The Wooden Wonders

Team 4

Product name: The Wooden Wonder

Problem Statement:
The problem was that we needed to find a system that allows for a urine sample to be introduced to a UTI test strip that was simple, inexpensive, and created as little waste as possible.

Concept Development Summary:
Before we started to do any kind of brainstorming or prototyping we first did research on Rwanda to get more information about the people that live there their language, income, access to healthcare, and the materials available to them. We also looked at the climate and economic state to help us understand who our consumers are so that we can meet their needs as best we can.

After researching we made a list of design inputs and requirements that we wanted our prototype to meet which were: disposable, cheap, easy to use, small, and lightweight. From there we did several brainstorming activities and came up with several possible products that we felt would fix the problem. Then we put our 3 best designs into a design selection matrix in which we rated on how well we thought each of the designs would meet our previously made requirements and found that our wooden tweezer design had the best score out of the 3 designs.

Test Report Summary for Prototype #1:
Test Date: 9/22/14
Test Time: 12:20-1:10
Test Location: Hammond Building
UTI Test Strip
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Test</th>
<th>Pass/Fail</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposable</td>
<td>Wood is easily disposable because it can be burned and is also bio degradable.</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>Cheap</td>
<td>Estimated cost per wooden tweezers is around $.04. A bag of 16 wooden rods costs $1 and 1 rod can make 2 wooden tweezers.</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>Easy To Use</td>
<td>Explained how to use wooden tweezers with the test strip to someone without speaking and only using gestures. They were able to successfully use the tweezers without further explanation or help.</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
<td>Grade</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>The tweezers measured 12 cm in length and .5 cm in diameter.</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>Lightweight</td>
<td>The tweezers only weighed 2 grams.</td>
<td>Pass</td>
<td></td>
</tr>
</tbody>
</table>
Functionality

When held under a stream of water the tweezers held the UTI strip in place while also keeping the hands dry.

Pass

Observation Summary:

While running the tests we observed that the cut on the rod was splintered and uneven and made it difficult to slide the UTI strip into place. We also found out that the cost of making the tweezers is very low which is important because it will be used in countries where most of the population live in poverty.

Re-Design Ideas/Thoughts for Prototype #2:

To improve our tests we could try different ways of explaining how to use the tweezers to multiple people. Instead of just explaining how to use the tweezers without speaking we could make an instruction manual with pictures and see if that worked better. We didn’t have a specific test for durability so we could add a test for durability.

Concept Refinement Summary:

The Design Thinking Workshop really helped us to think outside the box when brainstorming and also allowed us to come up with many more ideas than we had when brainstorming the first time around. We incorporated aspects from our favorite ideas to try and make our second prototype better than the first. We also used the results from testing prototype 1 and decided that we need to improve the durability and make it easier to view the results of the UTI Test.

Test Report Summary for Prototype #2:

Test Date: 10/6/14
Test Time: 12:20-1:10
Test Location: Hammond Building
<table>
<thead>
<tr>
<th>Requirement</th>
<th>Test</th>
<th>Pass/Fail</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposable</td>
<td>Wood is easily disposable because it can be burned and is also bio degradable.</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>Cheap</td>
<td>Estimated cost per wooden tweezers is around $.12 to make.</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>Easy To Use</td>
<td>Explained how to use wooden tweezers with the test strip to someone without speaking and only using gestures. They were able to successfully use the tweezers without further explanation or help. Developed graphics to help explain usage.</td>
<td>Pass</td>
<td>Nick explaining how to use The Wooden Wonder nonverbally.</td>
</tr>
</tbody>
</table>
Correct use of The Wooden Wonder with nonverbal demonstration.

<table>
<thead>
<tr>
<th><strong>Small</strong></th>
<th>The tweezers measured 10 cm in length and .5 inches in diameter.</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lightweight</strong></td>
<td>The tweezers only weighed 4 grams.</td>
<td>Pass</td>
</tr>
</tbody>
</table>
Functionality

When held under a stream of water the tweezers held the UTI strip in place while also keeping the hands dry. Makes it easy to view test results of UTI Strip.

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Pass</th>
</tr>
</thead>
<tbody>
<tr>
<td>When held under a stream of water the tweezers held the UTI strip in place</td>
<td></td>
</tr>
<tr>
<td>while also keeping the hands dry. Makes it easy to view test results of UTI</td>
<td></td>
</tr>
<tr>
<td>Strip.</td>
<td></td>
</tr>
</tbody>
</table>

The UTI strip stays in place and the user’s hands stay dry.

