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## **Nutrition on the Move: Nurturing Knowledge for Healthy Habits**

### **Executive Summary**

*Nutrition on the Move: Nurturing Knowledge for Healthy Habits* (NOM) was formed as a response to the current prevalence of childhood obesity within the United States. According to the 2014 State of Obesity report, more than 1 in 10 American children become obese between the ages of 2 and 5. This statistic is even higher for children from low-income families.

Our preventative program, NOM, has two objectives:

- increasing awareness and knowledge of health benefits of common fruits and vegetables for preschool children (ages 3-5), especially those from low-income communities
- increasing the likelihood of parents with young children purchasing healthier options and reducing barriers for purchasing those options

Through NOM, families can check out a Nom-Nom Box from a kiosk at their local grocery store, Woman, Infants and Children (WIC) center or library. This Nom-Nom Box provides a Nexus 9 tablet and accessories as well as plastic fruits/vegetables encoded with a NFC (Near Field Communication) tag. This tag initiates special effects within our apps and allows for interaction between the tangible toys and the tablet.

Different nutrition-related apps will be installed within the tablet, such as Nom-Nom's Adventure where children feed the character, Nom-Nom, with a Nomable. The Nom-Nom then teaches the children the benefits of that particular food through catchy jingles and lively animations.

Participants of the WIC program can check out Nom-Nom boxes for free, and individuals who are not eligible for the WIC program can check out a Nom-Nom Box for a fee. Caretakers can check out, return and renew Nom-Nom Boxes at kiosks. These kiosks also print out coupons and recipes to help families with the cost of purchasing produce, as well as providing them with suggestions on how to cook with produce. Kiosks also dispense mini-Nomables for children to collect to encourage continual use of the Nom-Nom Box. We plan to evaluate NOM through a pilot study with subsets of low-income families with our program.

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## **Introduction**

Childhood obesity is a national epidemic. According to the 2014 State of Obesity report, more than 1 in 10 children in the United States becomes obese between the ages of 2 and 5. Minority and low-income children have an even higher risk of becoming obese compared to their white counterparts. The obesity rates are 22.4% for Hispanics and 20.2% among Blacks, compared to 14.1% among whites (Trust for America's Health and Robert Wood Johnson Foundation, 2014). Overall, childhood obesity rates are stabilizing, but these current rates are still incredibly high and put children at risk for health problems. This is especially true in low-income communities where childhood obesity rates have increased from 12.7% in 1999 to 14.4% in 2011 (Trust for America's Health and Robert Wood Johnson Foundation, 2014).

The 2011 childhood obesity rate in Massachusetts for 2-4 year olds from low-income families was 16.4%. While this is a decrease from the 2008 16.7% childhood obesity rate, Massachusetts still has the 4th highest childhood obesity rate in low-income families compared to other states in the nation (Trust for America's Health and Robert Wood Johnson Foundation, 2014). Low-income children are more vulnerable to obesity because of the unique challenges they face, such as high levels of stress, limited access to healthy food options, and greater exposure to marketing of unhealthy products (Food Research and Action Center, 2010).

## **Summary of Objectives**

Our project, *Nutrition on the Move: Nurturing Knowledge for Healthy Habits* (NOM), focuses on preventing childhood obesity in low-income communities. As young children do not have control of their life circumstances, our project leverages state-of-the-art technology to empower them with nutritional knowledge while reducing cost barriers for their families. With our NOM program, we strive to promote children's access to healthier food options.

NOM advocates healthy dietary behaviors among preschool children, especially those who have the least access to health-related educational resources. Even though young children may not make the final decision on what to eat, as their caretakers purchase the groceries, it is essential to develop their awareness regarding healthy dietary behaviors. Intervention during the preschool years is especially important as preschool children gain more autonomy over their

diets when they begin elementary school. Without an awareness of what is considered healthy, they may easily form unhealthy dietary habits.

Consequently, the primary objective with our project is to promote young children's understanding of what is considered "healthy" and to increase their awareness and knowledge of the nutritional benefits of common fruits and vegetables. Through participating in our project, younger preschool age children (3- to 4- year-olds) should be able to identify and name common vegetables and fruits. Older preschool age children (4- to 5- year-olds) should attain mastery with the terminology of common vegetables/fruits and a general understanding of the nutritional benefits of vegetables and fruits.

Our secondary objective is to encourage parents' purchases of produce. Although our program is designed mainly for preschoolers, caregivers cannot be ignored because they make final purchasing decisions. By doing so, parents and caregivers exert great influence on children's food preference through their behaviors and attitudes (Patrick & Nicklas, 2005). Again, we are focusing on low-income families because they are at a greater risk for becoming obese.

