

# Effectiveness of the Healthy Diabetes Plate and Social Media Project

## Abstract

Twenty-eight men and women completed an eight week diabetes meal planning program called the Healthy Diabetes Plate (HDP) and Social Media (SM) Project. It focused on (1) ability to plan meals, (2) eating behaviors and self-efficacy, (3) diabetes signs and symptoms and (4) Facebook and Pinterest. Mixed methods-quantitative and qualitative analyses -were used to analyze the data. Quantitative analysis included frequencies and Pearson's chi-square analyses. Qualitative analysis included identifying themes from posts on the Healthy Diabetes Plate (HDP) Facebook and Pinterest pages that were created. Participant's knowledge or ability to plan diabetes meals increased from lesson 1 (79%) to lesson 3 (93%). From pre- to post-study, there was a significant increase in the number of participants who found diabetes meal planning to be easy, and a significant increase in their self-efficacy scores and their ability to eat out at restaurants and purchase foods while still following their diabetes meal plan. Fifty percent of participants participated in the Facebook and Pinterest social media activities. They used it to help them in meal planning (46.4%), finding recipes (28.6%), and (3) assist when dining out (21.4%).

## Introduction

Type 2 diabetes is a major threat to the public's health in the United States [1]. According to the 2014 National Diabetes Statistics Report, it is estimated that a total of 29.1 million people in the United States have diabetes or 9.3% of the population [1]. Diabetes self-management (DSM) is multifaceted and requires many lifestyle changes [2] such as weight loss [3], dietary habits and regular exercise [4] to obtain and maintain optimal glycemic control [2]. Diabetes control, achieved through changes in management practices can improve health outcomes and keep people with diabetes healthy [1].

Improving an individual's DSM through education can help them control their blood glucose levels by teaching them about the benefits of exercise, losing weight, if necessary medication use and following a meal plan [1]. Meal planning is one of the most challenging components of diabetes management [5] and out of the many diabetes meal planning tools that do exist such as carbohydrate counting [6], glycemic index [7] and exchange method [8], few target low literacy populations [9]. Understanding basic health information which includes diabetes management is a common problem in the United States where only 12% of the population can obtain, comprehend and process basic health information to make proper health decisions [10].

The Plate Method targets low literacy populations by providing a simple visual approach to learning about diabetes meal planning [11] that enhances understanding [12]. It teaches people the types and amount of foods they should be eating by dividing a plate into the various food groups [13] and has been promoted widely across the country by nutrition educators [14]. It was created for nutrition education purposes and designed to be incorporated into health



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Isaac Wright<sup>1</sup>, SeAnne Safaii<sup>1\*</sup>, Martha Raidl<sup>1</sup>, Julie Harker Buck<sup>1</sup>, Marnie R. Spencer<sup>1</sup>, Laura L. Sant<sup>1</sup>, Rhea Lanting<sup>1</sup>, Surine Greenway<sup>1</sup>, Ellie Nagel<sup>2</sup>, Joey Peutz<sup>1</sup> and Nancy C. Deringer<sup>1</sup>

<sup>1</sup>Family and Consumer Science Department, University of Idaho, USA

<sup>2</sup>St. Alphonsus Hospital, Ontario, USA

### \*Address for Correspondence

SeAnne Safaii, Associate Professor, Family and Consumer Science Department, University of Idaho, Boise 322 E. Front St Ste 180, Boise, ID, 83702, USA, Tel: 208-364-4567; Fax: 208-364-4035; E-mail: sjsafaii@uidaho.edu

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curriculum resources for a variety of learning styles [14].

For patients with diabetes, social media has been used to improve diabetes control [15] by reducing hemoglobin A1c levels [16]. Social media may also provide support and serve as a venue for individuals to share information, knowledge, connect with others and obtain information [17]. When social media is incorporated into the classroom, individuals use it as a way to remain connected with their instructors and enhance their learning [18].

