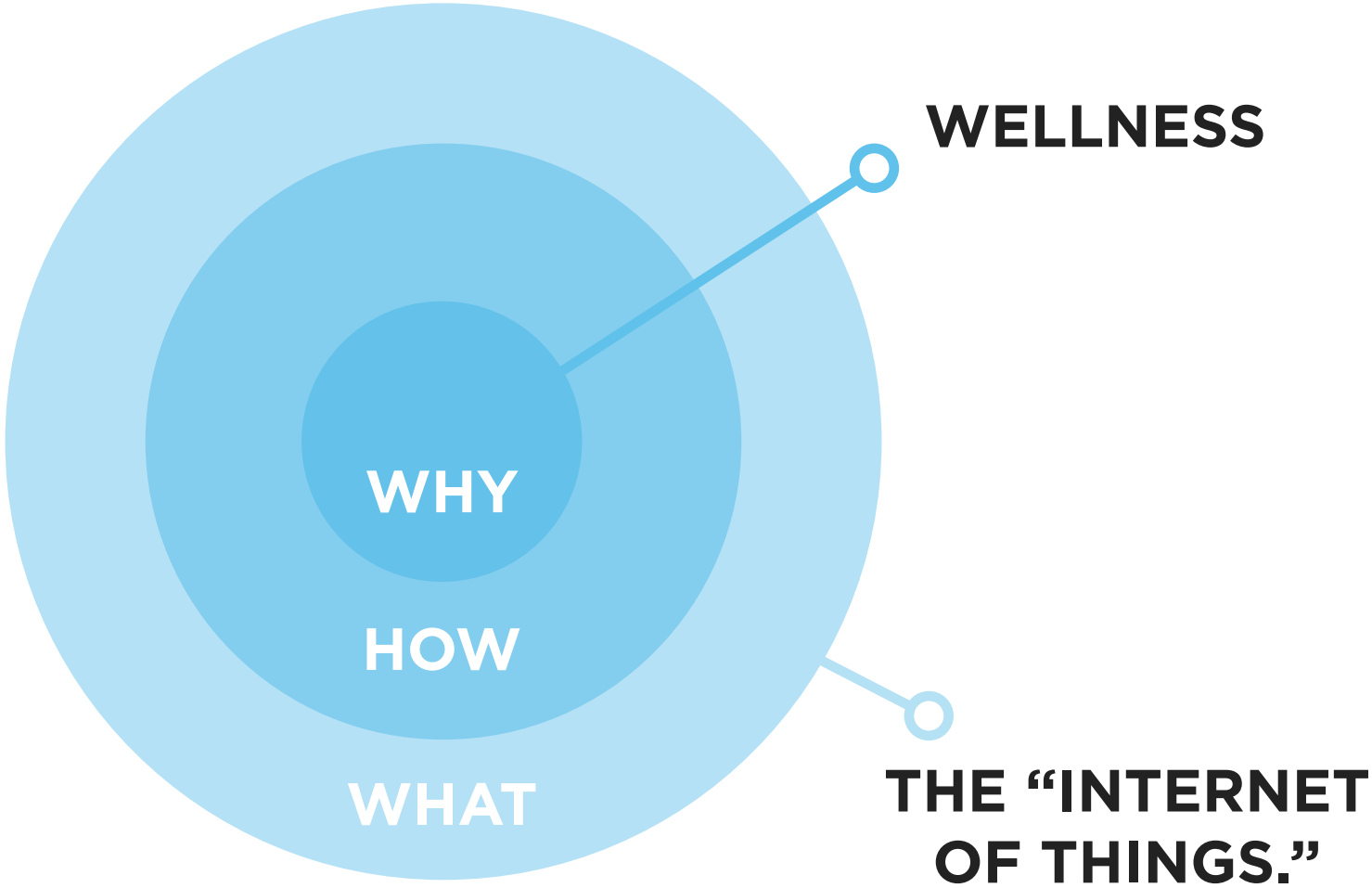
Joshua Hernandez
Mass Art
Class of 2016

Gayoung (Joanne) Park
Babson
Class of 2015

Claire Diehl
Olin
Class of 2016

Melisa Lopardo
Olin
Class of 2015

PROJECT BRIEF



This semester, we were asked to explore and innovate on two main themes: wellness and the “internet of things.”

INTERVIEWS WITH TEACHERS

8. How do you manage bullying that you don't directly witness?
9. How do you manage bullying that isn't reported to you?
10. What might cause you to interupt an interaction between two students?
11. Why might you abandon an effort to help two students get along?
12. **If you had a magic wand you could wave that would help you as a teacher, what would that wand do?**

We started by distributing a survey far and wide using an online tool. We elected to do an online survey becuase it allowed us to get feedback quickly. We spent a significant amount of time formulating and refining this set of questions so that they were specific in that they related to our opportunity area but open-ended so that we would get unique responses from each respondent.

In addition to the wording of each individual question, we paid close attention to the sequencing of our set of questions as a whole. Our set ended with the culminating question, "If you had a magic wand you could wave that would help you as a teacher, what would that wand do?" Our intention was to put teachers in the right mindset with the previous questions and once these topics and ideas were swirling around in their heads, we would try to get them to reveal what mattered most to them.

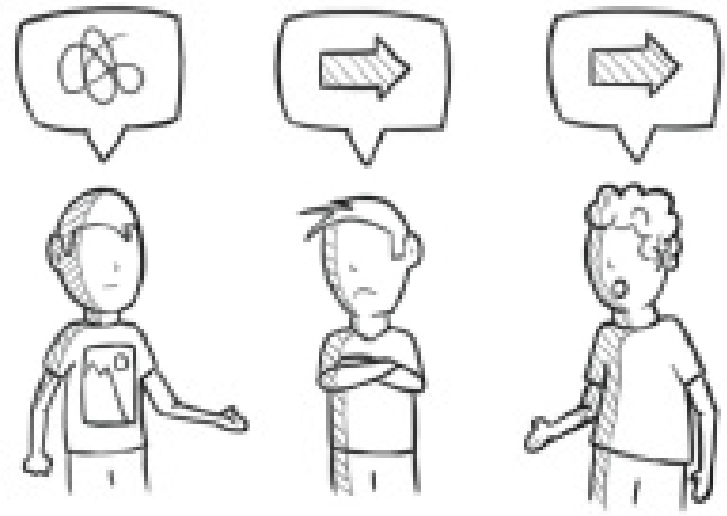
"[If I had a magic wand, it] would allow me to **give students the gift of mindfulness and empathy.** In general, students are impulsive. They do not think before they act. They do not look beyond themselves; they are self-centered. When students are able to look at the big picture and see connections and relationships, that is where true learning occurs..."