### **Target Audience**

*Primary Audience: Preschool Children, Particularly Those from Low SES Backgrounds.*

For the purposes of our project, we define our target audience as preschool children (ages 3 to 5), living in low-SES communities in Boston. Preschool-aged children often are able to identify common fruits and vegetables, as well identify healthy versus unhealthy food options. Unfortunately, they often do not really understand what makes certain foods healthy. This lack of understanding is apparent because current nutrition messages in educational resources tell children facts, such as the types of vitamins or minerals foods contain, which can be too abstract for young children (Lytle, Eldridge, Kotz, Piper, Williams, & Kalina, 1997). However, young children have a difficult time understanding what a vitamin or mineral is. During their formative years, young children develop their eating habits based on family behaviors (Savage, Fisher, & Birch, 2007). While children may not understand these concepts, they will still imitate health-related behaviors at school and at home.

Preschool-aged children need a concrete base of why healthy foods are healthy and why it is important to eat a variety of healthy foods. According to a Stanford study, children eat more vegetables after nutrition lessons that explain the need for eating a variety of healthy foods as opposed to lessons that simply state nutritional facts or attempt to train children how to eat (Gripshover & Markman, 2013). Unfortunately, most nutritional resources, such as those on ChooseMyPlate.gov, are guides on how children should eat. Preschool-aged children are overexposed to unhealthy food advertisements, such as sugary drinks, fast food, and high-calorie snacks (Food Resource and Action Center, 2010). Young children from low-income families frequently accompany their caregivers during shopping, and while parents and caregivers can exert great influence on children's eating preferences, exposure to this type of marketing can have an equally strong influence on young children. Caregivers may have the intention to make healthier food purchases, but young children can still influence their purchasing decisions (Wingert, Zachary, Fox, Gittelsohn, & Surkan, 2014).

*Secondary Audience: Parents and Caregivers of Low SES Households.* Children in low-SES communities may be at greater risk for childhood obesity, as their parents and caregivers may be purchasing less healthy food items for a variety of reasons. First, low-SES parents and caregivers may be more prone to purchasing foods higher in added sugars and fats due to their relatively lower costs. These foods often have a longer shelf life, which encourages low-SES families to purchase them in order to save more money. Second, low-SES families are more likely to live in neighborhoods that can be defined as "food deserts," which presents a geographic barrier to fresh fruits and vegetables (Darmon & Drewnoski, 2008). While studies suggest that low-SES parents do not know how to cook with fresh produce (Dibsdall, Lambert, Bobbin & Frewer, 2003), other studies remind us that it is not simply the little knowledge but perhaps the fact that they may not have time for extensive grocery shopping (Darmon & Drewnoski, 2008).

Providing knowledge and the skills to make health-related behavior changes is important, we recognize that knowledge alone will not have the impact we are hoping to achieve (Darmon & Drewnoski, 2008). According to the National Center for Children in Poverty, 33% of low-income children under 6 years old have at least one parent who works full-time year round,

76% of low-income children under 6 have at least one parent who works part-time or part year, and 88% of low-income children under 6 years old have parents who are not employed. (Addy, Englehardt, & Skinner, 2013). When looking specifically at Massachusetts, 35% of low-income children have at least one parent who is employed full-time year round, 38% of low-income children have at least one parent who is employed either part-time or part-year, and 27% of low-income children do not have an employed parent (Project Bread, 2014). Parents need to deal with the financial problems before they think about healthy issues. Consequently, our project includes ways to encourage low-SES families by reducing cost barriers (Burr, Trembeth, Jones, Green, Lynch & Roberts, 2007; Darmon and Drewnoski, 2008).

*Developmental Characteristics and Media Habits of Primary Target Population.* For children ages 2 and up, interactive and developmentally media has been suggested as potential tools for learning, such as for developing literacy or fine motor skills (National Association for the Education of Young Children and Fred Rogers Center, 2012). Use of hand-held screens such as smartphones or tablet devices, have increasingly grown within our population (Gutnick, Robb, Takeuchi, & Kotler, 2011). This interactive nature of handheld devices are suggested to be developmentally better for young children's learning. Larger screens, such as the iPad or Nexus tablets, as opposed to a smartphone, may be easier for young children to hold and play (C. Zanchi, personal communication, January 7, 2015).

