

# The Impact of The Flying Carrot, Food Literacy Project on Food Knowledge, Skills and Attitude at The Colorado Farm and Art Market

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## ABSTRACT

**INTRODUCTION:** The Flying Carrot (FC), a community outreach food literacy project, has brought nutrition education to the Pikes Peak region based on a duality framework emerging when sustainability and health are addressed in concert and using Diffusion of Innovation Theory. The purpose of this project was to 1) develop a valid and reliable survey assessing food and sustainability knowledge 2) test the efficacy of the FC at the Colorado Farm and Art Market (CFAM). It was hypothesized that the more frequently market patrons visit the FC, the greater their food literacy. **METHODS:** 40 volunteers ( $\geq 18$  y; male n=7, female n=33) were recruited at CFAM. Subjects were asked to complete a baseline survey with follow-up at visit 4 and 8. They were also asked to be interviewed upon follow-up. This study had three phases: 1) development and validation of a sustainable food literacy survey, 2) data collection of subjects' food literacy, and 3) conducting interviews. The survey was developed and tested for content and criterion validity and test-retest reliability. **RESULTS:** The mean criterion food literacy survey score, as assessed by experts in sustainable food literacy (n=10), was  $28.8 \pm 2.2$ . Comparatively, FC program participants scored  $24.9 \pm 3.6$  (n=40),  $26.9 \pm 2.2$  (n=18), and  $27.9 \pm 3.0$  (n=7), at baseline, 4<sup>th</sup> and 8<sup>th</sup> visit, respectively. Repeated measures ANOVA revealed no significant difference ( $p=0.934$ , n=7) in food literacy scores over time. Higher ratings on importance of healthy food ( $p=0.000$ ), skill ( $p=0.001$ ) and enjoyment ( $p=0.004$ ) with cooking showed positive associations with food literacy scores. Interviews (n=3) were analyzed qualitatively and themes (knowledge, senses, attitude and emotions, and actions and behaviors) were identified. Average ICC (0.926). Criterion validity implies that there is significant difference between average program patrons to "trained persons" ( $p=0.002$ ), and the criterion benchmark is 29 points out of 33 points (87% correction). **CONCLUSION:** Despite a small sample size of recurring customers and interviewees, the program participants expressed being inspired to eat healthy, sustainable food when visiting FC more often. It is possible that subjects were already knowledgeable at baseline, with little room for improvement in knowledge. Food and Sustainability Literacy survey is a valid and reliable tool. Future research is needed to evaluate a demographic with low baseline food literacy and skill level.

## INTRODUCTION

The current state of highly-profitable industrial agriculture and food corporations has brought abundance, bargain and easy access to food in our society for the price of highly processed, nutritionally-poor products and a costly environmental burden. As a result, rapid increase of lifestyle-related conditions such as obesity, cardiovascular diseases, and metabolic syndrome is seen rampant in the United States. The combination of access to local food with an educational program to influence diet may be successful in changing behavior (1,2). Furthermore, hands-on cooking, taste education, and food skills programs can improve cooking confidence, preference for and knowledge of wholesome foods and diet quality (3,4). The Flying Carrot, Food Literacy project started in 2011 with a broad idea to bring locally grown produce coupled with nutrition education to the Pikes Peak community. We use a sustainability and health model (5) and Diffusion of Innovation health behavior change theory (8) to develop the concepts of our program. However, the efficacy and impact of the program in food knowledge and consumer behavior of participants have not been systematically assessed. **Purpose:** To explore and establish the understandings of how a food literacy project, The Flying Carrot, can impact food knowledge and behavior change in people in the Pikes Peak community. **Hypothesis:** The more frequently market patrons visit the FC, the greater their food literacy.