Observation Summary:

Our new design held the strip much better than our first prototype did. It was also much easier to view the results of the UTI test with the new design. Prototype 2 is 2 grams heavier than prototype 1 but 2 centimeters shorter than prototype 1. Also prototype 2 is much more durable than the first prototype however, prototype 2 would cost around $.12 compared to prototype 1 which was only $.04.

Re-Design Ideas/Thoughts for Prototype #2:

If we were to make a prototype 3 our main focus would be reducing the cost. Either by reducing the diameter of the wooden rod or finding a cheaper type of wood possibly bamboo. Also we considered having the prototype come with the strip already in place rather than having them put the strip in place themselves.

Cost Analysis:

Throughout the development period, we experienced slight cost changes as we progressed from prototype #1 to prototype #2. Prototype #1 ran at a cost of $0.04 per unit at retail price while Prototype #2 jumped up to $0.12 per unit at retail price. Even with the large price increase, we believed Prototype #2 was designed better to meet the user needs and desired features more effectively. Prototype #2 was able to effectively meet all of the user needs and improved upon the aspects that Prototype #1 lacked. However, this $0.12 cost is not the lowest cost possible but rather ranges on the high end price wise. As this prototype was made with a single dowel, retail price was paid to obtain the materials which allows for a huge reduction in price when bought wholesale or direct from a manufacturer. Another aspect of the cost that could result in a reduction in cost would be the material used. For the prototype, Maple wood was used as it was the most readily available wood to use for testing. Being a relatively expensive
wood, Maple could easily be substituted for a cheaper or local wood. In Rwanda, for example, Bamboo is readily available, extremely cheap, and grows rapidly. By using Bamboo to produce this product, the price would be driven down to almost nothing similar to the test strip itself.

**User Guides:**

Wooden Wonder User Guide

Required materials:

- UTI Test Strip
- The Wooden Wonder

1)

*Figure 1 shows the required parts to successfully test for a UTI. The Wooden Wonder is shown on the left, and the UTI test strip is on the right.*
2)

Figure 2 shows how to place the UTI strip into The Wooden Wonder. For the best results, carefully place the test strip into the slimmest opening (where the arrows are pointing). This allows one to view their test results through the viewing window without having to touch the unsanitary, used test strip.

3)

Figure 3 illustrates how the Wooden Wonder should look after steps one and two. The strip was correctly placed in the thinnest slot and the strip can easily be seen from the viewing window.
Figure 4 represents the use of The Wooden Wonder. After the test strip is placed, the user may now urinate onto the test strip by holding the Wooden Wonder at an angle under the stream of urine. Also notice how the user is targeting the strip and the viewing window.

5)
Re-Design Ideas/thoughts:

The HESE students and general public provided us with a lot of beneficial feedback during the DEM Showcase. The majority of the feedback was very reassuring to our design. Two out of the three groups that listened to our pitch said that our design was very unique, but user friendly. The Wooden Wonder is a very simple design but a lot of thought was put into it. The HESE students admired the window on the design that allows users to look at the results of the test without touching the strip. This prevents the spread of bacteria. One group suggested that we should have thought about alternative material options. The wood that our model was made out of is maple, and it is not the cheapest one that we could have used. Bamboo was a suggested material; it is cheap and it is local in Rwanda. We should have gone above and beyond to obtain a cheaper material to make the model out of. If the HESE students were to take this idea further and build a prototype #3, I would suggest that they make the model out of bamboo. I would also suggest that they attempt to make the third prototype with a standard saw, rather than a band saw. Our “dream” prototype #3 would be accurately created with a normal saw and it would be made out of a cheaper material; this would be bamboo. This prototype would be given to the Rwandan people with the strip already in place, so that they do not have to insert it themselves. This is attainable because The Wooden Wonder is a one-time use.

Figure 6 is the last step in using The Wooden Wonder. After the user successfully assembles and tests for their UTI, they can safely and harmlessly use The Wooden Wonder and the test strip in their wood oven or fire. The Wooden Wonder itself is made from wood, and the test strip out of paper. Each are eco-friendly to burn and may help the user keep warm and/or cook dinner!