Elementary School Teacher from New York

PROBLEM

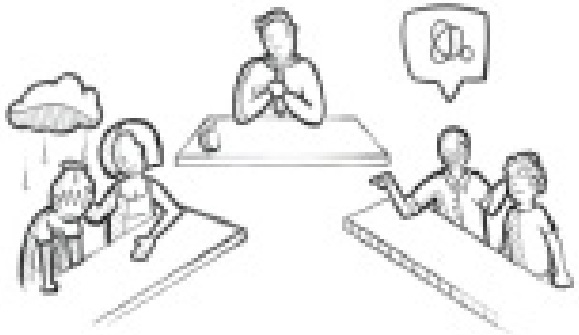
Self

Peers



MISUNDERSTANDING

Being misunderstood can develop into many undesirable outcomes: it can be confusing and distracting to one's self, it can disrupt relationships with peers, and it can devolve into serious conflicts. All of this is harmful to a student's personal growth and development.



Teachers

Parents

SOLUTION

Self

Peers

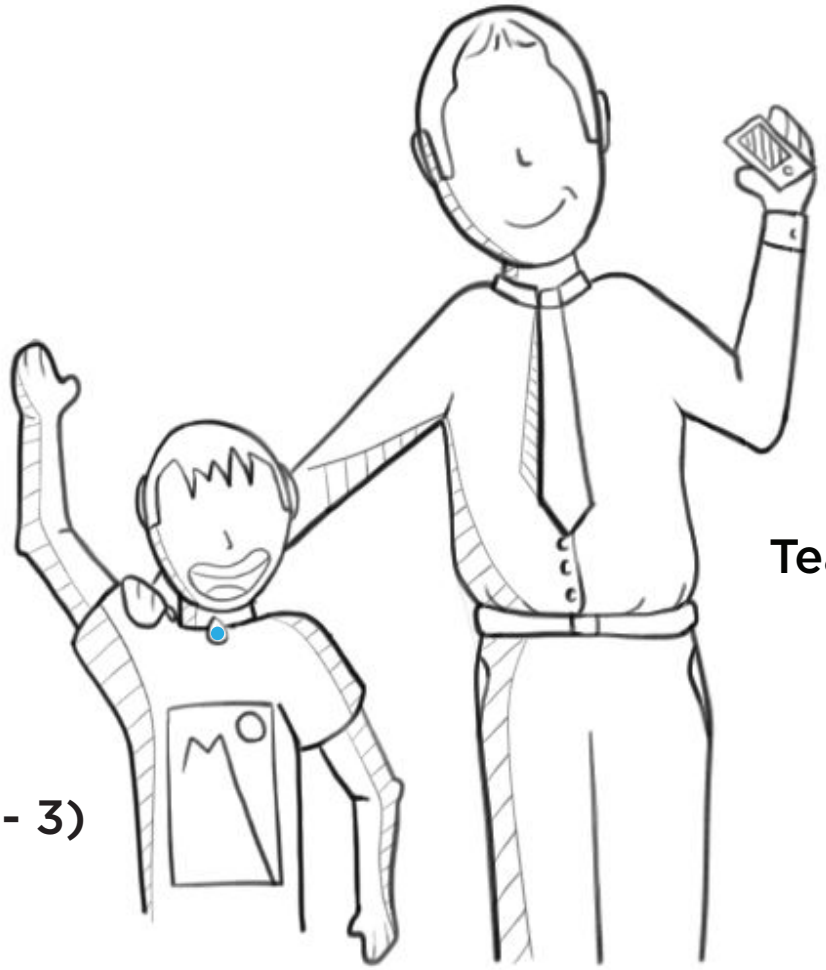
Teachers

EMPATHY

The Webe provides subtle hints to help students to stop and try to understand each other. These small signals lead to increased engagement and learning, strengthened relationships with peers, and a strong habit of empathy.

Parents

OUR USERS



Teachers

Students (Grades 1 - 3)

MORPHOLOGICAL ANALYSIS

CONSIDERATION	OPTIONS			
Data Sensors	Bluetooth (proximity)	Microphone (tone & volume)	EKG (pulse)	Accelerometer (movement)
Feedback Delivery Speed	Immediate (during the interaction)	Delayed (after the interaction)	Daily summary (reflection)	Partial Delay (only if interaction persists)
Device Placement	Wristband	Necklace	Clip badge	
Student Interaction	Signal from student 1 to student 2	Press button to reveal own state	No interaction (passively collects data)	Device vibrates for specified reasons
Insights	Engagement (distraction)	How students and groups are mixing	How student themselves is feeling	How another student is feeling
Data Collection	USB connection (daily download)	Wirelessly (connected to the internet)		
Frequency of Teacher Interaction	Just in time notifications	Daily summary at end of day	Summaries at end of specific activities	On an “as needed” basis

This device could have taken on a variety of different forms with different sensors, interfaces and users. In order to narrow down all the possible combinations, we listed every idea and discussed the different scenarios that would occur for each variable. We ended up choosing a badge-type wearable with limited child interaction and constant teacher contact.

