The Science and Craft of Coffee Course Plan

Matthew Gosen

Student Learning Objectives:

In this course students will learn about the two popular species of coffee plants used to craft coffee and the different flavor characteristics of the two species; where in the world coffee grows, what type of climate allows coffee to thrive, and what it means to have quality coffee. We will also learn that coffee is a beverage with a complexity of chemicals, learn about the two main chemical reactions that occur during the roasting process, as well as the different roast profiles and how the darker roasts have less caffeine, but more oils while the lighter roasts have more caffeine but less oils. Other topics will include some of the basic physiological effects of coffee, like how coffee keeps you awake; how frequent coffee consumption can lead to addiction; what some of the negative effects of drinking too much coffee are, such as rapid heart rate and increased anxiety and that research has shown correlations between drinking coffee and lowered risk of diabetes, heart disease and a few other diseases. Finally, we will discuss how to roast coffee, keep coffee fresh, get the correct grind size for different coffee drinks and how to prepare multiple types of coffee drinks such as espresso, French press, and pour over coffee.

Course Materials: This course will use different coffee equipment that I would not need to purchase such as:

1. electric burner
2. French press
3. Pour-over coffee filters
4. A coffee roaster
5. A spin blade coffee grinder and a handheld burr coffee grinder.
6. Water kettle.

Roasted Coffee Concern:

A major concern is financing and providing roasted coffee for my class to sample as the course progresses. One example is if there is the maximum of 20 students in my class and I wanted to make an 8 oz cup of coffee for each student to sample, then I would need to make 160 oz of brewed coffee. 160 oz of coffee is calculated by using the suggested ratio of coffee grinds to water ratio of 1:10 as suggested by Peet's Coffee Website. Therefore, I would need 16 ounces of whole or ground coffee. If I were to go Peet's Coffee and buy a 16 ounce (1 pound bag) bag of their modestly priced coffee like a French roast coffee then I would be spending approximately $14 dollars just for the coffee for one class session. To overcome this concern I will instead buy 16 ounce bags of green bean coffee at Sweet Marias Coffee Warehouse in Oakland at approximately $6 a pound. This makes it so that if I were to have coffee sampling during every other class then it would cost only $30 as opposed to $70 if I were to buy all of the coffee at Peet's.

Course Plan week by week breakdown:

Week1:

Quality Coffee

Questions that should be answered by the end of the class:

What does it mean to have quality coffee? Can we define precisely what quality coffee is? What brings a person to search for good coffee?

Schedule:

-introduction of course, have an icebreaker where student discuss who they are and what they hope to learn about in this class.
-have people break off into groups of three and discuss with their partners to come up with a list of how to express what their idea of quality.
-have each group present their idea on what they believe quality coffee is to their classmates.
-show power point presentation on quality as defined by:

Illy, A., Viani, R. "Espresso Coffee: The Science of Quality". 2005.
Freemna, J., Freeman, C., Duggan, T. "The Blue Bottle Craft of Coffee: Growing, Roasting, and Drinking, with Recipes. 2012.

-now discuss with the class if they agree with these definitions and if we can use these as a reference point for the rest of our class.

Week 2:

The Botany of the Coffee Plant

Questions that should be answered by the end of the class:

What are the two main species of Coffee Plant? Which species is used more in specialty coffee? Which species is used more in commercial coffee?

Schedule:
-introduce coffee as whole, meaning the influence it has over people and cultures and talk briefly about the different organizations that specialize in coffee such as the specialty coffee association and national coffee association.
- go over power point slides of the two main species of coffee-Arabica and
Robusta. Talking about the similarities and the differences of the properties of the two plants, i.e. height, altitude and vulnerability to environment, talk about the tastes these kinds of beans they produce, talk about which companies prefer which, i.e.- how Folgers would be more likely to grow Robusta beans while a specialty coffee shop in San Francisco would pride itself on Arabica

beans from a small farmer in Ethiopia.
-have class put posts it on the power point where they think coffee grows.
- Pass around green Arabica and Robusta beans and roasted coffee beans to the class and write up the differences on white board.
-during presentation pass around coffee plant to the class so they can view it.
- power point slides on what temperatures coffee can grow in and what regions of the world, talk about how at varying degrees of latitude coffee needs to grow at varying degrees of altitude. Talk about how some coffees grown in volcanic ash soil have different tastes from coffee grown in more tropical rain forest soil. Talk briefly about changing climate on where coffee can grow.

Week 3:

<u>The Raw Bean</u>

Questions that should be answered by the end of the class:

What is the process that coffee has to go through before it gets shipped to roasters? How do coffee cherries get picked? What is the difference between wet processing and dry processing?

Schedule:
-class discussion continuing from last time about how climate change will affect coffee supply and demand in the next fifty years.
-recap on different regions of the world that coffee is grown in, along with what climates each coffee bean grows in.
-now ask students if they know how coffee is processed before it is shipped.
-show power point of the different kinds of pulping/processing methods.
-play jeopardy game of what type of coffee bean would be processed in which way.

Week 4:

<u>The chemistry and craft of the roasting process</u>

Questions that should be answered by the end of the class:

What two main reactions are happening during the roasting process? What is the change in chemical composition in the coffee bean? How does this affect taste? What are the varying roast profiles?

