

## Appendix

### Design Brief Template:

**School:** Chaparral Middle School (this example has been adapted from Chaparral’s 2019 NEDC submission)

**State:** NM

**Division:** Middle School or **High School**

**Team Members’ Names:**

**Project Title:** Readers should have a glimpse at what the project is about and want to read more. (25 word maximum)

Biddle Products Introduces the Smart Spoon and Smart Liquid Alert for the Visually Impaired

**Project Purpose:** In one or two sentences simply identify the inequity being addressed and explain what this project intends to do. (50 word maximum)

Visually impaired students lack low-cost accessories to quickly cleanly and safely enjoy meals. Our goal is to develop a low-cost spoon and cup that will address this inequity.

**Abstract:** Briefly introduce the people who will benefit from the project and the challenges they face. Discuss the inequity they face and explain how the proposed solution addresses it. (100 Words Maximum)

Our classmate is visually impaired and struggles with eating, a simple task for most. When pouring a drink, she has to use her finger to avoid spillage, and she is unable to tell if she had anything on her spoon unless she touches the food. This makes meal times, especially at school, stressful and difficult. We want to assist our friend and thousands of students like her we will design a low-cost spoon and cup that will buzz when there is food on the spoon or enough liquid in the cup. This will help make meals quicker, safer, and cleaner.

**User Research:** Discuss key information about the users gathered through your research, interviews, and discussion with the user throughout the project. What did you learn about the user and the barriers they face? (200 word maximum)

Our research showed that many people nationwide struggle with eating and drinking due to their visual impairments. According to the Centers for Disease Control and Prevention, over 12 million U.S. citizens have visual impairments, and that number is expected to double by 2050 to about 24 million (CDC.gov, 2019).

Most of the tableware currently available are adaptive plates that help the visually impaired pick up their food. People with visual impairments eat using methods such as the clock reference system to determine the location of the food items on the plate

There are liquid level indicators such as the “Say When” for cups that use prongs which go into the cup to detect liquids. The Gyenno Parkinson’s Spoon that helps people that have trembling hands to not spill their food.

Our user touches her spoon or food to know if she has picked up any food. When she pours a liquid into a cup, she often spills. She uses her finger to tell when her cup is full.

The average school lunch for k-12 schools is 25-30 minutes

**User Insight:** Discuss your team’s understanding of the experiences, emotions, and motivations of the users, i.e., share the struggles, fears, and frustrations the inequity causes the user. What did you learn about how the barriers affect the user? (200 word maximum)

Lunch at school can be difficult for many students. With typically only about 10 minutes to eat after waiting in line for food and considering clean up, lunch is often a rushed process. Add to that the social pressure to fit in or not embarrass yourself. For our user, the stress of this situation is magnified because of her visual impairment. Everything takes a little longer for her. This can make her feel rushed. It can cause isolation because her friends don’t want to wait. It has the potential for embarrassment because she might spill or be messy because she is constantly touching her food. She and her parents are also worried about sanitation with the constant touching of her food. Ultimately, our friend just wants to be able to eat lunch, hang out with friends, and not feel like she is a burden because she is slowing people down or needs help.

**User Needs:** Develop a specific list of the user’s needs produced from the insight. Include specific functions or features required by the user. What does the user want to help them with the barrier? (100 word maximum)

A cup that would inform her when her cup is full to avoid spills.  
A utensil that informs her if there is food on the spoon to eliminate touching food.  
Use of a buzz to indicate presence of food.  
Both need to be durable since it will be kept in her backpack.  
Both need to be small and easily portable to make it easy to carry and use at school.

**Project Goals:** List specific goals you want your project to address. Describe how they will meet the user’s needs and address inequities faced by the user. Meeting these goals should be reflected in the key features and graphic(s) provided. What do you want the project to do to help the user? (100 word maximum)

Create a spoon that will use an Arduino to detect the presence of food and alert the user via sound.  
Create a cup that will use an Arduino to detect when the cup is almost full and alert the user via sound.  
Make both low-cost and durable for use by school-age children.  
Make both easy to use with little to no instruction needed.  
Make both light-weight and portable. Preferably to be carried safely in a backpack or lunch box.

**Key Features of Design:** List key features, illustrating that the design will adequately meet project goals. How will the project help the user? (200 word maximum)

Spoon and Cup attachment  
3D printed spoon and cup attachment. Durable and can be easily replaced.  
Photo resistor placed in bowl of the spoon to measure the amount of light.  
Non-Contact water level sensor in cup attachment for sanitary purposes.  
Spoon - Arduino signals buzzer to sound when light is less than the established baseline.  
Attachment - Arduino signals buzzer to sound when desired liquid level is reached.  
Elastic straps are attached to the box to allow the device to be adjusted to fit cups up to six inches in diameter.  
Battery holder for two 3v coin batteries in each.

**Impact:** Discuss how the design helps the user overcome the inequity. Include impact statements from the user. Does the project help the user? How? (200 word maximum)

Both the spoon and liquid alert are low-cost, durable, and easy to clean using handwashing. This allows almost anyone with a visual impairment access to this equipment and removes any cost barrier. Since they are easy to store, carry, and use our user is always ready to eat lunch and does not have to worry about knowing whether or not they have food on their spoon or liquid in their cup allowing the user to be self-sufficient. Our friend shared this quote with us, “I am so thankful for this spoon and cup. I like how easy it is to use and it has made lunch a better experience for me.”

**Status of Project:** Describe the current status of the project, including feedback on design from the user, and discuss potential next steps. What does the project do now? What would you like to work on in the future? (200 word maximum)

The spoon and liquid alert have been through a couple iterations and after testing we feel that both are ready for use. Some of the spoon’s strengths are that it is biodegradable, sanitary, has a low-weight and low-cost. Some strengths of the Liquid Alert is that it is biodegradable, quick to respond, will sound in less than a second and it is sanitary. Both prototypes are simple to turn on and off and allow for easy access to the batteries, characteristics that are important for our client. We would like to make our products dishwasher safe and fully waterproof so that our clients don’t have any difficulty when cleaning the product. We would also like to test different batteries in order to find those that would be easiest to replace. The final recommendation would be to make the Smart Spoon into a Spork so that it could be used for different types of foods.

**Reflection:** Show that your team has an increased understanding of human-centered design. Examples of personal growth and insights gained about designing for others and helping them overcome challenges should also be included. What did you learn about designing for others? (200 word maximum)

We learned that listening to your client’s is very important. We changed some of our initial ideas for the devices based on information from our client. This was very important because although we thought our ideas were good and they worked we have not lived the experience and could not understand how important some of the smaller details, like the buzzer, were to the user. The final products we feel are better overall because we stopped thinking about just creating a product but instead focused on helping a person.

This experience also helped us understand that some experiences that seem less important or less stressful, like lunch at school, were not that way for everyone. Everyone is expected to be able to have lunch in 30 minutes but for some people that is too little time and creates a barrier that may affect their ability to participate in school to the best of their ability. So, although a spoon and cup attachment seem like a simple device it could have a huge impact for someone like our friend.

**Prototype Graphic:** A single graphic with key features adequately labeled. It should be easy to understand, and the reader should have a general understanding of how the prototype functions by looking at the graphic.

Include graphic on next page.

Prototype Graphic:

