APPETIZERS AND DESSERTS IN TEACHING STATISTICS

Josefina V. Almeda
Philippine Statistical Research and Training Institute
University of the Philippines Diliman
Quezon City, Philippines
jvalmeda@up.edu.ph

Statistics as a subject matter may not be too easy to be absorbed by students. It needs to be taught in such a way that appreciation will come first so that understanding follows. The teacher uses appetizers and desserts to provide ways of making Statistics easier to swallow and digest. Appetizers are introduced to stimulate the student's appetite to get them hungry for more statistics. It comes in the form of games, quotation, jokes, actual studies, and real data sets related to the subject matter that complement the main course that is to follow. On the other hand, desserts are served at the end of the main topic. Desserts come in the form of games, activities, trivia, crossword puzzles, and quiz bee. Appetizers and desserts motivate students to learn statistics.

BACKGROUND

Appreciation of the statistical science can be traced back on how students were introduced to the discipline. It is a big challenge for teachers in the Kto12 program to translate the different topics of Statistics into cognition and subsequently appreciation of the discipline. It is postulated that statistics can be better introduced in a more casual and fun setting in order to motivate them.

Motivation has long been considered by psychologists and educators as an important factor that affects student learning and achievement. There is recognition that students need both the cognitive skill and the motivational will to do well in school (Pintrich & Schunk, 2002). Interest increases learning and promoting interest in the classroom increases students' intrinsic motivation to learn (Pressley et al., 1992; Sweet et al., 1998).

In the Philippines, the curriculum of the Kto12 program includes Descriptive Statistics to Inferential Statistics. There is even an introduction to Simple Linear Regression. This paper introduces some learning strategies which focuses on triggered situational interest (SI). Triggered-SI are thought to stimulate students (i.e., "catch" their attention; Mitchell, 1993). The interventions or learning strategies are called appetizers and desserts.

LEARNING STRATEGY: THE APPETIZERS

An appetizer is one that will make one more hungry for the next. It is something that stimulates the appetite and it is usually served before the main course. The teacher gives the activities before the discussion of a new lesson which act as appetizers to serve as a motivation. This aims to elicit the student's interest and to have the yearning to know more.   The following appetizers may be given to the students.

1) Quotation

A quotation is a statement or a sentence that aims to instill some ideas or virtues to the student. It may provide enlightenment to the meaning of a word, or it may support certain philosophies in life or it may offer direct information.

The teacher begins with a quotation that is relevant to the topic of interest. The quotation sets the mood for the topic of discussion. As an introduction to statistics, the teacher can use the quotation by Florence Nightingale. It states, "*Statistics is the most important science in the whole world; for upon it depends the practical application of every science and of every art; the one science essential to all political and social administration, all education, all organization based on experience, for it only gives results of our experience.*"

The teacher does not only give the quotation but also explains its implications. It will be helpful to introduce who wrote the quotation especially if the person is a known figure. This will give importance and add dignity to the person. So, who is Florence Nightingale?

"Florence Nightingale was a modern nurse, a writer, and a statistician. She used statistics in the compilation, analysis, and presentation of data on medical care and public health. She was a pioneer in the visual presentation of information who used the <u>pie chart</u> and the <u>polar area chart</u> to show seasonal sources of patient mortality in the military field hospital she managed. In her later life, Nightingale made a comprehensive statistical study of sanitation in Indian rural life and was the leading figure in the introduction of improved medical care and public health service in India. In 1859 Nightingale was elected the first female member of the <u>Royal Statistical Society</u> and she later became an honorary member of the American Statistical Association." (Wikipedia Encyclopedia)

Now, how do we explain the quotation by Florence Nightingale? It can be explained that since then, statistics has played a vital role in the different fields and has been recognized as an important tool in research. Why is this so? It is because in every field, there is always data. To analyze and interpret data correctly, then we need to learn the various statistical methods to be able to make wise decisions. Thus, statistics work hand in hand with any field. Through statistics, researchers come up with solutions to problems that help improve the quality of lives of the people. Its value becomes relevant to the student as they learn to use it.

With this introduction, the teacher may now define what statistics is and follow it up with its varied applications and uses. This allows the student to realize the magnitude of its usability in the different fields. This will hopefully stir up the student's interest to learn more about statistics. Hence, the teacher sees to it that there is first appreciation of the subject matter so that learning comes easily.