## METHOD

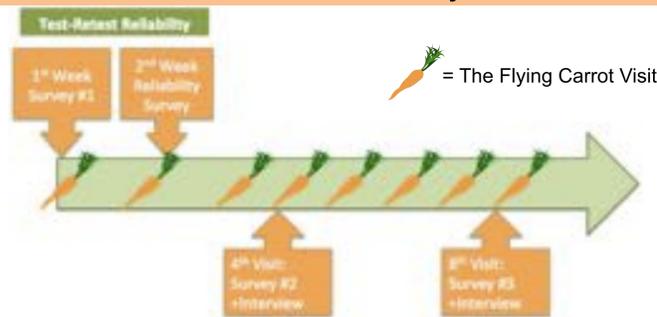
### Subjects

- A convenient sample, n=40, gathered via open recruitment throughout the summer market at Colorado Farm and Art Market (CFAM).
- Inclusion Criteria:  $\geq 18$  years of age, non pregnant population; able to visit CFAM's summer farmers market at Ivywild School.
- Asked to visit the Flying Carrot's educational table, and take bench mark and follow up surveys after every 4<sup>th</sup> visit.
- Participants for criterion and content validity were chosen based on their involvements in the area food, nutrition and sustainability.

### Surveys

- A food literacy survey was developed based on the current literature in sustainable food systems (6,7).
- Constructs: seasonality, sustainability, geography and agriculture, and food crops.
- Contents: The Flying Carrot specific, food literacy, food skill and attitude, and demographics.
- Validity: Content (n=10; academics) and Criterion (n=10, trained in local food).
- Reliability: Test Retest Reliability (n=8)
- Sustainability and Food Literacy Score = 33 possible points.

## Data Collection & Analysis



- Quantitative Analysis :
  - SPSS (version 22.0, IBM, Armonk, NY).
  - Descriptive statistics (means  $\pm$  SD and frequencies [%];  $p < 0.05$ )
  - Friedman's test (repeated measures, non-parametric test)
  - One-Way ANOVA (Attitude and skills vs literacy scores at baseline)
  - Intraclass Correlation Coefficient (ICC), test-retest reliability
- Qualitative Analysis:
  - Interview transcription and theme identification

## RESULT

Table 1: Demographics

Gender	Male	Female				
	n=7	n=33				
Age (y.o.)	$\leq 30$	31-50	51-70	$\geq 71$		
	n=8	n=13	n=16	n=1		
Ethnicity	African American	Hispanic	Asian	Native American	Caucasian	Others
	n=0	n=2	n=0	n=0	n=36	n=2
Anthropometry	Height (cm)	Weight (kg)	BMI			
Mean $\pm$ SD	167.4 $\pm$ 9.6	66.7 $\pm$ 10.32	23.8 $\pm$ 3.3			

Table 2: Food Literacy Mean Scores

Survey	Criterion (n=10)	#1 (n=40)	#2 (n=18)	#3 (n=7)
Mean $\pm$ SD	28.8 $\pm$ 2.2*	24.9 $\pm$ 3.6*	26.9 $\pm$ 2.2	27.9 $\pm$ 3.0

Table 3: Food Literacy Score Repeated Measures

Survey (n=7)	#1 (baseline)	#2	#3	P value
Mean $\pm$ SD	27.7 $\pm$ 2.5	27.3 $\pm$ 2.2	27.9 $\pm$ 3.0	0.765

\* Significant difference ( $p=0.002$ )

Table 3: Survey Test Retest Reliability

ICC = 0.926	95% CI [0.637, 0.982]
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Figure 1: Attitudes & Skills related Qs vs Food Literacy Scores

