Counting Carbohydrates for the Blind: An Online Instructional Design Module

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Abstract: Educating individuals to self-manage their diet is a key component to preventing and managing Type 2 Diabetes, which has been a growing health concern for more than a decade. A part of that education is learning how to count carbohydrates. While there are face-to-face classes or online resources that provide information about counting carbohydrates, these may not be accessible or the content may not apply to someone who is blind or visually impaired. Therefore, the purpose of this research study was to create and evaluate the effectiveness of an accessible online instructional module to teach carbohydrate counting to blind adults who may be at risk of developing or those who have already developed Type 2 Diabetes. The module was created in Canvas to simplify the navigation and was influenced by the Cognitive Load Theory. A total of eight screen reader users participated in the study. Data collected via tests and surveys were analyzed and reported using descriptive statistics. The pre- and post-tests showed an overall improvement. Additionally, the positive feedback from the post-survey indicated that participants felt they had learned an important skill.

Introduction

Diabetes continues to be a growing health issue in the United States. The number of people diagnosed in 1980 was 5.6 million (Centers for Disease Control and Prevention, 2013). In a little over three decades that number has sharply risen to 21 million (American Diabetes Association, 2014). Not only is it a physical and emotional burden, but the national financial cost associated with Diabetes back in 2012 was an overwhelming $246 billion (American Diabetes Association, 2014). Despite having one of the lowest rates of obesity, Hawaii has one of the highest rates of Diabetes in the country. There are more than 100,000 people in Hawaii diagnosed with Diabetes, more than nine percent of the state’s population (Centers for Disease Control and Prevention, 2013). Even more alarming is that it is estimated that nearly 500,000 people in Hawaii have prediabetes and only a small fraction of this number are even aware of their condition. Without intervention 15% to 30% of this number is expected to develop Diabetes within five years (American Diabetes Association, 2014).

Having Diabetes puts a person at a much higher risk for other health complications such as heart disease, kidney disease and nerve damage. Another complication is blindness.
Diabetes is the leading cause of new blindness cases among adults in the United States (Pobutsky, Balabis, Nguyen, & Tottori, 2010). In 2011, there were four million Diabetics living with vision loss (Centers for Disease Control and Prevention, 2014). There are currently more than 22,000 people who are blind in Hawaii (National Federation of the Blind, 2015). And like their sighted counterparts some in this group may have already developed Diabetes or could also be at risk depending on their health and family background. Every state has some form of Diabetes education, but most are face-to-face and may not be accessible or relevant to the blind. And the information that is available online about diabetes management can be challenging and time consuming for screen reader users to access. This is especially the case if sites have ads, a lot of links, are not properly designed with accessible navigational tools and or the information being sought is in the middle or at the bottom of a long webpage. The purpose of this instructional design project is to develop and evaluate the relevance and accessibility of a web-based module that will educate blind adults on how to count carbohydrates as a way to help prevent and treat Diabetes among the blind community who may be at risk or have already developed the disease in Hawaii.

Literature Review

Diabetes is a serious and complicated life-long condition. Prevention of Type 2 Diabetes and management of all types of Diabetes depends greatly on education (Pal et al., 2014). The start of this education typically begins with face-to-face classes with a group of patients, which is taught by a Certified Diabetes Educator (CDE) on what Diabetes is and how to manage their Type 2 Diabetes. A part of this education is learning about how to incorporate a healthy diet and more exercise into their daily routine as this combination has been shown to be the most effective at preventing and managing Type 2 Diabetes (Diabetes Prevention Program Research Group, 2002). A part of maintaining a healthy diet is to know how to keep track of your carbohydrates, which can help prevent or help manage Type 2 Diabetes (Hall, 2013).

Despite these classes being readily available they may not be accessible or relevant to the blind and visually impaired population for several reasons, difficulty traveling to the location of the classes, material not being provided in an accessible format and lack of awareness or relevance by program providers (Williams, 2009). Although there is information online about Diabetes and carbohydrate counting, it may not be as in depth as the face-to-face Diabetes education classes and like the face-to-face classes, may not be relevant or completely accessible to the blind population. As suggested by Pal, et al. (2014), a web-based alternative approach with a specific relevance to a targeted audience may provide access to much needed Diabetes education to those who are not being reached by the face-to-face classes.