Despite the potential of media as a learning tool, the technology used must be developmentally appropriate. For example, as preschool children are still unable to read and write, media must use audio voices and visual pictures to communicate to the children. Children ages 3 to 4 also have a hard time distinguishing between fantasy and reality. Only by the end of preschool, children are beginning to understand abstract or representational objects (Berk, 2012). Therefore, again, it is important again to present nutritional messages to children in developmentally appropriate messages, instead of simply stating nutritional facts. As for motor skills, gross motor abilities begin to rapidly grow in preschool years but fine motor skills are still not well developed in 3-5 year olds (Berk, 2012). Consequently some researchers, argue that certain more intricate or multi-step movements, such as drag and drop, may be difficult for younger preschoolers (Papalia, 2008).

### **Proposed Media: The Nom Nom Box**

The main component of our program is the Nom-Nom box which contains a Nexus 9 tablet, charging materials nested beneath the tablet, and a group of Nomables. Nomables are plastic toys that resemble healthy vegetables and fruits. Embedded inside each Nomable is an near field communication (NFC) tag that interacts with the back of the Nexus 9 tablet. This tag initiates special effects within our apps and allows for interaction between the tangible toys and the tablet. Each Nom-Nom Box contains different Nomables, so that each box can have an element of surprise. Children will be able to play and manipulate their Nomables in both real and virtual settings.

Each Nexus 9 tablet will be pre-installed with our apps and a software overlay limiting use of apps outside of our core product. In our apps, users will be able to play with and learn about healthy fruits and vegetables with our main character, Nom-Nom. Nom-Nom is a friendly, gooey creature designed with welcoming features such as large round eyes, broad lines, and arms.

At its current stage, our project focuses on an initial app in which children feed Nom-Nom with Nomables . In our initial app, Nom-Nom is shown on the screen and says “I’m hungry! Can you feed me?” To play the game, children take a Nomable (e.g. a carrot Nomable) and tap it on the back of the tablet. After tapping, the corresponding fruit/vegetable (e.g. a carrot) will pop up on the screen, and Nom-Nom will eat the food with fun animations and audio effects, and then undergo a series of transformations and dance while simultaneously singing facts about the food that is being consumed.

For example, after eating a carrot, Nom-Nom will transform into a carrot-looking creature, dancing on the screen with songs explaining the benefits of eating carrots. However, Nom-Nom’s facial features will not change to make children aware that this carrot is still Nom-Nom. We will include a wide variety of endings for every kind of vegetable/fruit that will create a surprise element and help reinforce the benefits of eating fresh produce through both visual and auditory means. For instance, an alternative ending animation after Nom-Nom eats a carrot is Nom-Nom wearing a pair of orange-colored goggles with background jingles and the words “Carrot Vision!” to illustrate the idea that carrots are good for people’s eyesight.

Our app content aims to build positive associations with healthy foods. As mentioned earlier, children are more likely to eat healthy foods if they understand why they should eat them (Gripshover & Markman, 2013). Instead of simply telling children facts about fruits and vegetables (i.e. “carrots have vitamin A”), our app helps children understand how eating fruits and vegetables will help them (i.e. “carrots are good for your eyes”). Additionally, our app is marketing healthier food choices to children while they are at an impressionable age. Research shows that engaging children with healthy foods can empower them to be purchasing change agents (Wingert et al., 2014). Young children who play our app will understand the benefits of eating healthy, and might be more likely to influence their parents and caregivers to purchase healthy foods during shopping trips.

The software interface for the Nom-Nom app is streamlined for usage by our target audience. The apps were designed to be easy to play with so that a preschooler will quickly be able access the playful learning components. The app is visually appealing to preschool children as it consistently utilizes commercial-like jingles, vivid colors, and lively animations - all characteristics found to be appealing to young children. In addition to research that shows that children pay more attention to media screens when there are visual action or fast paced songs, providing moment-to-moment entertainment (Fisch & Truglio, 2001), these characteristics were found to evoke the large amounts of attention and engagement from the children sampled in our formative study. By creating a highly appealing app, children are likely to play and engage with the app often, which allows for repetition and reinforcement. Consequently, as seen in the Sesame Street model where they also use repetition and reinforcement to teach solid content, children will be able to learn the materials and hence the names and benefits of various produce (Fisch & Truglio, 2001).