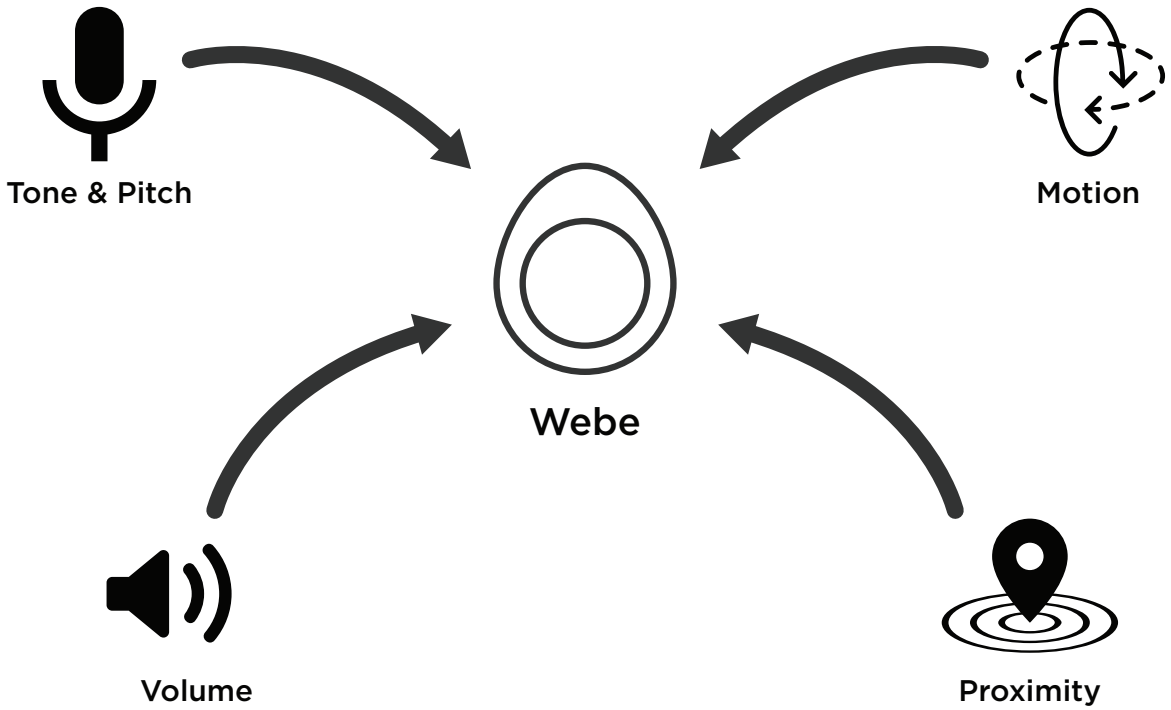
One major choice that we had to make was the form of the Webe. Though we ended up with a badge that clips to the collar of a childs clothes, other forms were discussed, such as a bracelet or necklace style device.The badge allows the microphone to have optimal placement for collecting the child’s voice data, though this comes at the cost of losing heart rate and skin conductivity. This data could be accessible if the device were a bracelet, but placement on the wrist would be less visible to other children.

DATA COLLECTION

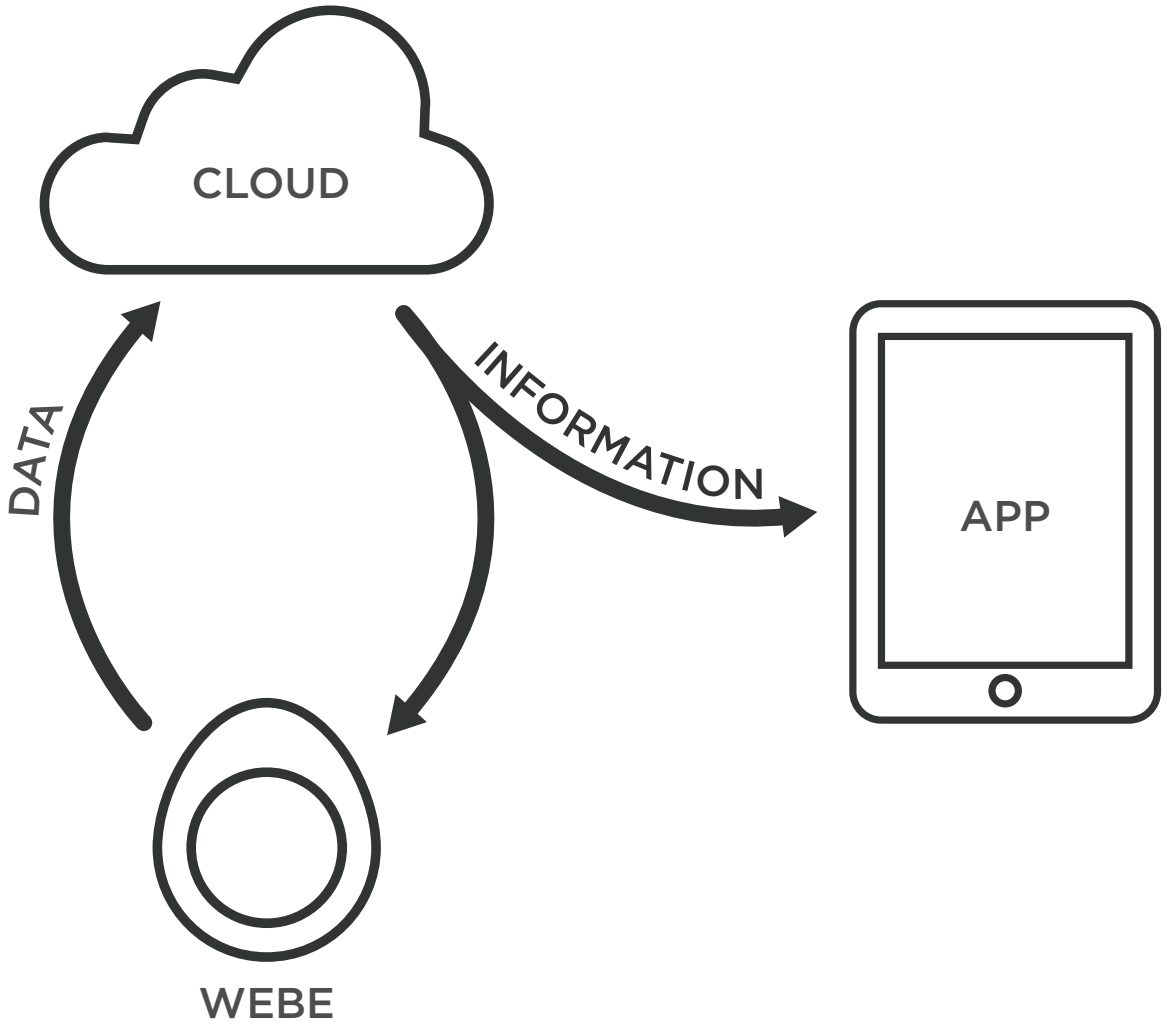
The data that is collected by the Webe is the movement of the child, the tone and volume of the child's voice, and the child's proximity to other children.