Therefore the purpose of this study was twofold: (1) to test a plate method curriculum called the Healthy Diabetes Plate on a diabetes population, and (2) to determine if social media is an effective educational tool.

## Materials and Methods

### Healthy diabetes plate program

The Healthy Diabetes Plate (HDP), a four-lesson peer-reviewed, evidence based curriculum, targets individuals with type 2 diabetes. It teaches diabetes meal planning skills and was originally published in 2003. Participants attending these classes learned about the diabetes



Figure 1: The original healthy diabetes plate

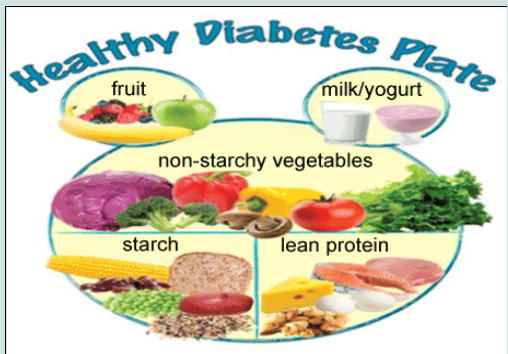


Figure 2: The updated healthy diabetes plate

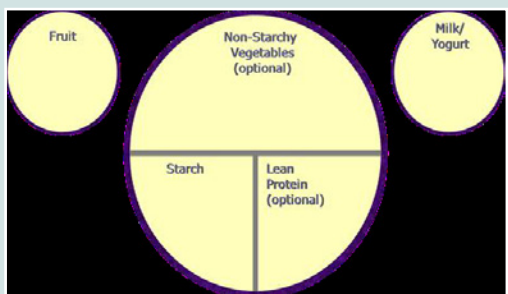


Figure 3: Example of a breakfast meal planning sheet

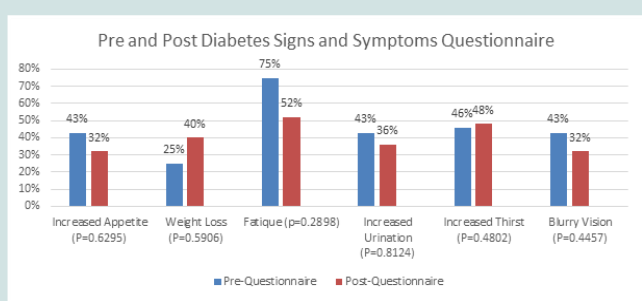


Figure 4: Percentage (%) of participants that responded “yes” to the signs and symptoms pre- and post-study

“plate” method, i.e. how five diabetes food groups - vegetables, starches, protein, fruit, and dairy-fit on a plate (Figure 1). When tested, between 85-99% of participants correctly used this “plate” method to plan their meals in a variety of settings home, grocery store, and eating out [19].

In 2014, the HDP curriculum was updated to reflect the changes in the American Diabetes Association (ADA) diabetes “plate” and their recommendation that more information was needed on the effectiveness of the “plate” method [5]. In addition, two social media platforms, the Healthy Diabetes Plate Facebook and Pinterest pages, were designed and incorporated into the program to determine if they would provide support and help individuals with their diabetes meal planning skills. The new curriculum was called The Healthy Diabetes Plate & Social Media (HDP & SM) program.

The new HDP & SM program was taught over an eight week

period. Participants attended face-to-face classes during weeks 1, 3, 5, and 7 and completed Facebook or Pinterest activities during weeks 2, 4, 6, 8. During the face-to-face classes, participants learned about the signs and symptoms of diabetes, the updated Healthy Diabetes Plate (Figure 2) which consisted of five food groups-non starchy vegetables, starches, lean protein, fruit, milk/yogurt, how to select foods in the supermarket, cooking tips, and eating out. At each face-to-face class, participants completed meal planning activities. During the social media sessions (weeks 2, 4, 6 and 8) participants completed Facebook and Pinterest activities that reinforced the concepts covered in lessons 1, 3, 5, 7, and posted pictures of meals they consumed.