One recommendation from our panel of experts was to market with a wider variety of apps for the product. While we are primarily focused on our initial app, we are investigating additional app offerings as well. One concept was a game in which Nom-Nom is on a quest to fight a cold. To do this, Nom-Nom requires fruits and vegetables high in vitamin C. Another concept is a platformer-style game in which Nom-Nom requires healthy foods to surpass certain challenges on each level. The user could tap the necessary Nomable on the back of the screen to

insert it into the game to be used by blob. For example, one level might be too dark or foggy for the character to see clearly. In this case, the user would tap a carrot on the back and enable “Carrot Vision!” allowing Nom-Nom to continue to the next challenge.

### **Distribution Method**

Nom-Nom Boxes will be distributed through kiosks, which allows caregivers to conveniently renew, return or replace the Nom-Nom Boxes. Kiosks are strategically placed in local grocery stores, libraries and Woman, Infants and Children (WIC) offices. Each kiosk will have four slots (see Appendix A). The first slot will contain a card swiper and a keypad that will allow customers to check out a Nom-Nom Box by using different payment methods. The second slot in the middle will dispense the Nom-Nom Box. The third slot will print coupons while caregivers are waiting for the Nom-Nom Box to come out. Caregivers are able to purchase vegetable/fruit at a discount rate in our partner grocery stores/supermarkets. The third slot will also print out recipes on how to cook with fruits and vegetables. The fourth slot will dispense a collectible Nomable toy.

Children receive the collectible Nomable toy each time they check out a Nom-Nom Box. This smaller Nomable also contain microchips, and can be used with our app. New collectible toys will come out every season to encourage eating seasonal foods. This will encourage repeat usage of the Nom-Nom Box while also increasing interest in consuming healthier food options as, in a literature review for the Robert Wood Johnson Foundation, Otten (2014) found that “associating toys with healthy foods can affect children’s food liking and preference” (pg. 2). As one panelist (Jennifer Perry) suggested, we are planning to collaborate with other toy companies or book publishers to expand our free offering of collectables to entice children to come back. Children will also be given a case by WIC and customer service desk at grocery stores to store their collectibles.

Utilizing NFC technology, the kiosks will automatically charge the tablets upon return of the Nom-Nom Box, so that the next family can have a fully charged tablet upon checkout. In order to address a wider population of low-SES households, many who are immigrant families, our kiosks will have multi-language options, audio for languages without written languages, and

options for the hearing and vision impaired. These features will ensure that accessibility to our product is not an issue. On each side of the kiosk is a 50” interactive touch screen, around the same height of preschoolers, where children can interact with Nom-Nom. This touch screen can attract children’s attention. Additionally, there will be advertisements of our product above the touch screen to attract parents or caregivers to the kiosk.

Although one panelist (Jennifer Perry) felt that kiosks were an incredibly difficult method of distributing materials, another panelist (Maria Flanagan) felt kiosks would be great in supermarkets. After much reflection, our group unanimously decided to keep the kiosks as our distribution methods as they are both convenient and have the potential to engage families. Only after conducting a pilot study with our program would we be able to determine whether kiosks are an effective distribution method and make necessary changes.

*Checkout Process.* Individuals eligible for the WIC program will be able to check out Nom-Nom Boxes for free. WIC members can register for our program at WIC offices to use their WIC pin number in order to check out Nom-Nom Boxes through kiosks. Individuals not eligible for the WIC program can check out a Nom-Nom Box for a fee by using their credit or debit cards on the card swiper slot on the NOM kiosks.

Participants can rent the Nom-Nom Box through kiosks at multiple locations including WIC offices, supermarkets/grocery stores, and local libraries. Kiosks in supermarkets and grocery stores will be arranged near the entrances so that people can obtain coupons for immediate use. The libraries will have a number of Nom-Nom Boxes on reserve. The libraries will also have Nomables and an interactive table display with a touch screen preloaded with our apps. Children can play with our products in a common area, which will enhance children’s learning experiences by engaging them in social play.

### **Formative Evaluation Plans**

We conducted formative research with ten 4 to 5 year olds from a local preschool in Cambridge. We showed each child individually a preliminary version of our app, and recorded their reactions to each component. Overall, the children were incredibly excited and attentive to the audio and animation. They also enjoyed the alternative endings.

Through this formative assessment, we were able to get a glimpse of the potential impact of our product. Despite only interacting with our prototype two times, a few of the children were able to tell us “carrots are good for your eyes” or “good for your vision.”

As we continue to develop our product, we would continue similar formative evaluations to determine our product’s appeal and usability. Additionally, we would conduct focus groups with parents and caregivers to better understand their needs. Specifically, we would ask how they feel about our product in regards to their children using it, and how they feel about our product features. This will be especially important as we design the kiosks, as we want to ensure parents and caregivers find them easy to use.