An accelerometer captures the child's motion. The child's normal motion is averaged so as to create a baseline for detecting sudden increases or decreases. Vocal data is collected with a microphone. This is processed to create the different data streams - tone and volume. Again, normal conditions for each child are taken into account to allow the device to be the most accurate. These three types of data are processed to determine the child's activation and the pleasantness of their emotions.

Bluetooth connections between the Webes generate proximity data. This allows teachers to review which children are connecting and which are not. When this is compared to the data received from the accelerometer and the microphone, a teacher can glean even more information about their class, such as what type of connections - positive or negative, growing or degrading - are occurring between their students.

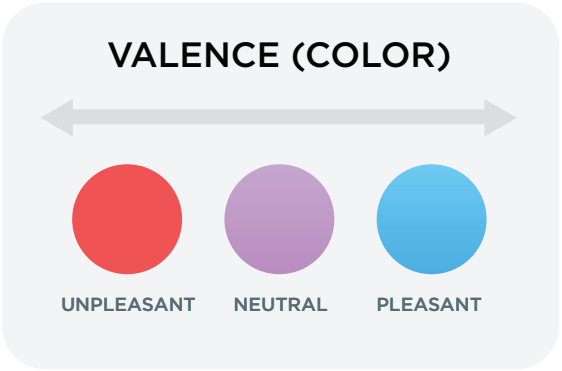


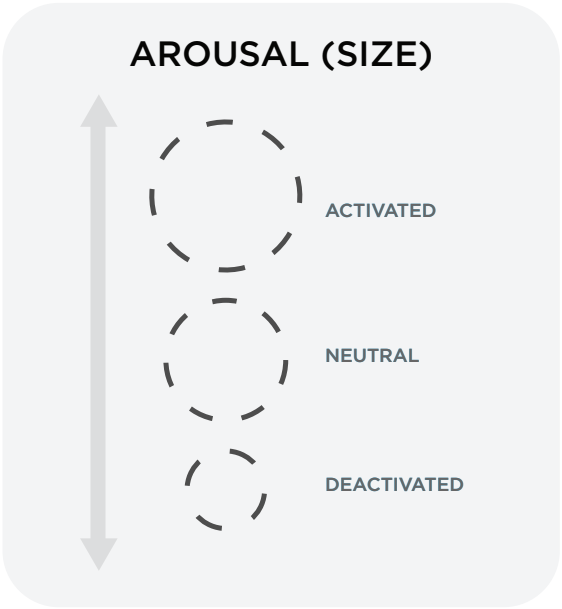
DATA INTERPRETATION

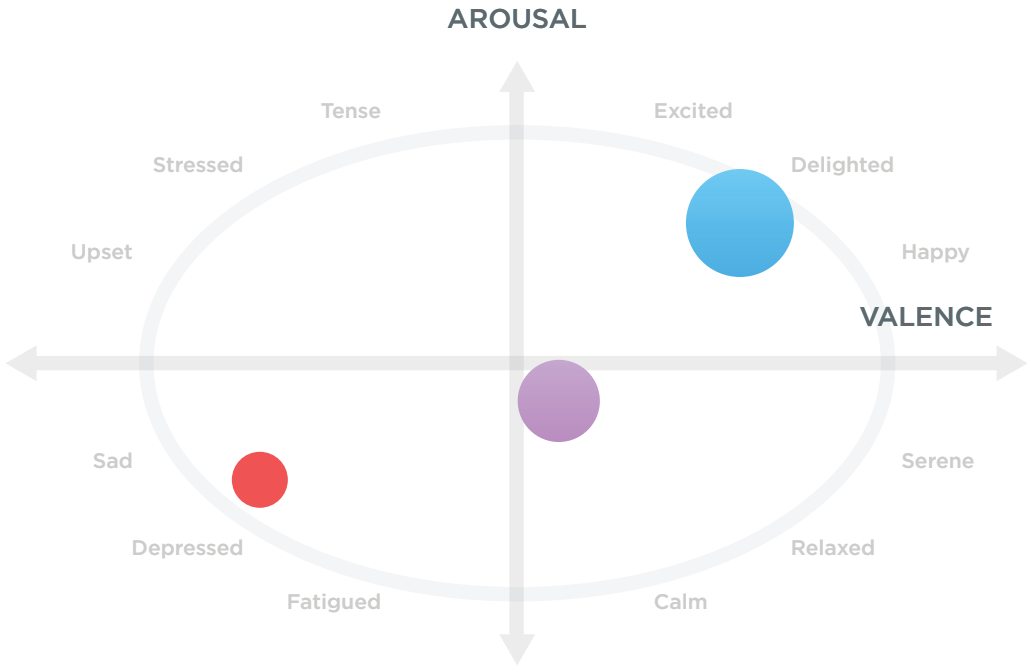


The data for each child is collected by on-board sensors on each Webe. This data is transmitted over wifi to the Webe server. Here, the data is processed into appropriate forms and sent back to the student's Webe, as well as the teacher's app on either their phone, computer, or tablet.

DATA REPRESENTATION - DEVICE SIGNALING







Our research confirmed that it is possible to translate the data we're collecting into information about emotion. Knowing this, we thought next about how we would represent it.