The HDP & SM project was approved by the University of Idaho (UI) Institutional Review Board (IRB) in January 2015. Six University of Idaho extension faculties and one Certified Diabetes Educator (in Oregon) were trained on the research protocol and conducted the program in a community or hospital setting from February - June 2015.

**Participants:** A convenience sample of (N=54) adults enrolled in the study and (N=28) completed the study. They were recruited through the University of Idaho extension offices, diabetes support groups, and health care agencies using flyers, radio advertisements and Facebook. Eligibility criteria included being 18 years of age or older, being diagnosed with type 2 diabetes or having a caregiver or friend with diabetes or interest in diabetes meal planning. Classes

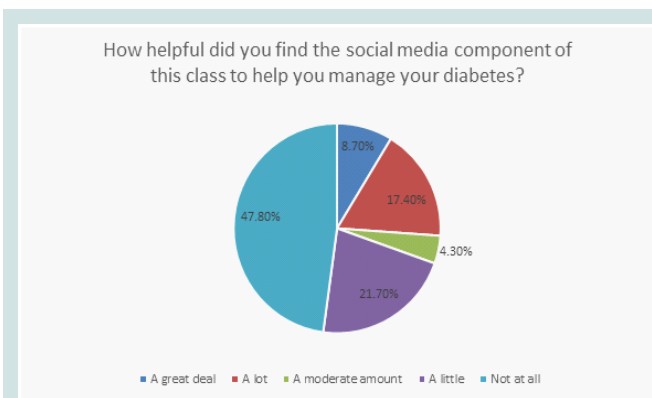


Figure 5: Number and percentage (%) of responses to questions on the post-survey related to SM use and preference

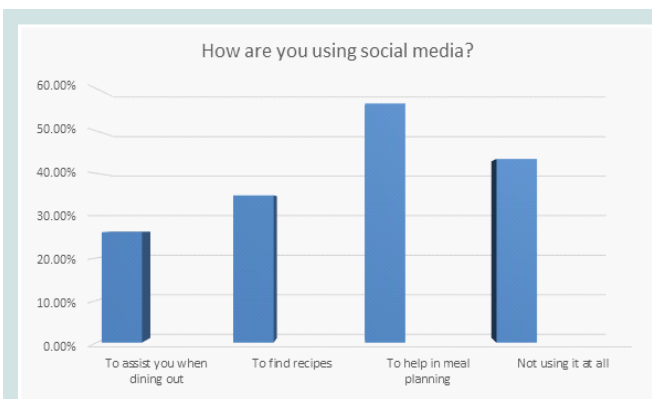


Figure 6

**Table 1:** Demographic information and characteristics of participants in the HDP & SM program

Characteristics	No. of Participants (%)
<b>Age</b>	
21-30 years-old	1 (3.6)
31-40 years old	3 (10.7)
41-50 years old	3 (10.7)
51-60 years old	6 (21.4)
61-70 years old	10 (35.7)
Greater than 71 years old	4 (14.3)
<b>Sex</b>	
Male	2 (7.1)
Female	26 (92.9)
<b>Race</b>	
White or Caucasian	27 (96.4)
American Indian and Alaska Native	0 (0.0)
Native Hawaiian and Other Pacific Islander	1 (3.6)
Black or African American	(0.0)
Asian American	0 (0.0)
<b>Ethnicity</b>	
Hispanic	1 (3.6)
Non-Hispanic	27 (96.4)
<b>Diabetes History</b>	
Type 1 Diabetes	1 (3.6)
Type 2 Diabetes	14 (50.0)
Gestational Diabetes	0 (0.0)
Not sure if they have diabetes	3 (10.7)
Caregiver or a friend of someone who has diabetes	4 (14.3)
Don't have diabetes but are interested in diabetes meal planning	6 (21.4)
<b>Length of time with diabetes</b>	
Newly diagnosed, less than 1 year	5 (17.8)
1-5 years	2 (7.1)
6-10 years	2 (7.1)
11-15 years	1 (3.6)
16-20 years	2 (7.1)
Greater than 20 years	3 (10.7)
Doesn't Apply	10 ( 35.7)

were offered for free or at minimal cost. All subjects signed a Subject Consent Form at the first class.