For the lesson on data presentation using statistical charts, a good quotation is from an ancient Chinese Proverb that states *"One picture is worth ten thousand words."* This explains that once we put data in a chart, there are many significant findings. It is comparable to a painting wherein there can be different interpretations. On the other hand, if the teacher does not want to sound very philosophical, he/she can cite the first line of the song "If" by Bread that says *"If a picture paints a thousand words...."* which is analogous to what was discussed.

Before the discussion of the different summary measures (e.g. measures of central tendency, measures of dispersion, measures of location, measures of skewness, and measures of kurtosis), another quotation worth mentioning is by H.G. Wells (1929). It says *"The time may not be very remote when it will be understood that for complete initiation as an efficient citizen of one of the new great complex worldwide states that are now developing. It is as necessary to be able to compute, to think in averages, maxima and minima, as it is now to be able to read and to write."* This may sound very profound, but the teacher explains that being statistics literate is analogous to knowing how to read and write. Every individual equipped with statistics has an edge in life since there is power in understanding figures. Numbers, if correctly analyzed provide policies and programs that are necessary for developing a nation.

2) Games

A game is a form of entertainment. It may be an activity for one or more persons. If played by one person, then this involves concentration and thinking. On the other hand, if played by more than one person, then this involves cooperation, unity, and thinking. Games open doors in communicating with students new concepts that they need to learn.

Students like to play. They enjoy doing activities and interacting with others. When the teacher incorporates games in class, this creates excitement and enthusiasm on the subject matter. Before introducing a new topic, the teacher can serve an appetizer such as a game connected to it to entice the students. For example, on data organization, the game "Arrange Yourselves" is appropriate. This is a very common game in children's parties. Thus, students are familiar with it. Learning becomes easy when it is based on what the students know.

To do this, group the students in such a way that there are at most 10 members. There can be two to four groups depending upon the class size. Students are tasked to arrange themselves either in descending or ascending order based on the quantitative variables like age, weight, height, foot size, waistline, birth year, and so on. The first group to have a score of 3 out of 5 wins the game. As a final game, the teacher can remove the grouping and lets the entire class arrange themselves according to another given variable.

After the game, the teacher processes the activity by stating first its objectives. The teacher explains that the objectives of the game are 1) to show different ways of arranging numbers and 2) to know the advantages of arranging numbers. The teacher may elicits insights from the students regarding what they have learned from the activity.

After processing the activity, the teacher discusses the raw data and the array. Relate the game that transpired with the array and its advantages. Stress that it is convenient to get the lowest and the highest observations and where some of the observations are concentrated in the array. Then, recall the last game played where there is no more grouping and all the students arranged themselves according to magnitude. Ask the students the difficulty they encountered. Emphasize now that as the number of observations become large, sorting becomes cumbersome and it does not provide enough information. This is now a good opportunity to introduce the frequency distribution as another way of organizing the data and its benefits.

Another game that can serve as an appetizer is the "Find the Word". This is helpful in introducing the different terms that the student should be acquainted with. Inferential statistics, in particular, involve the use of so many terms that students unusually hear or read upon. The game will make the students become aware of the different terms utilized in inferential statistics. The students need not understand the meaning/s of these terms yet but rather to give them exposure to the terms used in inferential statistics. This game initiates memory recall and familiarity with the different terms. An example of the "Find the Word" game for inference is given in Annex A.

LEARNING STRATEGY: THE DESSERTS
A dessert is the sweet; usually last course of a meal. A good meal is not complete without having a dessert. Thus, to end a topic in statistics, the teacher can give several desserts to wrap up the lesson, to unwind the class session, and to emphasize important matters.

1) Jokes
A joke is a short story of a situation with the intent of being humorous. A joke is given for purposes of entertainment. Laughter is good for our health. It uses the stomach muscles, releases endorphins, and natural "feel good" chemicals into the brain. (Wikipedia)

After the student learns a topic in statistics, the teacher can now give as dessert some associated jokes. Humor is very important in teaching. This reduces the seriousness of the atmosphere and creates a more relaxed mood in the classroom. If the student understands the joke, then this may imply comprehension of the concepts discussed in class. Adding humor in a lecture lightens a rather difficult subject matter.