Schedule:

- ask class what they know about the different kinds of roasts and how they think they taste.
- power point slides on the mallard and strickard reactions that happen when coffee beans are roasting, talk about the caramelizing process of the sugars in the coffee beans, talk about the volatile lipids in the coffee beans as well as the oils that are secreted when the coffee bean is

roasted, described the different roast profiles that coffee beans have and how each roast profile would be optimal for different kind of coffee drinks and for coffee from different regions of the world.
-have different roast levels of coffee brewed and use pH paper to try and discern the differences in acidity.
- go outside with the class and demonstrate the roasting process live by roasting green coffee beans until a full city roast. Talk about listening for pops and the temperatures at which green coffee needs to be roasted at.
-let student switch off with roasting the coffee.

Week 5:

Storing Coffee and grinding it fresh

Questions that should be answered by the end of the class:

What are the three different grinders used to grind coffee? Why does having fresh ground coffee versus pre-ground coffee affect the taste? Why does the type of grinder affect the taste of the coffee?

Schedule:

-talk about whether or not the class thinks fresh grinded coffee is better or preground coffee is better,
- talk about the importance of fresh ground coffee through use of power point and white board, talk about the volatile compounds in coffee and how they escape when coffee is ground, talk about the difference in burr grinders creating consistent grind versus a blade grinder the produces inconsistent grinds, grind coffee right there in front of the students and pass it around for them to see the difference themselves.

Week 6:

Physiological Effects from Coffee

Questions that should be answered by the end of the class:

Why does coffee keep us alert? How long do the effects of coffee last? How much coffee can I drink in one day? What happens if I drink too much coffee? Does coffee affect my memory?

Schedule:

- have a small discussion about what everyone knows about the effects of coffee when we drink it.
- have power point slides about caffeine affecting adenosine receptors, talk about half life of caffeine in our body, talk about research showing how coffee affects memory, show pictures and symptoms of drinking too much coffee in one day.

- discuss times when people have had too much caffeine or when people have used coffee to stay up all night and how they felt.

Week 7:

Medicinal Effects of Coffee

Questions that should be answered by the end of the class:

What has research shown about coffee possibly preventing certain diseases? What are the positive long term effects of drinking coffee? What are the negative long term effects of drinking coffee?

Schedule:

- have brief conversation about what students know about coffee and its medicinal affects, get a census as to whether or not they think it is good or bad for one's health.
-ask what they normally hear in news reports about coffee and health vs. energy drinks and health….is there a bias?
- show the positive long term effects of drinking coffee such as the correlation between lowered risk of type two diabetes, decreased risk of heart disease and decreased chance of getting alzheimers.
-discuss some of the negative long term effects of drinking coffee such as possible physical addiction, increased frequency of urination, disruption in sleeping patterns, whether any students in the class have experienced any of these and what it was like.
- discuss whether the results of these studies can be accepted or not as true, if these findings just happen to be due to the population studied or if coffee does actually have medicinal benefits.

Week 8:

How to prepare different espresso drinks

Questions that should be answered by the end of the class:

What makes a macchiato different from an espresso con panna? How to make good tasting espresso? Why do a latte and a cappuccino taste similar?

Schedule:
-have students in small groups present for 2-3 minutes on the various espresso drinks and how to make it.
-discuss how each espresso based drink is different from the rest.
-discuss on how to make perfect espresso and talk about anything the students missed from their presentations. See which espresso drinks students have had and what they thought made it taste good or bad. Talk about how to create the perfect milk foam.

Week 9:

How to prepare different coffee drinks

Questions that should be answered by the end of the class:

How does a pour over coffee differ from a siphon coffee? How to make good coffee without fancy equipment?

Schedule:

-ask about different methods to make coffee

-powerpoint slides on the different brewing methods, ie siphon coffee, French press, pour over coffee.

-have students practice how to make French press coffee and maybe siphon coffee.

Week 10:

Coffee Cupping and Tasting Process

Questions that should be answered by the end of the class:

How do Coffee Professionals rate coffee? What makes them like a certain coffee and dislike another? Where can I get specialty coffee?

Schedule:

-review main concepts talked about this quarter and talk about how professionals rate coffee.

-drink different roasts of coffee from different specialty coffee shops and talk about where to get specialty coffee.

-have students write paragraph about what they learned this quarter.

Note: Still need to come up with interactive activities for weeks 2,5 and 6.

Reference Books:

Braun, S. Buzz: The Science and Lore of Alcohol and Caffeine. 1996.

Flament, I. Coffee Flavor Chemistry. 2001.

Freemna, J., Freeman, C., Duggan, T. “The Blue Bottle Craft of Coffee: Growing, Roasting, and Drinking, with Recipes. 2012.

Illy, A., Viani, R. “Espresso Coffee: The Science of Quality”. 2005.

Jacob, H. Coffee: The Epic of a Commidity. 1962.

Luttinger, N., Dicum, G. The Coffee Book: Anantomy of an Industry from Crop to Last Drop. 1999.

Weinberg, B., Bealer, B. The world of caffeine: The Science and Culture of the world’s most popular drug. 2001.