While there has been an increased effort to make websites more accessible to the disabled community, many in the blind community feel more needs to be done. According to the 2015 online accessibility survey conducted by WebAIM only 38%of the participants felt web accessibility has gotten better, compared to 37% and 23% who feel it has not changed or gotten worse respectively. Many web designers either do not take into consideration web accessibility during the design phase of the web design or mainly rely
on accessibility software tools to check if their site is accessible. These tools can help with the assessment, but it is not a replacement for an actual user and does not guarantee usability for people who use assistive technology to access the internet (Rebaque-Rivas, Gil-Rodriguez, & Sabate-Jardi, 2013).

In taking into consideration the challenges of navigating a website that my target audience may encounter as advanced or novice users of screen readers, the design of this module was influenced by the Cognitive Load Theory (Kirschner, 2002). Often times a screen reader user takes much longer to become familiar with a website than someone sighted who can familiarize themselves with a glance. The module has been broken down into short and easy to understand chunks as well as providing information that is relevant to my target audience. Navigation to the information has been designed to take the least amount of steps possible (Alasraj, Freeman, & Chandler, 2011).

**Project Development**

The goal of this instructional design module is to inform blind individuals about carbohydrate counting and teach them how to accomplish this without the use of sight. An online platform was chosen because of limitation for the blind to travel and potential accessibility issues with print material used at face-to-face classes, which can be mitigated by using a screen reader to access the web-based module. Therefore, the design of the module needed to minimize the barriers of accessing the online content and activities when using a screen reader by reducing any unnecessary clutter; ensuring screen reader users can complete online forms; and simplifying the navigation through the module.

At first, Weebly or Google Sites along with Google Forms was considered as the primary platform to create the module and collect feedback. However, after testing these platforms with two different screen readers, the platforms did not perform well, especially with an embedded Google Form. The “focus” of the screen reader (i.e. the position of where the screen reader is currently reading on the web page) always jumped to the bottom of the web page after completing an embedded form and would skip over the navigation buttons. This issue could potentially confuse or frustrate users as they try to navigate through the module.

After experimenting with a few other available platforms, as well as testing for accessibility with multiple screen readers, the instructional module was created using Canvas. Although there are some standard navigation areas, this platform allows the designer to minimize the amount of links and non-content related information on a page so the user can focus on the content of the module (See Figure 1).
Canvas also has its own online quiz system that allows designers to create various forms such as tests, quizzes, and surveys, which are accessible to screen readers. The content, surveys, and quizzes were then placed in sequential order (Figure 2) to simplify the navigation so users could use navigational buttons (Figure 3) that work well with screen readers. This ensured more accessibility as well as allowed learners to go through and complete the module at their own pace and convenience. The module is simple in design and is fully compliant with accessibility standards and guidelines.
The module focuses on four content categories: (1) a brief introduction on Diabetes, (2) understanding carbohydrates and why they are important, (3) basics of counting carbohydrates, and (4) tools or techniques blind people can use to count carbohydrates. Each topic builds on the knowledge learned from the previous topic. In January 2016, feedback sessions with content matter experts were conducted to ensure content was accurate and up-to-date. Any indicated revisions to the module were completed before February 2016.

A combination of tools, pre-survey, pre-test, imbedded tests, post-test, and post-survey, were used to evaluate the success of the module. Surveys and tests were created in the Canvas module. The pre-survey (see Appendix B) was used to gather demographic information, accessibility preferences and carbohydrate counting knowledge or experience. The pre-survey includes the following four sections: information on demographics, accessibility preferences, experience with online learning, and Diabetes information. The post-survey (see Appendix C), which was provided at the end of the module, was qualitatively analyzed for content and design satisfaction and rates the following qualities: Module Navigation, Understandable and Engaging Content, and Satisfaction of Experience. Participants were provided the opportunity to leave comments and or suggestions on how to improve their experience with the module. The pre-test (see Appendix D) and post-test (see Appendix E) was quantitatively analyzed and compared to assess the modules effectiveness. These tests contain questions that are based on the content of the module.