There are several jokes in statistics found in the internet. Always cite the source and author of the joke. Here is a joke on sampling by Hugh Foley.
"One day there was a fire in a wastebasket in the Dean's office and in rushed a physicist, a chemist, and a statistician. The physicist immediately starts to work on how much energy would have to be removed from the fire to stop the combustion. The chemist works on which reagent would have to be added to the fire to prevent oxidation. While they are doing this, the statistician is setting fires to all the other wastebaskets in the office. "What are you doing?" they demanded. "Well to solve the problem, obviously you need a large sample size" the statistician replies."
Examples of jokes on skewness and random experiments are provided in Annex B.

2) Quiz Crossword
The quiz crossword is a word puzzle that allows the user to fill in the white squares with letters, words, or phrases. Given are a set of clues in the form of questions usually regarding a general knowledge or a single topic so that the player can get the answer.

A delicious dessert after learning the concepts is the quiz crossword. If we give the appetizer "Find the Word" game to students to have an overview of the different terms of a new topic, the quiz crossword, on the other hand, helps determine if the students have internalized the subject matter. This activity enhances the student's memory capability and comprehension. An example is given in Annex C. After the completion of the quiz crossword, this builds the confidence of the student regarding the topic. The student finds learning more rewarding because of the accomplishment.

3) Trivia

Trivia are not so unusual or unfamiliar information that we get from answering a certain question. The trivia question initially stalls the listener but once the answer is given, the answer sounds familiar. This may serve as appetizers and give light to some application of the topic. Several interesting information about the Philippines and general information are given as examples to give application to some summary measures. Given examples are for largest, smallest, mean, and mode. Other examples are found in Annex D.

Trivia about the Largest Observed Value:
- The world's longest underground river system accessible to man can be found at the St. Paul National Park in the province of Palawan.
- The largest fish in the world, the Whale Shark, locally known as Butanding, regularly swims to the Philippine waters.

Trivia about the Smallest Observed Value:
- The world's shortest and lightest freshwater fish is the dwarf pygmy goby (Pandaka Pygmaea), a colorless and nearly transparent species found in the streams and lakes of Luzon. Males have an average length of 8.7 mm. and weigh 4-5 mg.
- San Juanico Strait - said to be the narrowest yet the most navigable strait in the world

Trivia about the Mean:
- In 24 hrs. an average healthy human breathes 23,000 times.
- An average human scalp has 100,000 hairs.

Trivia about the Mode:
- Negros Occidental has the most cities among Philippine provinces.
- The most common disease in the world is tooth - decay.

4) Quiz Bee

Give the quiz bee as the final dessert before the end of classes. The contest serves as a review of all lessons tackled and as a preparation for the final examination. As an incentive, the teacher can give prizes to the top three students winning the contest. This activity motivates and challenges the students to study harder, do research more, and be competitive. In addition, this creates an atmosphere of fun and excitement.

As for the mechanics of the quiz bee, the pre-elimination round includes all the students of the class. The teacher can give a 20 to 50--item exam and gets the top 10 students to be in the elimination round. The elimination round consists of easy and average questions. The five students with the highest scores move to the final round. The final round consists of difficult questions and the points doubled. The top three students win the quiz bee contest.

CONCLUSION

Learning strategies such as appetizers and desserts may help students get interested with Statistics. Statistics is not an easy subject to swallow and digest but with some interventions; students may be motivated and become interested in the subject matter.

REFERENCES

Mitchell, M. (1993). Situational interest: Its multifaceted structure in the secondary school mathematics classroom. *Journal of educational psychology*, *85*(3), 424.

Pintrich, P. R., & Schunk, D. (2002). *Motivation in education Theory, research, and application*s Pearson Higher Ed (2nd ed.).

Pressley, M., Schuder, T., Bergman, J. U, & EI-Dinary, P. B. (1992). A researcher-educator collaborative interview study of transactional comprehension strategies instruction. *Journal of Educational Psychology*, *84*, 231-246.

Sweet, A., Guthrie, J. T., & Ng, M. (1998). Teacher perceptions and student reading motivation. *Journal of Educational Psychology*, *90*, 210-223.