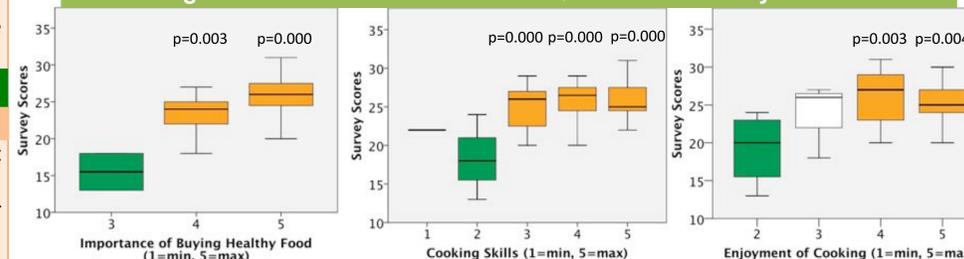
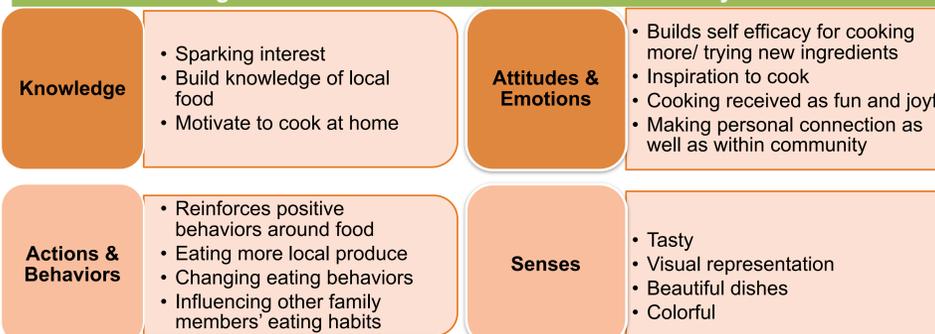


Figure 2: Themes Identified via Qualitative Analysis



## DISCUSSION

### Sustainable Food Literacy:

- Mean literacy scores (Table 2) show a slight insignificant upward trend overtime with high baseline scores.
- Repeated measures revealed no significant difference in literacy (Table 3) within program patrons over time.

### Attitude and Skills:

- Within the Food Attitude and Skills section, subjects who rated high on importance of buying healthy food, skill and enjoyment with cooking seem to have higher literacy scores. This may suggest knowledge to be positively influenced by how people prioritize buying healthy food and self confidence and enjoyment towards cooking.

### Interviews:

- Based on the 3 interviews transcribed, four themes were identified: 1) knowledge, 2) senses, 3) attitude and emotions, 4) actions and behaviors describing FC's impact on market patrons.
  - Coming to table and watching cooking sparks interest as well as ideas. Builds knowledge/literacy and skill of local food, motivates to cook at home.
  - Taste and visual representation are described as important aspects. Aesthetic presentation of food and educational materials are seen as market's "highlights."
  - Builds self efficacy and confidence for cooking more and/or trying new ingredients. Making personal connections as well as within the community.
  - Reinforces positive eating behaviors surrounding food including other family members. Trying new foods and more local foods.

### Limitations:

- Inconsistent participations and large drop-out rates for the follow-up surveys.
- A convenient sample does not represent the Pikes Peak community as a whole.
- Most participants had previous exposure to the Flying Carrot education.
- Relatively short intervention period to see true impact.
- The homogenous subject pool may have contributed to selection bias.
- People who visit the project might already with high baseline knowledge with food literacy as well as self efficacy with possible saturation of knowledge.
- Survey questions may not be able to capture all areas of food literacy and self-efficacy around food preparation.
- Small n=size for qualitative part

## CONCLUSIONS & FUTURE DIRECTIONS

### Conclusions:

- There is no significant difference in literacy scores over time.
- Literacy level is related to healthier food, cooking skills and enjoyment.
- Qualitative analysis from interviews revealed the FC is inspiring and gives ideas to cook more local produce, which influences eating habits.
- The survey developed is a valid and reliable tool to capture and evaluate people's sustainability and food knowledge of farmers market goers.

### Future Directions:

- This is the first study to evaluate the Flying Carrot's Food Literacy program in the community. The Flying Carrot is needed in areas with low access to both food and literacy. Thus, future research is planned to evaluate this program in a low income population with expected lower literacy, cooking skills and healthy eating.

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