

Appendix D – Kutztown University Undergraduate Research Fund - Proposal Cover Sheet

Name:	Kurt Frieauf	Student ID #:	1123581321
Local Address:	123 Tin Pan Alley, StevieRayVaughanville, Colorado 80525		
Local Telephone:	555-123-4567	Email:	frieauf@kutztown.edu
Major:	Geology	Credit hours this semester:	16
Expected graduation date:	May 2019	Total credit hours at KU:	110
Research faculty advisor name:	Dr. Jennifer Forsyth	Faculty email:	forsyth@kutztown.edu
Title of Research Project:	Estimating Jelly Bean Abundance and Its Potential Effect on Student Hunger		
Total Project cost:	220	Costs covered by other sources:	0
Funding type requested:	<input checked="" type="checkbox"/> Research materials <input type="checkbox"/> Travel to present research <input type="checkbox"/> Travel to do new research	Destination (if travel):	n/a
Have you received a previous research grant from the KURF?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If yes, date of grant:	February 2015
Title and amount of previous KURF research grant received:	Estimating Lima Bean Abundance - \$250		
If Institutional Review Board (IRB) approval of the ethical treatment of subjects is required for project, date application submitted to IRB or date received IRB approval for research: <i>Include explanation in proposal</i>			<input type="checkbox"/> submitted <input checked="" type="checkbox"/> approved date: 08/2015
If Institutional Animal Care and Use Committee (IACUC) approval of the ethical treatment of subjects is required for project, date application submitted to IACUC or date received IACUC approval for research: <i>Include explanation in proposal</i>			<input type="checkbox"/> submitted <input type="checkbox"/> approved date:

Estimating Jelly Bean Abundance and Its Potential Effect on Student Hunger

Project title

Student name: **Kurt Frieauf**
Faculty advisor: **Dr. Jennifer Forsyth**
Program: **Geology**
Project cost: **\$210**

Abstract

The jar of jelly beans on Dr. Forsyth's desk in her office contains a previously undetermined number of jelly beans. Accurately assessing the quantity of jelly beans will enable bean counters to predict more precisely the number of hungry students that might be satisfied by consumption of those jelly beans and alert Dr. Forsyth to the potential need to replenish her supplies. We propose to estimate the number of jelly beans in the jar using a combination of gravimetric and acoustic methods. Such an approach will constrain the amount to a value within a range of acceptable variance as defined by Forsyth and Frieauf (2013a).

Introduction

Optimization and augmentation of undergraduate student schoolwork output in both amount and quality is perhaps one of the most important branches of professorial research today. The economic impacts of such research include, but are not limited to, increases in the amount of training of graduating geology majors and the resulting direct increase in national gross domestic product (GDP), and a reduction in tax burden in the state due to higher professor retention (related to greater job satisfaction when professors see students working harder).

Early workers focused on blunt-force approaches in which students were burdened with large numbers of complex structural geology problems and geologic mapping projects (Erslev, 1987, 1988, 1989), massive exercises in memorization of mineralogical trivia (McCallum, 1985, 1986, 1988, 1989), and logging of drill cuttings, preparation of fluid inclusion samples, and basic rock descriptions (Thompson, 1987, 1988, 1989a, 1989b). Such primitive methods were sufficient for unusually motivated students, but a majority of students react to this approach by triaging assignments based on their potential impact on course grades (Grademonger, 2004).

Self-administration of large doses of caffeine in the form of coffee or soda pop have historically driven up student output, but excessive quantities can have the negative side effects of hyperactivity (Tindall, 1999) and strong urinary urges (Frieauf, 2014). Furthermore, long-term studies by Forsyth and Frieauf (2013b) indicate prolonged use of caffeine results in pointless chemical addiction without significant stimulative benefits.

Sugar consumption and subsequent conversion of complex sugars to blood glucose is a significant source of energy for student activities, including whiffleball, studying petrology, and working on petrology term research projects (Frieauf and Sherrod, 2005). Heavy thinking requires brain combustion of glucose, so a constant feed of high-grade brain fuel can promote student learning.

Excessive sugar consumption, however, can lead to fattening of the consumer (e.g., Friehauf, unpublished self-study, 2014) and thus degradation of performance at whiffleball or other physical activities.