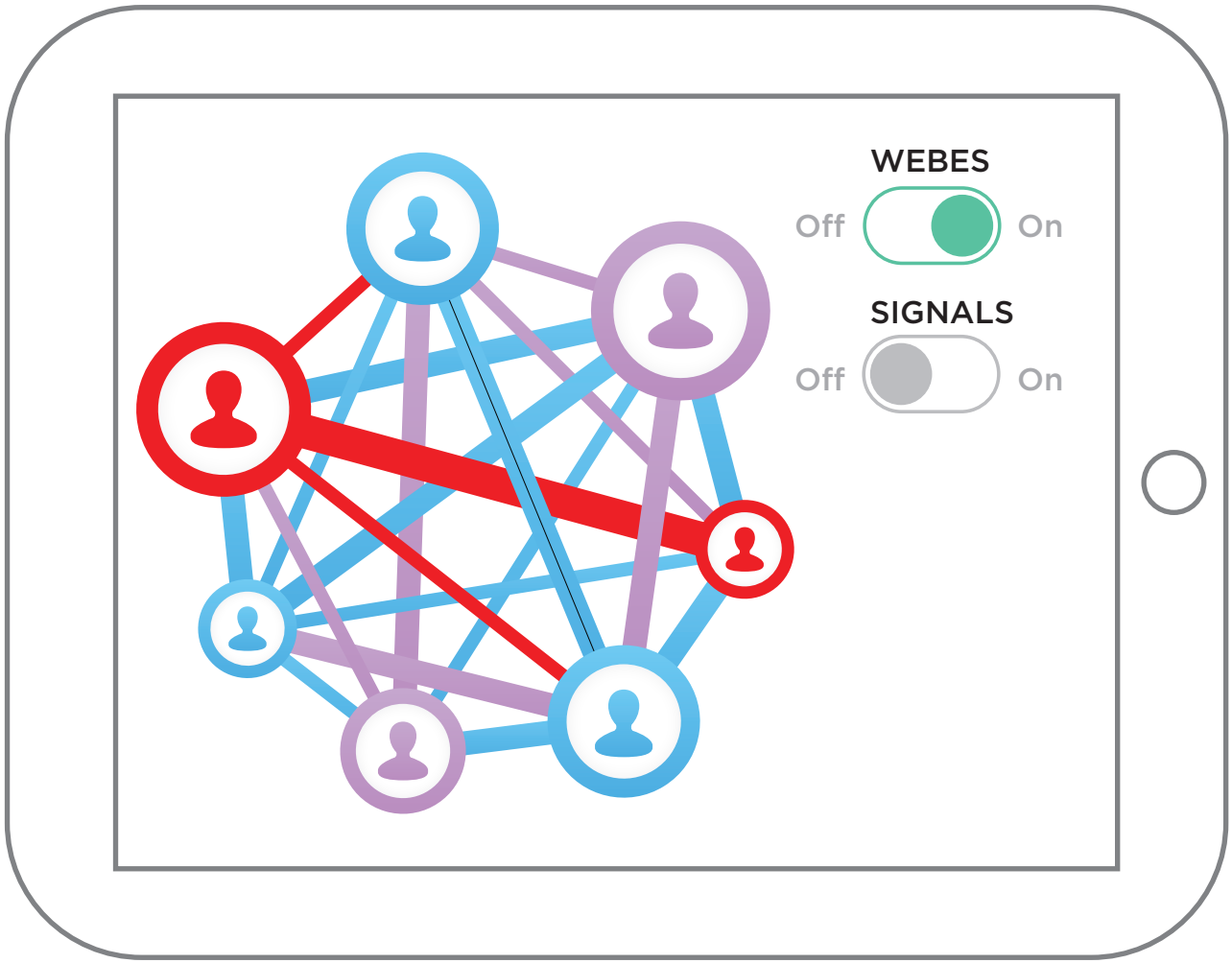
In our research, we found that there are a variety of models used to classify and then represent emotion.

We knew that we wanted the signal from the Webe to be simple and easy to understand because our interviews with teachers revealed that children will often struggle to connect specific facial expressions or gestures to the right corresponding emotions.

We also knew that we wanted the signal to be a subtle hint so that it would not distract from or interrupt but enhance an unfolding interaction. This would mean that the interpretation by the user should happen at a glance and be intuitive.

After careful consideration, we elected to use the circumplex model of affect (seen depicted) because it can be used to represent a wide array of emotions by adjusting only two attributes: size and color. By using this model to represent the signals, the viewer can quickly and intuitively make sense of the wearer's emotional state.