**Methods**

The target population for this learning module is adult Diabetics who have lost or are losing their sight, or those who think they may be at risk of developing Type 2 Diabetes who are already blind. I attempted to recruit volunteers ranging in age from 18 to 80 years old by contacting local blind organizations via email as well as using social media (see Appendix F). A total of thirteen (13) people responded with interest to participate. However, only ten (10) volunteers accessed the module online and only eight (8) completed the entire module.
All volunteers were provided instructions via email on how to access the web-based module at their convenience within a three-week period from any internet-connected computer and were informed to contact me anytime if they had difficulty. The instructions included how to create a Canvas account and register for the course that contains the Counting Carbohydrates module. Once the participants accessed the module, they would navigate mainly through the use of “Next” and “Previous” buttons at the bottom of each page (see Figure 3). The module was estimated to take about 60 to 90 minutes to complete.

Within the Canvas platform, participants were required to agree to the terms of the Consent to Participate Form (Appendix A). The consent form informed participants of the module contents, the benefits and risks, time commitment involved, confidentiality and privacy, and how to contact me. By proceeding into the module, participants agreed to the terms of the Consent to Participate Form. All participant results to the pre survey, pre-test, embedded test, post-test and post survey were numerically coded prior to being analyzed to protect participant privacy, and all answers were kept strictly confidential.

**Results:**

Though a total of ten (10) participants accepted the course invitation and created a canvas account, data is only shown for the eight (8) who finished the instructional module. As shown below in Table 1, all of the final participants were women between the ages of 18-35 (3 participants, 38%) and 46-75 (5 participants, 62%). Education among the participants ranged from a high school diploma (12%) to a Ph.D. (12%) with the largest group of participants having a bachelor’s degree (38%) followed by an Associate’s degree (25%).

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<th>Technology Utilized</th>
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The pre-survey also had questions on browser and screen reader use and Internet and screen reader proficiency. As shown in Table 1, a majority (5 participants, 62%) use Internet Explorer as their primary browser followed by Safari (2 participants 25%). One participant used chrome while no one selected Firefox. Participants were asked to rate their Internet proficiency of use from beginner (1 participant, 12%), intermediate (3 participants, 38%) and advanced (4 participants, 50%). Participants were also asked if they used a screen reader, what screen reader and what is their proficiency using it. All of the eight participants (100%) indicated they did use a screen reader. The percentage was the same with half (50%) of the participants indicating they perceived their usage as advanced, although not the same participants that rated their Internet proficiency as advanced answered the same for their proficiency with their screen readers.

Comparison of Pre-test and post-test scores

A comparison of participant scores from the pre-test and post-test shows an improvement for 7 of the participants. Participant #1 shows the most gain from 25% on the pre-test to 68% on the post-test followed by participant #6 with a score of 63% on the pre-test to 93% on the post-test. The smallest gain was made by participant #4 with 50% in the pre-test to 56% in the post-test, while participant #5 dropped from 75% to 60%.

Content Analysis

The pre-test was used to assess prior knowledge about Diabetes and carbohydrate counting and then compared with the post-test to assess mastery of the content. The questions in the pre-test and the post-test were grouped into 3 categories, information on
Diabetes, information on carbohydrates and carbohydrate counting. The greatest gain was made in the carbohydrate counting category from 45% to 68%, while the smallest gain was made in the Diabetes category from 66% to 71%.

### Module Evaluation

The post-survey consisted of 8 questions, 5 Likert scaled (1 strongly disagree to 5 strongly agree) and 3 open-ended questions. The 5 Likert scale questions were separated into 3 categories on navigation, content and satisfaction. The lowest rated question was on the ease of navigation, which received a rating of 3.75.
The participants were also asked to provide feedback about the module in the form of three open-ended questions: What did you like least about the module? What did you like most about the module? and What can be done to improve the module?