We would also conduct formative research to further understand cultural and community needs. Since we are targeting our product in low-SES communities in Boston, we would take the proper steps to ensure our product reflects their needs. Through focus groups and interviews, we would identify what types of recipes and coupons should be incorporated in our project. We would also identify what types of produce is typically available in those areas, so that the recipes we incorporate would be feasible for families to follow.

### **Outreach Design and Partnership Initiatives**

To reach our target audience, we would partner with the Women, Infant, and Children (WIC) organization, supermarkets, and libraries. At the WIC offices, we would place our NOM kiosks so that mothers could easily borrow Nom-Nom Boxes by using their WIC pin numbers. The WIC offices would be trained with our NOM kiosks and Nom-Nom Boxes so that they could then inform and train mothers and grandparents. With WIC’s mission to “safeguard low-income women, infants, and children up to age 5 who are at nutrition risk” (Women, Infants, and Children, 2013), we would help bolster their mission by helping young children understand the nutritional benefits of healthy eating. As suggested by the panelists, we would also provide a cell phone text-messaging service for parents so that Nom-Nom Box reminders and nutrition tips can be sent on a weekly basis.

Partnering with supermarkets would enable more distribution of Nom-Nom Boxes. Supermarkets such as Stop and Shop and Star Market would be excellent distribution partners as

these stores are where our target audience can use their WIC pins. Supermarkets would accept the coupons that are printed from NOM kiosks, and in return, our kiosks would increase foot traffic to their locations. These kiosks would accept major credit cards so that we do not bar other families from engaging with our product. We also recognize that some cities such as Dorchester, Massachusetts are considered “food deserts,” where larger supermarket chains are infrequent or absent. Therefore, partnering with WIC and local libraries would ensure that our target audience in these environments receive the same benefits.

As mentioned previously, local libraries like the Boston Public Libraries, will have several Nom-Nom Boxes and Nomables on reserve. At these libraries, families can rent the Boxes from the NOM kiosks with their credit card or WIC number, or with their library cards. We would encourage social play between children by installing large touch screen tables where children can use the Nomables to play the various apps.

When considering other partners, we recognize having Google and the Robert Wood Johnson Foundation would be equally important. Google, who has been an active, philanthropic partner in the education sector. For example, Google Apps for Education is a free suite of applications including email, word processing, spreadsheet, slideshow and drawing functionality in the cloud. These services are provided at no cost to districts. Recently, Google opened a specific app store for Android devices that targets the educational market and a suite of productivity apps in Google Classroom. Google is clearly showing interest in the education sector, but has not had the success they anticipated in the US. By providing us with Nexus 9 tablets, which are manufactured by a Google-owned company, they will be helping disadvantaged youth gain access to technology while also introducing their products to future users before they reach the classroom.

As the largest public health philanthropy foundation in the U.S., the Robert Wood Johnson Foundation (RWJF) focuses on several areas of public health, including childhood obesity. We would partner with RWJF as our mission aligns with their goals in improving “health ... for all Americans” (Robert Wood Johnson Foundation, 2014). Having RWJF as a partner would increase the strength and impact of our partnership team, as well as provide connections to other potential partners.

## **Plans for Impact Evaluation**

Given our goals of nurturing knowledge for healthy habits in young children and increasing purchasing power for their parents, we would conduct a pilot study to test NOM with subsets of the low-income families, identified through the WIC centers. Through the pre-test, we record preschool children's baseline knowledge about nutrition and, through an interview with the parents, examine the children's dietary habits. We would randomly assign target families into control and evaluation groups.

Evaluation groups would receive the Nom-Nom Boxes for a week, which is the normal rental period for a Nom-Nom Box, and participate in another interview with the parents and a post-test with the children once the Boxes are returned. With the Nom-Nom Boxes, we can track the children's usage with the Nexus tablets and potentially find any correlation between a child's nutrition app usage and hopefully his or her increase in nutrition knowledge.

Other ways of measuring impact would be through our supermarket and library partners. At our supermarket locations, we could track how many coupons were used for the selected vegetable or fruit that week, which would help indicate parental purchasing behaviors. At the libraries, we can evaluate how many Nom-Nom Boxes are being rented and played with at the library and/or taken home. We can also interview the librarians about children interacting with each other with the Nom-Nom Boxes.

