1. What is the independent variable in the experiment?

The independent variable in the experiment is the chop stick length.

2. What is the dependent variable in the experiment?

The dependent variable in this experiment is the efficiency of food-pinching.

3. How is the dependent variable operationally defined?

The efficiency of food-pinching is defined as counting the peanutes picked up and placed in a cup (PPPC).

4. Based on the description of the experiment and the data set, list at least two variables that you know were controlled.

Both the gender and education of people were controlled.

One great advantage of ipython notebooks is that you can document your data analysis using code, add comments to the code, or even add blocks of text using Markdown. These notebooks allow you to collaborate with others and share your work. For now, let's see some code for doing statistics.

In [1]:
```
import pandas as pd

# pandas is a software library for data manipulation and analysis
# We commonly use shorter nicknames for certain packages. Pandas is often
# hit shift + enter to run this cell or block of code
```

In [3]:
```
path = r'~/Downloads/chopstick-effectiveness.csv'
# Change the path to the location where the chopstick-effectiveness.csv f
# If you get an error when running this block of code, be sure the chopst

dataFrame = pd.read_csv(path)
dataFrame
```

Out[3]:

	Food.Pinching.Efficiency	Individual	Chopstick.Length
0	19.55	1	180
1	27.24	2	180
2	28.76	3	180
3	31.19	4	180

4	21.91	5	180
5	27.62	6	180
6	29.46	7	180
7	26.35	8	180
8	26.69	9	180
9	30.22	10	180
10	27.81	11	180
11	23.46	12	180
12	23.64	13	180
13	27.85	14	180
14	20.62	15	180
15	25.35	16	180
16	28.00	17	180
17	23.49	18	180
18	27.77	19	180
19	18.48	20	180
20	23.01	21	180
21	22.66	22	180
22	23.24	23	180
23	22.82	24	180
24	17.94	25	180
25	26.67	26	180
26	28.98	27	180
27	21.48	28	180
28	14.47	29	180
29	28.29	30	180
...	...	...	...
156	26.18	2	330
157	25.93	3	330
158	28.61	4	330
159	20.54	5	330

160	26.44	6	330
161	29.36	7	330
162	19.77	8	330
163	31.69	9	330
164	24.64	10	330
165	22.09	11	330
166	23.42	12	330
167	28.63	13	330
168	26.30	14	330
169	22.89	15	330
170	22.68	16	330
171	30.92	17	330
172	20.74	18	330
173	27.24	19	330
174	17.12	20	330
175	23.63	21	330
176	20.91	22	330
177	23.49	23	330
178	24.86	24	330
179	16.28	25	330
180	21.52	26	330
181	27.22	27	330
182	17.41	28	330
183	16.42	29	330
184	28.22	30	330
185	27.52	31	330

186 rows × 3 columns

Let's do a basic statistical calculation on the data using code! Run the block of code below to calculate the average "Food Pinching Efficiency" for all 31 participants and all chopstick lengths.

In [4]:
```
dataFrame['Food.Pinching.Efficiency'].mean()
```

Out[4]: 25.00559139784947

This number is helpful, but the number doesn't let us know which of the chopstick lengths performed best for the thirty-one male junior college students. Let's break down the data by chopstick length. The next block of code will generate the average "Food Pinching Effeciency" for each chopstick length. Run the block of code below.

In [5]:
```
meansByChopstickLength = dataFrame.groupby('Chopstick.Length')['Food.Pinc
meansByChopstickLength

# reset_index() changes Chopstick.Length from an index to column. Instead
```

Out[5]:

	Chopstick.Length	Food.Pinching.Efficiency
0	180	24.935161
1	210	25.483871
2	240	26.322903
3	270	24.323871
4	300	24.968065
5	330	23.999677

5. Which chopstick length performed the best for the group of thirty-one male junior college students?

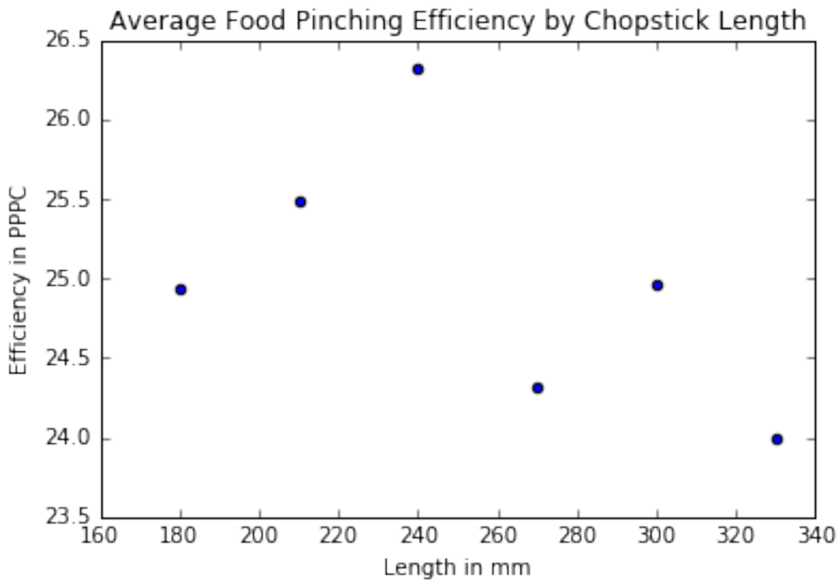
The chopsticks measuring 240mm.

In [6]:
```
# Causes plots to display within the notebook rather than in a new window
%pylab inline

import matplotlib.pyplot as plt

plt.scatter(x=meansByChopstickLength['Chopstick.Length'], y=meansByChopst
            # title="")
plt.xlabel("Length in mm")
plt.ylabel("Efficiency in PPPC")
plt.title("Average Food Pinching Efficiency by Chopstick Length")
plt.show()
```

```
Populating the interactive namespace from numpy and matplotlib
```



6. Based on the scatterplot created from the code above, interpret the relationship you see. What do you notice?

The relationship between chopstick length and efficiency is inverted and possibly curvy (parabolic). Initial chopstick efficiency is abbout 25 PPPC for 180mm sticks, then it increases as the length goes up to 240mm for then do decrease when the sticks are longer then 240mm.

In the abstract the researchers stated that their results showed food-pinching performance was significantly affected by the length of the chopsticks, and that chopsticks of about 240 mm long were optimal for adults.

7a. Based on the data you have analyzed, do you agree with the claim?

It is not clear that the food-pinching performance is affected by the length as the relationship seems to be parabolic. I agree with the statment however that chopsticks of about 240mm long are optimal for adults.

7b. Why?

The significance of the claim that food-pinching efficiency depends on the length of the chopstick can not be statistically determined unless we do a hypothesis tests for the difference in means.

That the optimal lenght of foodsticks for PPPC is 240mm seems ok as it reflects the results.