In general, the comments about what participants liked most about the module was “the content” as one participant noted. Additionally, there was an appreciation that the content was geared toward the blind stating the tools “[i]lluminated how blind people can monitor their sugar with minimal help.” As for what participants liked least, half of the participants mentioned the navigation of the platform with a screen reader was an issue. One participant stated, “What I did not like was the fact I needed to refind [sic] where I left off after answering each question in the modules [sic].” Another participant suggested “more directions on navigation.” A few participants also mentioned the content could be better as one participant “found it a little boring” and another “thought there should be more information on carbs.” (See Appendix G: Tables 6, 7, and 8 for all the participants’ written feedback.)

Discussion

Though the module appeared accessible with several different screen readers, issues about navigation still arose. However, the cause of the navigation issues is unclear. The two questions in the pre-survey about Internet and screen reader proficiency were intended to establish technical knowledge of their screen reader and familiarity with the Internet. It was expected that Participant 7, who selected beginner for both Internet and screen reader, would rate the question of ease of navigation with strongly disagree. However, it was surprising to see Participant 6 who chose a rating of intermediate for Internet and screen reader also indicated difficulty with navigation, though the participant does comment that the participant may have overestimated their ability. Also, two out of the four participants who indicated themselves as advanced screen reader users also made comments about navigational problems, while the other advanced and intermediate users did not. Therefore, the issues about navigating the module with a screen reader may or may not be caused by the technology itself, but may also be impacted by the actual skills of the user and another way to gauge the users’ ability may have been needed.

Another limitation to the study was obtaining a representative sample of participants who would benefit from the module. First, the sample size was small. This could be attributed to the size of the blind and visually impaired population is such a small size compared to the general population. Also, there were no non-screen reader users who are visually impaired or male participants. Such a limited sample size may not allow the data to be generalized.

Based on the comments provided in the post-survey, additions to the module could be made. Although there were several comments that touted the content, there were suggestions to have more content and activities related to actually counting carbohydrates in meals. As the ultimate goal of Diabetes self-management would be to have people count carbohydrates in their meals, expanding the module to include some additional content and practice may be warranted. Another suggestion was to include instruction on
how to navigate the module. By adding specific instructions as well as tips for screen readers to ensure proper navigation may limit navigation issues.

With an average increase of 18% from the pre-test to the post-test, the module did have a positive impact on the performance of the participants. And, participants had the largest increase (from 45% to 68%) in the main focus of the module of counting carbohydrates. However, the participants’ prior knowledge may not have been accurately determined since the pre-test used only true/false questions. Even though participants had the option of choosing “I don’t know,” they might have simply made a guess. A fill in the blank may have been too difficult, so a multiple choice might have been a better indicator to determine participant’s prior knowledge about module content.

**Conclusion**

Based on the data collected from the surveys and tests, the purpose and goals of this study were met. The rise in scores from the pre-test to the post-test shows an increase of knowledge about Diabetes and especially carbohydrate counting. The positive feedback in the post survey indicates that participants felt that the specific content was valuable to the specific audience.
References


Appendix A

University of Hawai‘i
Consent to Participate in Research Project:
Counting Carbohydrates for the Blind: An Instructional Design Project

My name is Stacie Phasouk, and I am a graduate student at the University Of Hawaii. A requirement for earning my Master’s degree is to conduct a research project. The purpose of my instructional design project is to develop and evaluate the effectiveness of a web-based module that teaches blind adults who may be at risk of developing or who have already developed Diabetes on how to count carbohydrates as a way to help prevent or help manage Diabetes.

I am asking you to participate in this project because you are over the age of 18, have access to the Internet and have a visual impairment.

Time and Activity Commitments:

Once you have consented to participate, you will be asked to fill out a pre-survey followed by a pre-test. There are 4 sections. Each section ends with a quiz. The last two sections will also have practice activities. The end of the module has a final test that will have questions on all four sections. Once you have completed the module, you will be asked to fill out a satisfaction survey. The module is estimated to take 60 to 90 minutes to complete.