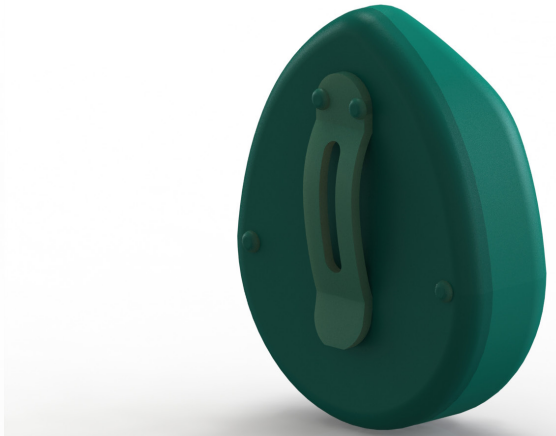
DATA REPRESENTATION - APP INTERFACE



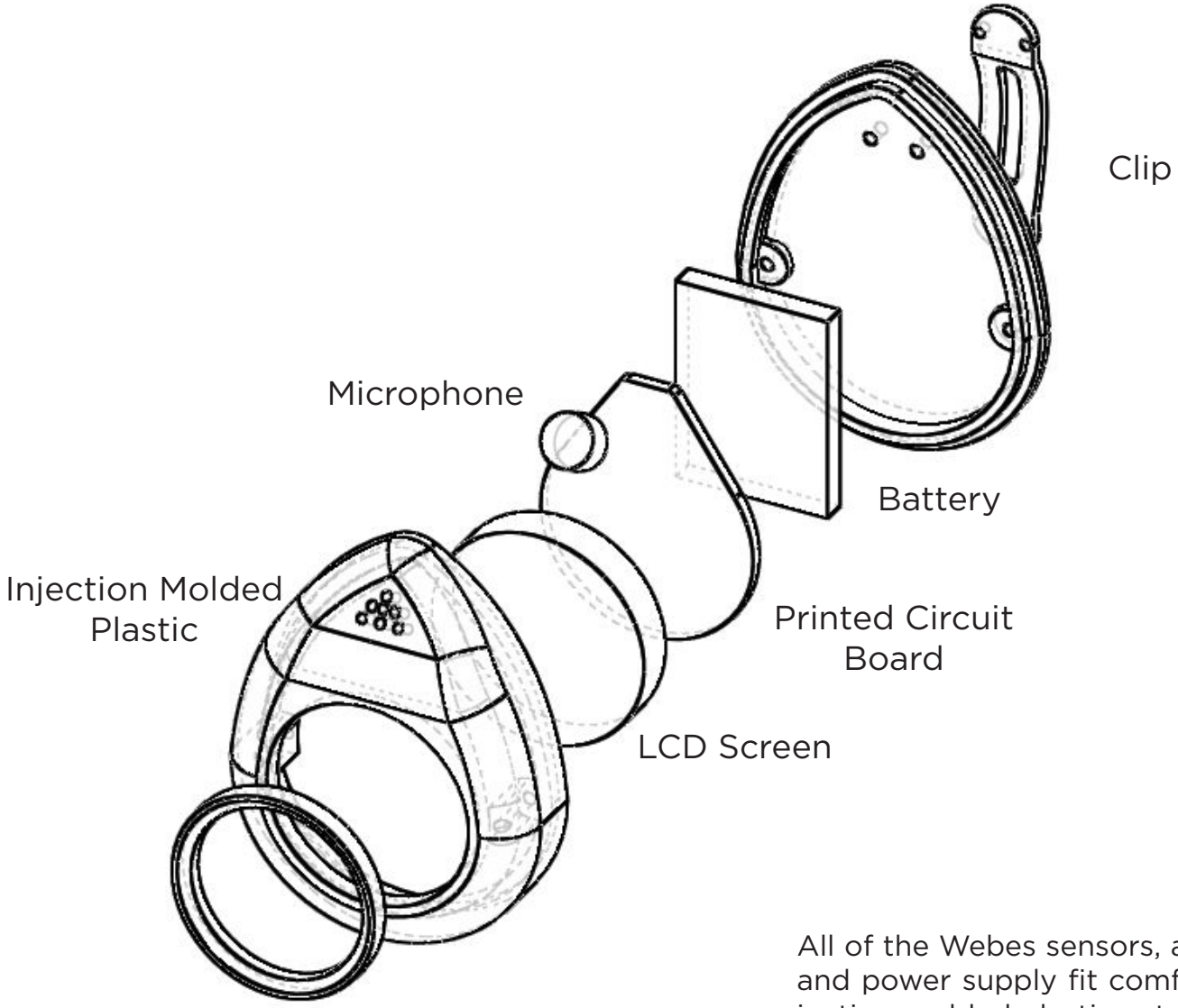
The app for teacher gives them to control of the Webes and lets them view the data they collect. There are options to switch the Webes on or off and a toggle whether or not their displays are on. This decoupling allows teachers to constantly collect data at all times and select certain times or activities when they want the screens to display signals.

As for data interaction, the teacher can see a network map of their students that visually displays each student's average activity and valence with the thickness and color of their icon border, as well as the average frequency and valence of two students' interactions with the thickness and color of the line connecting their icons. The teacher has the option of selecting one student and viewing their specific statistics as well as selecting a subset of the class to view their relationships in isolation.

INTRODUCING THE WEBE

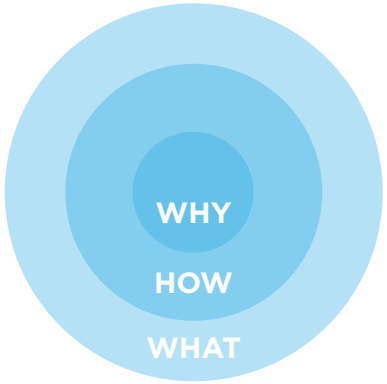


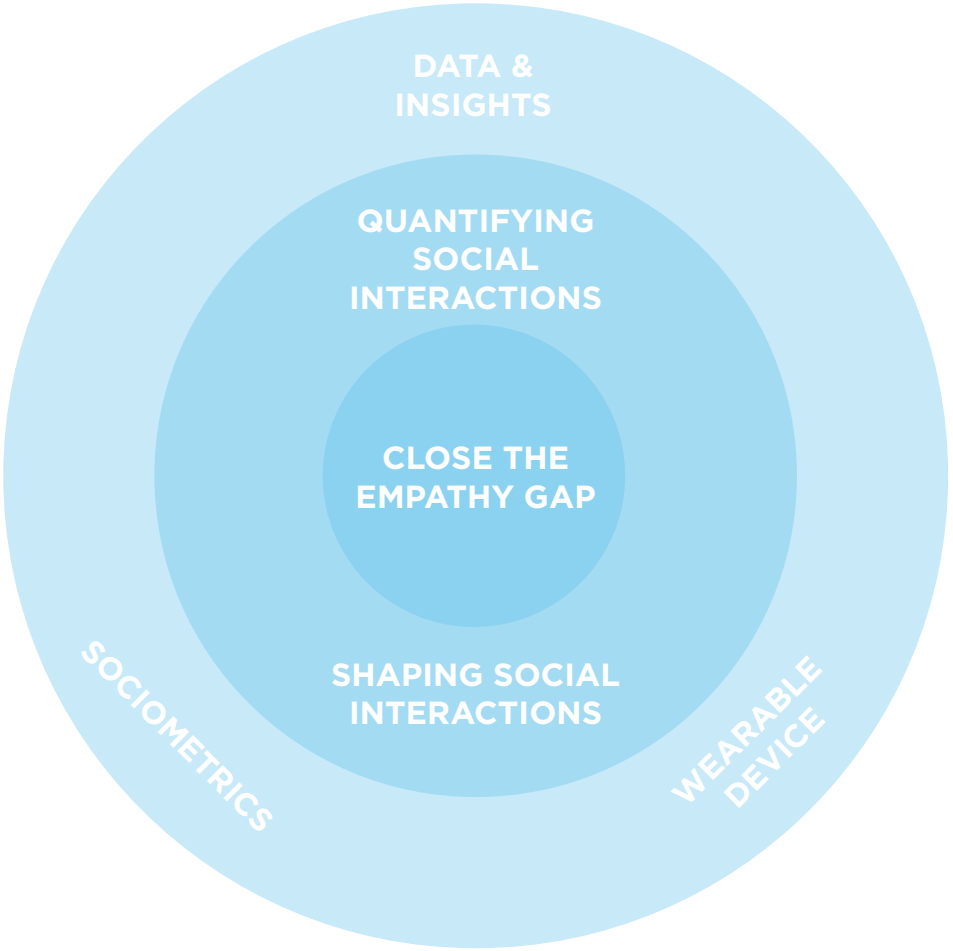
WHAT'S INSIDE?