Dr. Forsyth maintains a pickle jar of jelly beans on her desk that is available for visiting students. The precise number of jelly beans in the jar, and thus the total potential for augmenting student coursework, is undetermined. This study proposes to evaluate the jar's potential by estimating the number of jelly beans contained therein.

Problem statement

Precisely how many jelly beans are in the jar on Dr. Forsyth's desk? Does the number meet the minimum required for intellectual stimulation of a standard petrology class without exceeding the sugar-rush limit beyond which students revert to hyperactive Brownian motion?

Methods

I propose estimating the number of jelly beans using a combination of gravimetric and acoustic techniques. The results of two separate techniques based on different principles will help act as an internal check for accuracy. Although the gravimetric method has the advantage of higher precision, acoustic analysis is both louder and more rhythmic.

Gravimetry

Each jelly bean in the jar has a specific mass. Although individual jelly beans differ slightly in mass, an average mass can be determined by weighing several jelly beans at once and dividing by the number of jelly beans according to equation 1:

$$m_{\text{avg}} = \frac{m_{\text{samp}}}{n} \quad (\text{eq. 1})$$

where m_{avg} is the average mass of an individual jelly bean, and m_{samp} is the total mass of a sample of n jelly beans. Weighing a portion of the jelly beans and calculating the per-unit mass will allow for calculation of the total number of jelly beans using equation 2:

$$n = \frac{(m_{\text{total}} - m_{\text{jar}})}{m_{\text{avg}}} \quad (\text{eq. 2})$$

where m_{total} and m_{jar} represent the total mass of the jelly bean-filled jar and the mass of the glass jar sans jelly beans, respectively.

Acoustic analysis

The method of acoustic analysis is founded on the principle that, when agitated, a partially-filled jar of jelly beans will make a sound fingerprint reflecting its state of fullness. Jars filled with only a few jelly beans produce a high pitched "tink – tink" or "tockle-tockle" sound when shaken. Due to grain-grain interactions and the distribution of collisional stresses between particles, large numbers of jelly beans produce a lower-pitched "schuckle-schuck-schuckle" sound when energetically agitated.

This study will quantify the acoustic output of the shaken jelly bean jar from Dr. Forsyth's desk and compare it to a calibrated curve previously determined by the analyses of known standards (i.e., jars containing a known number of jelly beans) (e.g., Figure 1). In line with proper scientific protocol, we will only interpolate between standard values on the calibration curve. This will therefore require the purchase of a larger volume of jelly beans than exists in the desk jar and a precise individual counting of the number of jelly beans in this larger sample.

Data / Results to date (if applicable)

No results to date.

Conclusions

The combined gravimetric and acoustic analysis of the data will allow a reliable estimate of the number of jelly beans in the jar. Using a conversion factor from the U.S. Food and Drug Administration, we can then calculate the total caloric value of the jar. This caloric value will then be compared to the graphs relating student output, sugar intake, and blood glucose level of Friehauf and Sherrod (2005). The total number of students who can be stimulated to produce more work using the jelly bean jar will thus be calculated.

The results of this study will be published in the Journal of Student Manipulation and presented at the annual meeting of the Slave-Driving Professors Association of America..

References

Erslev, Eric, 1987, Structural Geology, Colorado State University course

Erslev, Eric, 1988, Field Methods, Colorado State University course

Erslev, Eric, 1989, Advanced Structural Geology, Colorado State University course

Friehauf, Kurt C., 2014, Diuretic effect or just old age? Coffee and the urge to pee in aging professors: International Journal of Tall Bald Guys, v. 33, no. 9, p. 12-13.

Forsyth, Jennifer, and Friehauf, Kurt C., 2013a, A quantitative analysis of jelly bean consumption and its relation to student work output: Journal of Student Manipulation, v. 34, no. 6, p. 134-156.

Forsyth, Jennifer, and Friehauf, Kurt C., 2013b, Long-term adaptation of immunity to caffeine and the nullification of the potency of the brown nectar of the gods: Journal of Wisdom from Age, v. 1, no. 1, p. (don't remember so well any more).