Benefits and Risks:

There may be no direct benefit to you, but the information gathered from the project may help to provide more accessible resources to blind adults dealing with preventing or managing their Diabetes. There is little to no risk to you in participating in this project.

Confidentiality and Privacy:

The data taken from your participation in this study will be used solely for the purpose of this usability study. I will not ask you for any personal information, such as your name or address. Please do not include any personal information in your survey responses.

I will keep all information securely stored on a protected computer. I will not use your name or any personal information that could identify you in my research report. Only my University of Hawaii advisor and I will have access to the information. Other agencies that have legal permission have the right to review research records. The University of Hawaii Human Studies Program has the right to review research records for this study.

(continued on next page)
Voluntary Participation:

Your participation in this project is completely voluntary. You may stop participating at any time. If you stop being in the study, there will be no penalty or loss to you.

Questions:

If you have any questions about this study, please call me at (808) 256-5096 or email me at phasouk@hawaii.edu. You may also contact my adviser, Dr. Peter Leong, at (808) 956-3902 or peterleo@hawaii.edu. If you have questions about your rights as a research participant, you may contact the UH Human Studies Program at (808) 956-5007 or uhirb@hawaii.edu.

This is a printed version. Please keep for your own records.
Appendix B

Demographic Survey Sample

1. What is your age?
   Under 25
   26-35
   36-45
   46-60
   61-74
   75 or older

2. What is your gender?
   I am a woman
   I am a man

3. What is the highest level of education you have completed?
   Some high school
   High school degree or equivalent
   Associate Degree
   Bachelor’s Degree
   Master’s Degree
   Professional Degree
   Doctorate Degree

4. Do you live in Hawaii?
   Yes
   No

5. Do you have Diabetes or know someone who has Diabetes?
   Yes
   No

6. How much do you know about Diabetes?
   None
   Some
   A lot

7. How much do you know about counting carbohydrates?
   None
   Some
   A lot

8. How would you rate your proficiency with using the internet?
   Advanced
   Intermediate
   Beginner
9. What browser do you use most often?
   - Safari
   - Internet Explorer
   - Firefox
   - Chrome
   - Other (edit field)

10. Do you use a screen reader?
    - Yes
    - No

11. What screen reader do you use? Select all that apply.
    - Jaws
    - Window-Eyes
    - NVDA
    - Voice Over
    - ChromeVox
    - System Access or System Access to Go
    - Other (edit field provided)

12. How would you rate your proficiency in using your primary screen reader?
    - Advanced
    - Intermediate
    - Beginner
Appendix C

Post Survey Sample

1. The website was easy to navigate.
   Strongly Agree
   Agree
   Neutral
   Disagree
   Strongly Disagree

2. The content was easy to understand.
   Strongly Agree
   Agree
   Neutral
   Disagree
   Strongly Disagree

3. The content and activities were interesting and engaging.
   Strongly Agree
   Agree
   Neutral
   Disagree
   Strongly Disagree

4. I am more confident in my ability to count carbohydrates.
   Strongly Agree
   Agree
   Neutral
   Disagree
   Strongly disagree

5. I would recommend this module to others.
   Strongly Agree
   Agree
   Neutral
   Disagree
   Strongly Disagree

6. What did you like the least about the module?

7. What did you like the best about the module?

8. What can be done to improve the module?
Appendix D

Pre-Test Sample

Questions about Diabetes

1. Diabetes is caused by being overweight.
   True
   False
   I don’t know

2. Type 2 Diabetes is the most common form of Diabetes
   True
   False
   I don’t know

3. One of the symptoms of Diabetes is loss of appetite.
   True
   False
   I don’t know

4. A possible health complication of Diabetes is kidney disease.
   True
   False
   I don’t know

Questions about carbohydrates.