**Data collection**

The HDP & SM program was evaluated using pre- and post-surveys, questionnaires, in-class meal-planning activities, and social media (Facebook and Pinterest) postings. The following types of data were collected:

**Demographic and diabetes characteristics:** At week 1, participants provided information on age, gender, race and ethnicity, and their diabetes characteristics.

**Ability to plan meals:** In the four face-to-face classes, participants completed breakfast, lunch, and dinner meal planning “plate” sheets using the five diabetes food groups (Figure 3).

**Changes in behaviors:** Participants completed a pre-survey in week 1 and post-survey in week 7 that measured changes in eating behaviors, self-efficacy, and social media use.

**Changes in diabetes signs, symptoms:** Participants completed a diabetes signs and symptoms questionnaire pre- and post-study which measured change in their diabetes signs and symptoms

**Facebook and pinterest:** Participants’ responses on the HDP

**Table 2:** Percentage of correct responses on food choices, by food group and meal setting

Food Group	Meal Setting		
	Lesson 1: Home	Lesson 2: Grocery Store	Lesson 3: Eating Out
Fruit	91%	100%	100%
Milk/Yogurt	72%	79%	91%
Non-starchy Vegetables	73%	92%	80%
Starch	74%	93%	93%
Lean Protein	83%	92%	97%
Total Correct	79%	92%	93%

Facebook page were organized by themes and analyzed by frequency. For Pinterest, the number of participants were identified that posted recipes to four Pinterest boards; breakfast, lunch, dinner and snacks.

**Statistical analyses**

Mixed methods - quantitative and qualitative analyses-were used to analyze the data. Quantitative analyses included frequencies and Pearson’s chi-square analyses. Frequencies were conducted on demographics and diabetes characteristics of participants, ability to plan meals and diabetes signs and symptoms. Pearson’s chi-square ( $\chi^2$ ) analysis was used on questions that had categorical responses which included eating behaviors and self-efficacy; significance was set at an alpha level of  $\leq 0.05$ . Qualitative data was obtained by analyzing the participant themes from the HDP Facebook and Pinterest pages.

**Results**

**Demographic and diabetes characteristics of participants**

Table 1 shows participants’ age, sex, race, ethnicity diabetes type, length of time with diabetes and diabetes history. Fifty-four individuals started the project, and 28 (52.7%) completed all four lessons. Ages ranged from 21 to 71, however most of the participants (82%) were over 40. From the 28 participants that completed the lessons, 93% were female, 96% were Caucasian and non-Hispanic. Fifty percent of participants had type 2 diabetes, of these, 17.8 % were newly diagnosed (less than one year) and the rest had diabetes from 1-20+ years. The remainders of the participants were either caregivers or friends (14.3%) and 21.4% didn’t have diabetes but were interested in learning about diabetes meal planning. Those who were not diagnosed with diabetes may have had a history of this in their family and wanted to prevent it.

**Ability to plan meals**

In lessons 1, 2 and 3, participants completed a Healthy Diabetes Plate meal planning activity that measured their ability to correctly plan meals in three settings - home, grocery store, and eating out. For each setting, participants had to place foods using correct portion sizes into the correct food groups on the plate. The percentage of correct responses for each of the five food groups was then calculated. There was an increase in participants’ knowledge or ability to plan meals from lesson 1 (79%) to lesson 2 (92%) and this knowledge was maintained in lesson 3 (93%). In lesson 1, the percentage of correct responses for the five food groups ranged from approximately 70% (for milk/yogurt, non-starchy vegetables, starch) to 80% (lean

protein) and to 91% (fruit). In lesson 2 and 3, for each of the five food groups, approximately 90% of the responses were correct.