All of the Webes sensors, as well as the display and power supply fit comfortably within its injection molded plastic exterior.

OUR PURPOSE


WHY
HOW
WHAT


DATA &
INSIGHTS
QUANTIFYING
SOCIAL
INTERACTIONS
CLOSE THE
EMPATHY GAP
SHAPING SOCIAL
INTERACTIONS
SOCIOMETRICS
WEARABLE
DEVICE

COST & PRICE

Item	Cost
Accelerometer	$1
Microphone	$1
Processer	$10
Battery	$4
Wifi antenna	$5
microUSB Connector	$0.20
PCB	$1
Housing	$1
LCD Screen 1in x 1in	$2
SUM	$25

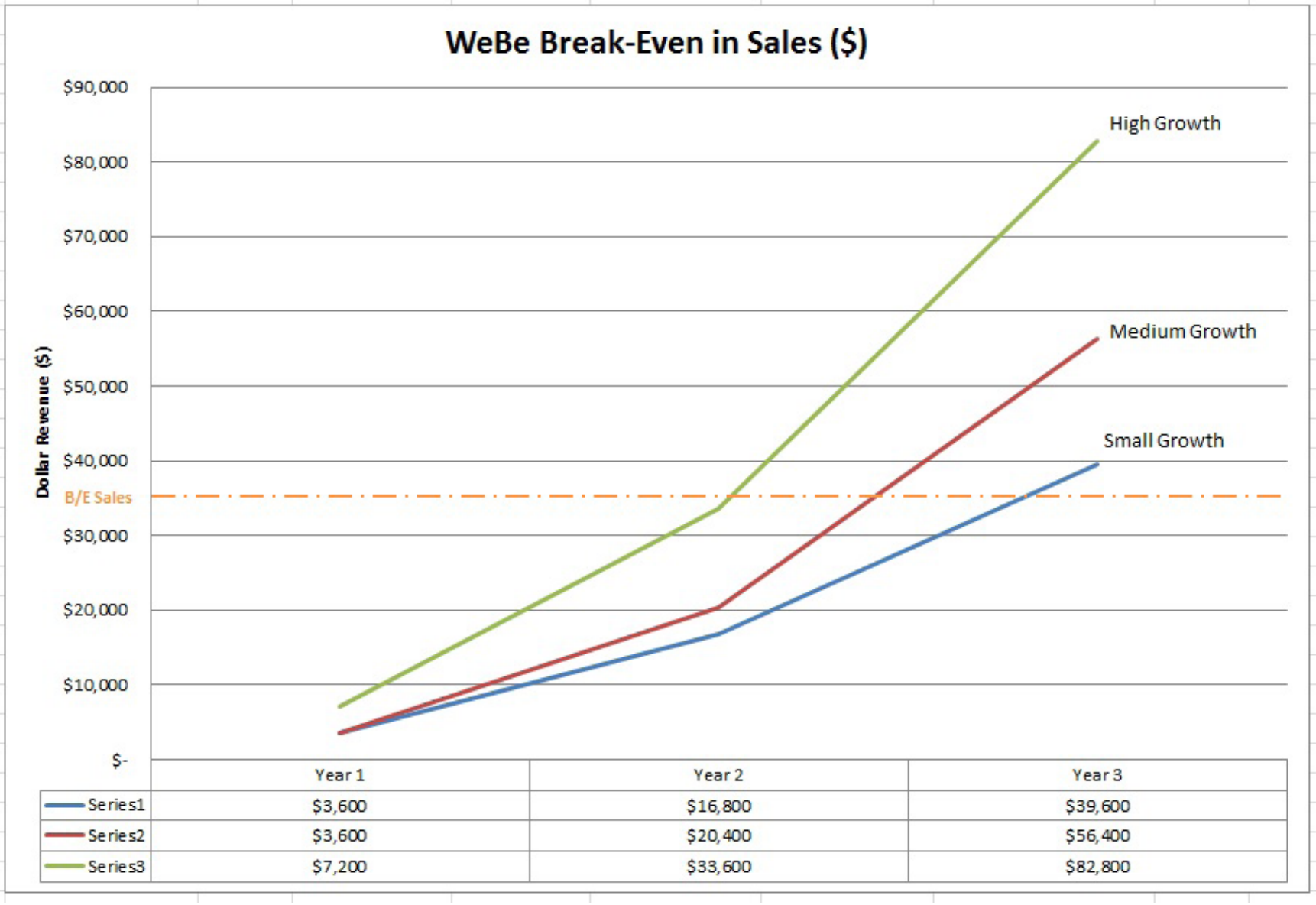
With all the necessary materials that go into WeBe, it costs us $25 to produce each unit. We have priced our product at $40 for a year to rent a unit which will give us a $15 contribution margin. And we will be selling our products to districts.

There are 240 students in each grade on average, so it costs $9,600 (240 units * $40/unit) to outfit a district. Considering that they will rotate 240 units to serve 720 students in each school from grade 1-3, the cost per pupil for using WeBe would be $13.33 per student per year.