5. Carbohydrates are converted into red blood cells in the body.
   True
   False
   I don’t know

6. Someone with Diabetes needs to pay more attention to their fat intake than their carbohydrate intake.
   True
   False
   I don’t know

7. Milk contains carbohydrates.
   True
   False
   I don’t know

8. Grilled chicken breast contains some carbohydrates.
   True
   False
   I don’t know
Questions about Carbohydrate counting

9. Carbohydrate counting along with exercise can help in the prevention of Type 2 Diabetes.
   True
   False
   I don’t know

10. The main goal of carb counting is to lose weight.
    True
    False
    I don’t know

11. 1 carb serving is equal to 1 carb.
    True
    False
    I don’t know

12. Carbohydrates are measured in ounces.
    True
    False
    I don’t know

13. Using the nutrition information on a food label, The number listed by the total carbs and the number listed by Calories is used to determine the carb count for that item.
    True
    False
    I don’t know

14. 3 carb servings is equal to 45 carbohydrates.
    True
    False
    I don’t know

15. 1 serving of orange juice (8oz) has less carbs than a Mrs. Fields chocolate chip cookie.
    True
    False
    I don’t know

16. A breakfast of 2 scrambled eggs, 3 slices of bacon, and a piece of whole wheat toast with butter and a cup of black coffee with artificial sweetener is about 17 carbs.
    True
    False
    I don’t know
Appendix E

Post-Test Sample

Questions about Diabetes

1. What are risk factors for developing Type 2 Diabetes? Select all that apply.
   - Being Overweight
   - Having a family history of Type 2 Diabetes
   - Being over 60
   - Being Asian
   - Being underweight

2. Type 1 Diabetes makes up what percentage of the Diabetes population in the United States?
   (Fill in the blank)

3. What are some symptoms of Diabetes? Select all that apply.
   - Frequent urination
   - Loss of appetite
   - Extreme thirst
   - Diarrhea
   - Chills
   - Lethargy

4. What are some complications due to Diabetes? Select all that apply.
   - Blindness
   - Asthma
   - Heart disease
   - Kidney disease
   - Shingles

Questions about Carbs:

5. What nutrient must a diabetic pay close attention to?
   (fill in the blank)

6. Carbohydrates are converted into what before entering the bloodstream?
   (fill in the blank)

7. What in the list below “DOES NOT” contain carbohydrates?
   - Milk
   - Butter
   - Yogurt
   - Ice cream
8. Select the one item in the list that contains carbs.
   Wine
   Salmon
   Chicken
   Eggs

Questions about Carbohydrate Counting:

9. What is the main goal of carb counting?
   To lose weight
   To gain weight
   To manage glucose levels in the blood stream
   To manage insulin levels in the blood stream

10. Which food has the most grams of carbohydrates?
    A large banana
    A 5oz grilled steak
    Mrs. Fields chocolate chip cookie
    1 serving of Honey Nut Cheerios

11. Besides total carbohydrates what other information is important in determining how many carbohydrates you plan to eat?
    Calories
    Sugar
    Fiber
    Protein
    Serving size

12. What has the most carbohydrates?
    1 serving of milk
    3 servings of corn
    2 servings of brown rice
    1 serving of grilled salmon

13. How many carbohydrates does a meal of 1 cup of brown rice, 4oz of grilled chicken breast, 1 cup of steamed broccoli and 8oz of milk have?
    (Fill in the blank)
Appendix F

Recruitment Email:
Hello Hawaii Association of the Blind members,
My name is Stacie Phasouk, and I am a graduate student at the University Of Hawaii at Manoa. A requirement for my Master’s degree is to develop a project and find participants to test its usefulness. The purpose of my instructional design project is to develop and evaluate the effectiveness of a web-based module that teaches blind adults who may be at risk of developing or who have already developed Diabetes on how to count carbohydrates as a way to help prevent or help manage Diabetes. If you would like to be a participant, please contact me at phasouk@hawaii.edu.