**Changes in behavior**

Table 3 shows the percentage of participants’ pre- and post-study responses on questions covering eating behaviors and self-efficacy. With an alpha level set at ( $\leq 0.05$ ) questions 1, 4 and 5 were statistically significant and showed an improvement in scores from pre- to post-test. Question 1 asked participants how difficult it was to follow their diabetes meal plan. It was difficult to interpret this result since 43% of the participants initially did not answer this question. This may have been due to not using a diabetes meal planning tool before the study began. Generally, from pre- to post-, there was a decrease in the number of people who found their diabetes meal planning tool to be difficult and an increase in the number who found

**Table 3:** Changes in eating behaviors and self-efficacy

Question on diabetes eating behaviors (eating behaviors Q1-3) and self-efficacy (self-efficacy Q4-Q6)	Pre-test response # and Percentage (%)	Post-test response # and Percentage (%)	Chi square observed P value
1How difficult is it to use your diabetes meal planning tool? <sup>a</sup>	Response #: 0 (43%) 1 (7%) 2 (11%) 3 (14%) 4 (21%) 5 (4%)	Response #: 0 (7%) 1 (4%) 2 (11%) 3 (21%) 4 (9%) 5 (14%)	11.6 0.031
2How many meals do you eat regularly? <sup>b</sup> Breakfast = 1 Lunch = 2 Dinner = 3	0 (14%) 1 (11%) 2 (25%) 3 (50%)	0 (4%) 1 (4%) 2 (32%) 3 (61%)	3.34 0.366
3How many snacks do you eat each day? <sup>c</sup>	0 (25%) 1 (18%) 2 (39%) 3 (14%) 4 (4%)	0 (0.04%) 1 (0.14%) 2 (0.61%) 3 (0.21%) 4 (0.00%)	7.29 0.103
4How confident are you in your ability to eat out at restaurants and follow your diabetes meal plan? <sup>d</sup>	0 (21%) 1 (18%) 2 (32%) 3 (7%) 4 (18%) 5 (4%)	0 (0%) 1 (11%) 2 (57%) 3 (18%) 4 (7%) 5 (0%)	11.36 0.044
5How confident are you in your ability to shop for groceries and follow your diabetes meal plan? <sup>d</sup>	0 (21%) 1 (21%) 2 (29%) 3 (14%) 4 (14%) 5 (0%)	0 (0%) 1 (36%) 2 (50%) 3 (7%) 4 (4%) 5 (4%)	12.1 0.033
6How confident are you in your ability to prepare recipes and follow your diabetes meal plan? <sup>d</sup>	0 (21%) 1 (18%) 2 (43%) 3 (14%) 4 (0%) 5 (36%)	0 (0%) 1 (39%) 2 (36%) 3 (18%) 4 (4%) 5 (4%)	9.54 0.065

<sup>a</sup> = choices include: 1= very difficult, 2 = somewhat difficult, 3= neither difficult not easy, 4= somewhat easy, 5 = very easy  
<sup>b</sup> = shows how frequently breakfast, lunch, dinner is consumed  
<sup>c</sup> = choices include: 1 = one snack, 2 = two snacks, 3 = three snacks, 4 = more than three snacks  
<sup>d</sup> = choices include: very confident, 2 = somewhat confident, 3 = neither confident nor unconfident, 4 = somewhat confident, 5 = very unconfident  
 0= responses recorded as "0" listed in the table above are the percentage of participants that did not answer the question



it to be easy, which may explain why this was significant ( $p < 0.03$ ). For question 4 there was a significant improvement ( $p < .044$ ) in the number of people that reported being somewhat confident in their ability to eat out at restaurants and following their diabetes meal plan, from 32% to 47%. For question 5 there was a significant ( $p < 0.03$ ) improvement in the number of people that reported being very confident in their ability to follow a diabetes meal plan, from 21% to 36% and somewhat confident, from 29% to 50%. Questions 2, 3 and 6 showed an improvement in scores as well, but were not statistically significant. There was no significant change in the number of meals or snacks that they ate or in their level of confidence in preparing recipes and following their diabetes meal plan.