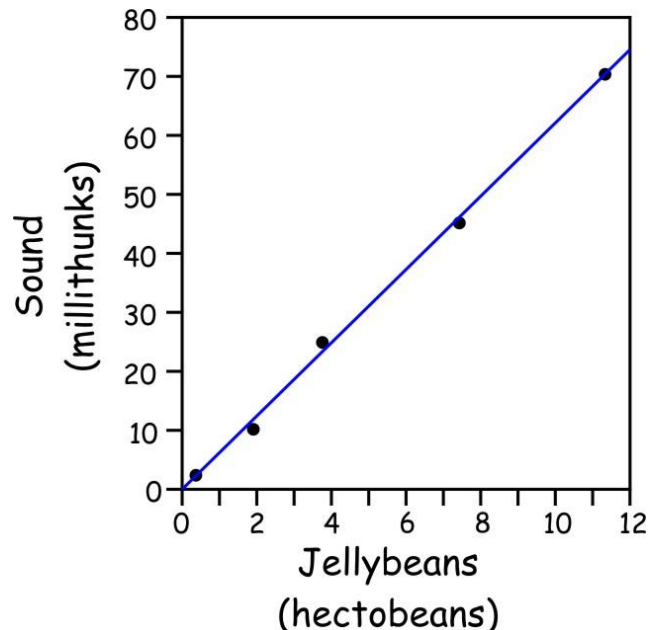


Figure 1. Calibration curve relating acoustic properties of agitated jelly bean jar with jelly bean quantity. Black dots indicate measured standards.

Frieauf, Kurt C., and Sherrod, Laura, 2005, Stimulation of students using sugar-rich foods – an indirect approach to increasing student workloads, *Journal of Student Manipulation*, v. 33, no. 1, p. 14-26.

Grademonger, R., 2004, Strategies for dealing with school workloads by procrastination and assignment attrition: *Journal of Undergraduate Student Survival*, v. 6, no. 3, p. 22-31.

McCallum, M.E., 1985, Crystallography, Colorado State University course

McCallum, M.E., 1986, Mineralogy, Colorado State University course

McCallum, M.E., 1988, Geochemistry, Colorado State University course

McCallum, M.E., 1989, Exploration Geochemistry, Colorado State University course

Thompson, 1987, Introduction to Ore Deposits, Colorado State University course

Thompson, 1988, Hydrothermal Alteration, Colorado State University course

Thompson, 1989a, Fluid Inclusion Analysis, Colorado State University course

Thompson, 1989b, Advanced Ore Deposits, Colorado State University course

Tindall, Sarah, 1999, Brownian motion of human bodies induced by excessive ingestion of caffeine: *American Journal of Atomic Physics Analogies to Human Behavior*, v. 115, no. 2, p. 345-361..

Timeline

March, 2016	Purchase jelly beans for deriving gravimetric calibration curve
April 1-8, 2016	Gravimetric analysis
April 12-15, 2016	Calibration of acoustic analysis curve (including counting standard jelly beans) and acoustic analysis
June 20, 2016	Presentation of results at National Association of Sugar Addicts (NASA) in Harrisburg, PA

Budget

item	vendor	cost	use
Jelly beans	Giant	\$ 200.00	
Milk	Giant	\$20.00	wash down standard calibration jelly beans after determining curve
Total		\$220.00	
Amount requested from KURF		\$220.00	
Amount covered by other sources		\$0.00	From: <i>n/a</i>

Biographical sketch of student

I am a geology major who is fascinated both by the physics of particle interaction and the chemistry of metabolic processes involved in the breakdown of rock candy (I'm using jellybeans in this study, though, to save on costs). I'm originally from Colorado, but moved to Pennsylvania to attend Kutztown University. I am working hard to become a quantitative geochemist so I can someday work for a large geochemical firm in the San Luis Valley of southern Colorado. This project will not only give me experience in the type of research I'd like to do in my career, but it will also enable me to attend a major scientific conference where I can learn about the cutting edge of my science, as well as meet established geologists and being developing my professional network.

I've emailed a high resolution photograph of myself you as a separate jpg file – roughly 1-2 Mb in size.

Published abstract

n/a (yet!)