Twitter Recruitment:
I'm doing research to assess an online module to teach carb counting to blind. Looking for blind adults. PLS RT
## Appendix G

### Table 2 - Participant Pre-Test Scores

| P. | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Total Pts | %  |
|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-------|-----|
| 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 1  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 4     | 25% |
| 2  | 1  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1   | 1   | 0   | 0   | 0   | 1   | 11    | 69% |
| 3  | 0  | 1  | 1  | 1  | 0  | 1  | 1  | 1  | 1  | 1   | 0   | 0   | 1   | 0   | 1   | 11    | 69% |
| 4  | 1  | 1  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 0   | 0   | 0   | 0   | 0   | 1   | 8     | 50% |
| 5  | 1  | 1  | 0  | 1  | 0  | 1  | 1  | 1  | 1  | 1   | 1   | 1   | 0   | 0   | 1   | 12    | 75% |
| 6  | 0  | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 1  | 1   | 0   | 1   | 1   | 0   | 0   | 10    | 63% |
| 7  | 0  | 1  | 0  | 1  | 1  | 1  | 0  | 1  | 1  | 1   | 0   | 0   | 0   | 0   | 0   | 7     | 44% |
| 8  | 0  | 1  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 0   | 0   | 1   | 0   | 0   | 1   | 9     | 56% |

**Total Group Avg.** 9 56%

*Note:* Total sample size, n=8. Question (Q), Pre-Test (Pre), Participant (P), Points (Pts)

### Table 3 - Participant Post-Test Scores

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<th>Q12</th>
<th>Q13</th>
<th>Total Pts</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.50</td>
<td>1</td>
<td>0.33</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>8.83</td>
</tr>
<tr>
<td>2</td>
<td>0.75</td>
<td>1</td>
<td>1.00</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>11.75</td>
<td>90%</td>
</tr>
<tr>
<td>3</td>
<td>0.50</td>
<td>1</td>
<td>1.00</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>11.50</td>
<td>88%</td>
</tr>
<tr>
<td>4</td>
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<td>0</td>
<td>0.33</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>7.33</td>
</tr>
<tr>
<td>5</td>
<td>0.50</td>
<td>0</td>
<td>0.33</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>7.83</td>
</tr>
<tr>
<td>6</td>
<td>0.75</td>
<td>1</td>
<td>0.33</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>12.08</td>
<td>93%</td>
</tr>
<tr>
<td>7</td>
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<td>0.67</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>7.67</td>
</tr>
<tr>
<td>8</td>
<td>1.00</td>
<td>1</td>
<td>0.67</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>9.67</td>
<td>74%</td>
</tr>
</tbody>
</table>

**Total Group Avg.** 9.58 74%

*Note:* Total sample size, n=8. Question (Q), Pre-Test (Pre), Participant (P), Points (Pts)
Appendix G

Table 4 – Content Analysis for Pre and Post-tests

<table>
<thead>
<tr>
<th>Pre-test</th>
<th>Questions about Diabetes</th>
<th>Questions about Carbohydrates</th>
<th>Questions about Counting Carbohydrates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
</tr>
<tr>
<td>Average Correct (%)</td>
<td>50</td>
<td>75</td>
<td>38</td>
</tr>
<tr>
<td>Average Correct by Content (%)</td>
<td>66</td>
<td>69</td>
<td>45</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-test</th>
<th>Questions about Diabetes</th>
<th>Questions about Carbohydrates</th>
<th>Questions about Counting Carbohydrates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
</tr>
<tr>
<td>Average Correct (%)</td>
<td>63</td>
<td>63</td>
<td>58</td>
</tr>
<tr>
<td>Average Correct by Content (%)</td>
<td>71</td>
<td>84</td>
<td>68</td>
</tr>
</tbody>
</table>

Table 5 - Module Evaluation

<table>
<thead>
<tr>
<th>Website Navigation</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The website was easy to navigate.</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Content: Understandable and Engaging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The content was easy to understand.</td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. The content and activities were interesting and engaging.</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Satisfaction of Experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I am more confident in my ability to count carbohydrates.</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5. I would recommend this module to others.</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note. Total sample size, n=8. Scores based on a Likert 5-point rating scale. 5=Strongly Agree 4= Agree 3=Neutral 2=Disagree 1=Strongly Disagree.
Appendix G