### Changes in diabetes signs and symptoms

The diabetes signs and symptoms that participants were asked to report at week 1 (pre) and week 7 (post) include: increased appetite, weight loss, fatigue, increased urination, increased thirst, and blurry vision. Although participants experiences no significant changes in the aforementioned symptoms from pre-to post-, there was a positive trend towards improvements in appetite, weight loss, fatigue, urination and blurry vision.

### Facebook and pinterest results

From the Facebook and Pinterest activities that were offered, 14 individuals (47.8%) chose not to use SM for diabetes meal planning. For those participants that did use SM, they used it to (1) help in meal planning (56.5%), (2) find recipes (34.8%) and (3) assist when dining out (26.1%).

### Social media

When considering the amount of participants that began the class ( $N=54$ ), few (21 total responses) chose to participate in Facebook and Pinterest activities which included questions and activities related to each lesson. For those who did participate, common themes on the Facebook page were identified and related to preparing meals at home (57.1%), followed by diabetes management (19.0%), supermarket activities (14.3%), and signs and symptoms of diabetes (4.8%). Participation in the Pinterest activity was also low where fourteen posted or modified a recipe. However, Pinterest was a positive venue for posting recipes, with 67 breakfasts, 51 lunches, 22 dinners and 1 snack recipe posted.

### Discussion

The three components of diabetes self-management are diet (i.e. following a healthful eating pattern), regular physical activity, and often medications [5]. The eight week Healthy Diabetes Plate (HDP) and Social Media (SM) program focused on diet, the most challenging component of diabetes self-management [5]. Overall, it was successful in teaching participants how to plan meals and increase their level of self-efficacy. It was less successful in keeping participants enrolled in the program, having them use social media (Facebook and Pinterest). Although they weren't statistically significant, slight decreases in diabetes signs and symptoms were noted as observed by participants.

The classroom and social media components taught participants how to plan meals in three settings. Results from the classroom meal planning activity showed that 79% to 93% were able to correctly

plan breakfast, lunch, and dinner meals based on foods they had at home, foods in the supermarket, and when eating out in a restaurant. These results were similar to other researchers [19] that used the Plate Method for diabetes meal planning activities. Being able to plan meals in a variety of settings indicates that the HDP program is flexible which meets the American Diabetes Association recommendation that diabetes meal plans should not be "one size fits all [20]."

The social media component of the Healthy Diabetes Plate program was designed to reinforce principles covered in the classes. Fifty percent of subjects participated in the social media activities. This low participation rate may be due to the majority of participants being 51 years or older (51%) and most of them not using social media. The corresponds to statistics gathered by the Pew Research Center which found that approximately 46% of Internet users 65 years and older use social networking sites [21]. For those who participated in the social media activities, approximately 60% found them useful and used Facebook and Pinterest mainly to post pictures of HDP meals and share recipes which may have helped them in their classroom meal planning activities.

There was an improvement in participants' self-efficacy or level of confidence in their ability to eat out at restaurants, shop for groceries and prepare recipes while still following their diabetes meal plan level. Higher self-efficacy has been found to improve diabetes self-management behaviors in diet, exercise, blood sugar testing, and taking medication [22,23].

There were no significant changes in participants' diabetes signs and symptoms. This is not unexpected since many individuals with type 2 experience very mild signs and symptoms [24].

### Limitations

There were several limitations of this study. The first limitation is the composition of the sample. It was small ( $n=28$ ), a convenience sample, and most of the participants were female and Caucasian. Therefore, it may have not been representative of the type 2 diabetes population and the results may not generalize to them. A second limitation was that attrition rate was high (48%), where several people didn't finish the ending lessons. A third limitation was low participation in the social media component of the project.

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