Through these measures, we would be able to evaluate the breadth and depth of our program after a certain period of time. Although we recognize healthy habits take time to form, we would hope to see those behaviors evolve and increase over time, especially with the changes we would undertake in order to meet the cultural and health needs of our target audience.

## **Summary and Conclusion**

The *Nutrition on the Move: Nurturing Knowledge for Healthy Habits* program leverages the power of immersive media technology and tangible smart objects to engage young children in fun, playful experiences that increase their awareness of the benefits of eating fruits and vegetables. With greater knowledge of what is healthy at a younger age, children are more likely to form healthy dietary habits earlier on. Through various partnerships and strategically placed

kiosks, this program reduces barriers to purchasing healthier food items by decreasing food costs for parents through coupons and presenting convenient recipes.

NOM targets young children from low-income families as there are very few media companies who identify “poor, disadvantaged and at-risk children” as their primary audience (Dunn, 2015). This population of children is at a greater risk for becoming obese and would benefit the most from our project. Our project would have a dramatic impact on these children, while also empowering their families to make healthier choices. If our initial pilot study in Boston is successful, we believe NOM will positively impact the lives of all low-income children and families in the United States by nurturing knowledge for healthy habits.

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## APPENDIX A

Figure 1. Nom-Nom, the friendly blob

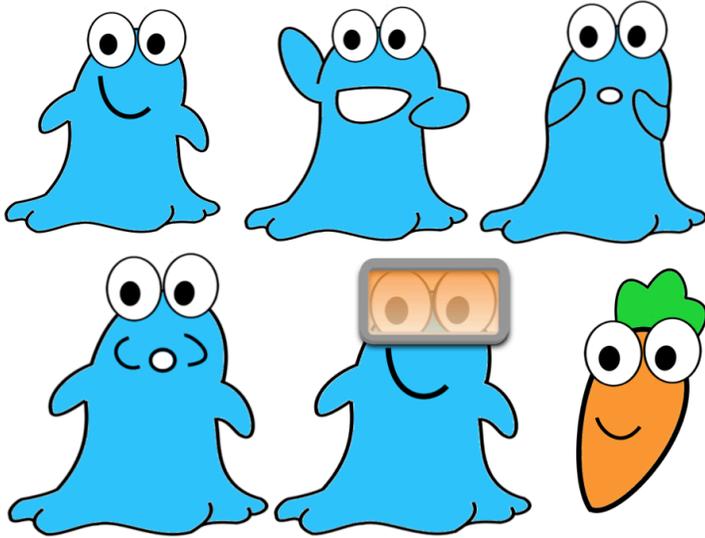


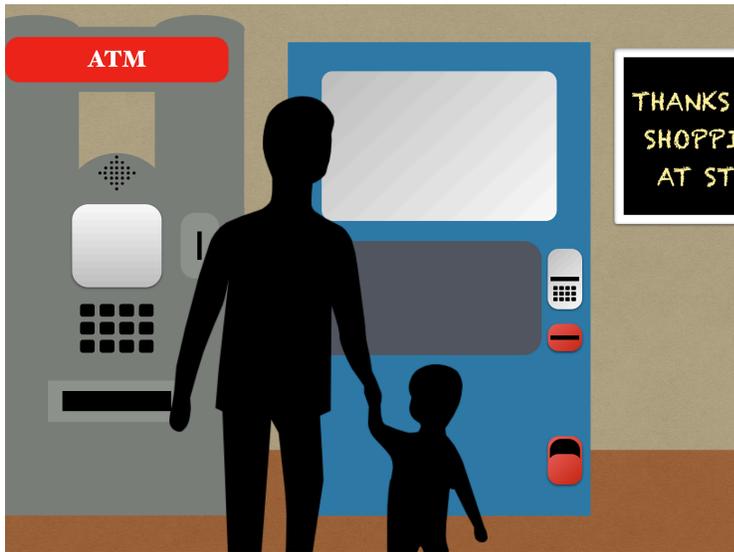
Figure 2. Kiosk - Side View



Silhouette from

[http://www.gunterisd.org/cms/lib6/TX01917909/Centricity/Domain/173/parent\\_child.gif](http://www.gunterisd.org/cms/lib6/TX01917909/Centricity/Domain/173/parent_child.gif)

Figure 3. Figure 3. Kiosk - Front View



Silhouette from [http://www.gunterisd.org/cms/lib6/TX01917909/Centricity/Domain/173/parent\\_child.gif](http://www.gunterisd.org/cms/lib6/TX01917909/Centricity/Domain/173/parent_child.gif)

Figure 4. Kiosk - Labeled Diagram