**Table 6** – Responses to Open-ended Post-test Question: What did you like the least about the module?

<table>
<thead>
<tr>
<th>Ps</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This is all helpful information, so there is nothing that I did not like. I have to say that I found it a little boring, but I am sure if I had diabetes, I would have loved every word of it.</td>
</tr>
<tr>
<td>2</td>
<td>No way to jump directly to each part of the module. Have to click Previous or Next multiple times to skip around. Would have been nice to have some kind of Table of Contents for easier navigation.</td>
</tr>
<tr>
<td>3</td>
<td>I thought there should be more information on carbs. For instance, information on the other things that might affect carb count, such as dietary fiber, or why they have no effect. I would have also liked to see information on Atkins and other low carb diets and their efficacy for diabetics and pre-diabetics.</td>
</tr>
<tr>
<td>4</td>
<td>The only thing I didn't like about is when would look at your anser the cursor would jump to the top where the question was, this is before I turned automatic refreshing off, after that it worked fine.</td>
</tr>
<tr>
<td>5</td>
<td>What I did not like was the fact I needed to refind where I left off after answering each question in the modules. I would answer part of the question with my first item checked, then find I was now way above where I was working. I kept using JAWS commands to find my place, but it was somewhat annoying.</td>
</tr>
<tr>
<td>6</td>
<td>navigating website and finding my place again after getting kicked off for some reason</td>
</tr>
<tr>
<td>7</td>
<td>I am not very good at working with and navigating on the computer, and doing a test like this just confirms it.</td>
</tr>
<tr>
<td>8</td>
<td>Having to look up answers instead of being given the option to choose answers that were provided.</td>
</tr>
</tbody>
</table>

**Table 7** – Responses to Open-ended Post-test Question: What did you like the best about the module?

<table>
<thead>
<tr>
<th>Ps</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>That it gave clear instructions on how to count carbs.</td>
</tr>
<tr>
<td>2</td>
<td>I liked the section on the tools to find carb info. Illuminated how blind people can monitor their sugar with minimal help.</td>
</tr>
<tr>
<td>3</td>
<td>I liked the activities, getting us out there using the tools to get carb information.</td>
</tr>
<tr>
<td>4</td>
<td>What I like best about the modual was it taught you what to look out for if you have diabetes and it also explained what carbos were, and how to count them.</td>
</tr>
<tr>
<td>5</td>
<td>I enjoyed the content, which taught me things I didn’t know. The most enjoyable was learning how to independently get carb info by going online.</td>
</tr>
<tr>
<td>6</td>
<td>learning about carbs and diabetes</td>
</tr>
<tr>
<td>7</td>
<td>It's a step forward for accessibility for the blind for this information, even though I can't use it very well, maybe other people can.</td>
</tr>
<tr>
<td>8</td>
<td>The content</td>
</tr>
</tbody>
</table>
Table 8 - Responses to Open-ended Post-test Question: What can be done to improve the module?

<table>
<thead>
<tr>
<th>Ps</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Can't think of anything.</td>
</tr>
<tr>
<td>3</td>
<td>Add at least one more activity page where we're counting carbs in meals. I worry that I may have missed a few questions by not choosing the right foods when I was exploring. It's also good to see the difference between brown and white rice, white and yellow corn, etc.</td>
</tr>
<tr>
<td>6</td>
<td>to</td>
</tr>
<tr>
<td></td>
<td>Less steps to get to info</td>
</tr>
<tr>
<td></td>
<td>For new users, more direction on navigation</td>
</tr>
<tr>
<td></td>
<td>Maybe this would be done before starting the class. I know it really helped after Stacie gave me a little direction. I may have overestimated my skill level as medium user...ha ha.</td>
</tr>
<tr>
<td>7</td>
<td>Since I already have problems using the computer, it's hard to know which of my problems with navigation and with entering the module come from my inability and which come from the module itself.</td>
</tr>
<tr>
<td>8</td>
<td>Would rather have answers be multiple choice instead of having to go outside the module to look for answers.</td>
</tr>
</tbody>
</table>

NOTE: Participants 2, 4, and 5 did not leave a response.