Unit Price	$	40.00
Unit Cost	$	25.00
Contribution Margin	$	15.00

Initial Investment		
Fixed Costs		
Salaries	$	10,000.00
Rent	$	20,000.00
Utilities	$	1,200.00
Training	$	3,000.00
Servers	$	50.00
Total Fixed Costs (TFC)	**$**	**34,250.00**
Variable Costs		
Cost of Goods Sold	$	25.00
Total Variable Cost	**$**	**25.00**

BREAKEVEN ANALYSIS



	Year 1	Year 2	Year 3
Series1	$3,600	$16,800	$39,600
Series2	$3,600	$20,400	$56,400
Series3	$7,200	$33,600	$82,800

BREAKEVEN ANALYSIS CONTINUED

Cumulative Sales ($)						
	Scenario	No. of Units	Year 1	Year 2	Year 3	Break Even in Yrs
small growth	A	240	$ 3,600	$ 16,800	$ 39,600	**2.8 years**
medium growth	B	240	$ 3,600	$ 20,400	$ 56,400	**2.4 years**
high growth	C	240	$ 7,200	$ 33,600	$ 82,800	**2 years**

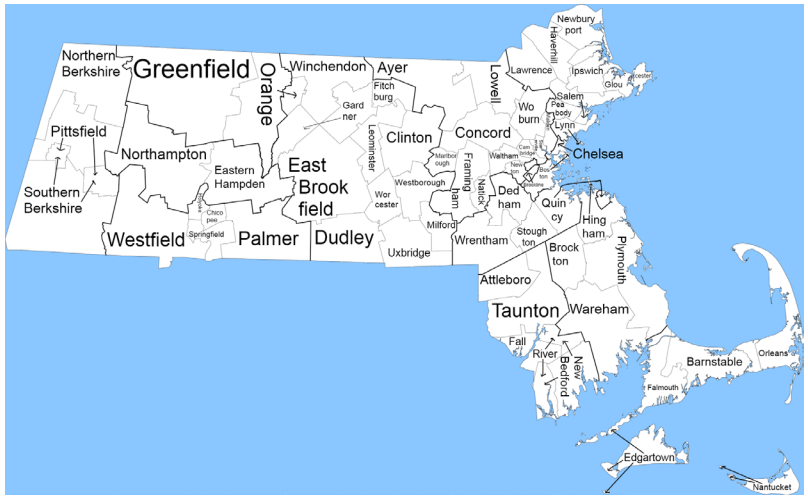
We came up with three different scenarios for the break even analysis: small growth, medium growth, and high growth.

For small growth, we assumed that we will be able to have a contract with one district per year and all the other existing districts remain uncontracted throughout the year. With this consideration, it will take us 2.8 years to break-even.

For medium growth, we assumed that we will be able to have a contract with one district in our first year, a contract with two more districts in our second year, and a contract with two more districts in our third year. Like the first scenario, we assumed that all the contracted districts will continue to use our product. With these assumptions, it will take 2.4 years for our second scenario to break-even.

For high growth, we assumed that we will be starting our first year with contracting two districts in our first year, two more districts in our second year, and three more new districts in our third year. We assumed that all the schools will continue to use our product. With these assumptions, it takes us two years to break-even.

TARGET MARKET

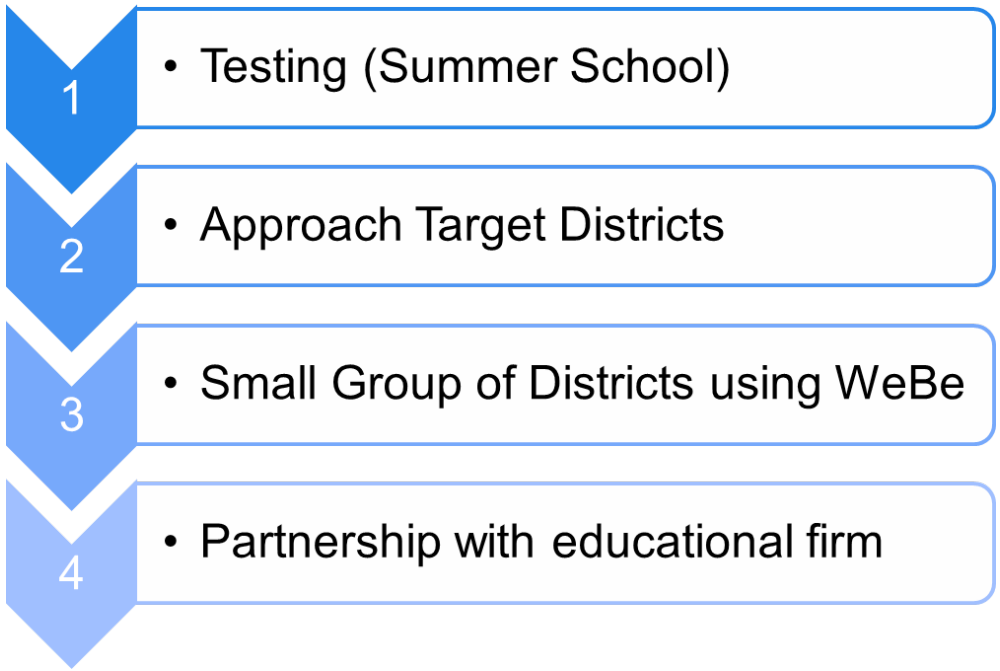


Per Pupil Amounts for Current Spending of Public Elementary Schools

		Support services			
	Total[1]	Pupil support	Instructional staff support	General adminis-tration	School adminis-tration
Maryland	4,874	624	747	197	997
Massachusetts	5,032	1,066	853	195	625
Michigan	4,082	860	537	175	576
Minnesota	3,196	292	474	321	427
Mississippi	2,955	389	418	253	470

We decided to focus on grades 1-3 with districts that have the highest spending per pupil as some districts have a limited budget for students. Geographical, we decided to target Massachusetts districts because these districts have high spending compared to other states' districts. The top five highest spending per pupil districts in Massachusetts are Boston, Springfield, Worcester, Brockton, and Lynn. So we will begin targeting those five districts in the beginning of our business.

MARKET ENTRY STRATEGY



Because our product will be new to the market, we need to test our product first before the school year starts. Summer school will be the perfect option as we will have the same user groups present. After successfully testing WeBe, we will be approaching our target districts.

Once we have a contract with some districts, we will be able to build a reputation and the other districts will be interested in using our service. From there, we will be able to establish a small group of districts using WeBe. We eventually will try to build a partnership with a big educational firm and distribute our products through them as district/school channels are hard to penetrate. This will help our business expand and grow faster.