



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Shreya Banerjee</b>	<b>Project Number</b> <b>S0401</b>
<b>Project Title</b> <b>Childish Thinking</b>	
<b>Abstract</b> <b>Objectives/Goals</b> In my project, I decided to test whether or not Piaget's theory applies to children. The method I used to test this understanding was to test whether or not children understand the concept of conservation. Piaget's Pre-operational stage extends from the age of 3 to 7. According to Piaget, at age seven, children gain an understanding of conservation. <b>Methods/Materials</b> I observed five four-year-olds, five five-year-olds, five six-year-olds, and five seven-year-olds. I hypothesized that the five-year-old children would have an understanding of conservation. I asked each of these children questions about objects placed in front of them. The #tests# were determined with the five different types of conservation: number, length, volume, mass, and area. <b>Results</b> The children answered incorrectly until the age of seven, and I determined that my hypothesis was incorrect, and that Piaget's stage was correct in determining the level of cognitive development that children have. <b>Conclusions/Discussion</b> This knowledge of the developmental stages is extremely important to parents and educators. They can develop suitable teaching methods and educational programs for children. Answering these simple tests incorrectly is not a sign of less intelligence, but a normal growth phase.	
<b>Summary Statement</b> At what age children grasp the concept of conservation.	
<b>Help Received</b> All parents cooperated and helped me by letting their children be a part of my project. Ms. Jackson and my mother helped me to put the project together.	



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<b>Name(s)</b> <b>Helaman Burdge; Camille Krahn</b>	<b>Project Number</b> <b>S0402</b>
<b>Project Title</b> <b>Social Pressures</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective is to determine the social pressures that teenagers have on other teenagers and to determine the variation of heart rate between individuals and groups of participants. <b>Methods/Materials</b> Informed consent was obtained from more than 50 various high school students, grades 9 to 12. 18 participants were randomly selected, with an even number of males and females. A slide show of 25 images was prepared containing 3 neutral images followed by randomly placed positively and negatively charged images. Heart rate monitors were attached to computers using the Logger Pro Lite 3.8.4 program. 7 trials of individuals were completed and 7 trials of groups of participants were completed. The groups of participants consisted of one subject surrounded by four "confederates". Confederates four people who were asked to behave certain ways for each image. The confederates were the same four for each trial. <b>Results</b> The subjects (in a group environment) had an average heart rate that was more than double compared to the individual's average heart rate. Overall on average group subjects conformed 34% of the time and did not conform 66% of the time. On average group subjects looked at other participants 8 times overall throughout the slideshow. <b>Conclusions/Discussion</b> The data collected from our experiment provides conclusive evidence that does not support our initial hypothesis. On average, the subjects looked at the other participants 8 times during the time of the slide show. Only thirty-four percent of the time the participants changed their initial reaction to conform to the group. The heart rate data collected supports the remaining portion of our hypothesis. The average heart rate was dramatically higher with the subjects who were in a group, compared to individual subjects. If we were to repeat the trials again, we would place a mirror behind the participants so we could properly match up the reactions to the slide. We would also find a way to time the slideshow and heart rate monitors down to the exact millisecond. In conclusion, groups of people have a dramatic effect on the conscious and subconscious behaviors of people.	
<b>Summary Statement</b> The project was based on social pressures and conformity in groups of four confederates and one subject, participants ranged between the ages of 14-18.	
<b>Help Received</b> Ms. Schroeder helped organize our data, brainstorm and complete our original application; Mother helped draw the title on the board; Ms. De La Cruz provided a classroom to complete our experiments	



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<b>Name(s)</b> Nelson Chandler; Clifton Guillory	<b>Project Number</b> <b>S0403</b>
<b>Project Title</b> <b>The Effect of Music on Basic Human Reaction Time</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of our project is to determine how music affects reaction time. We also attempted to determine what type of music would have the best affect on reaction time. The genres of music that we used in the experiment was Intense Classical, Metal, Folk, Calm Classical, and Electronic.</p> <p><b>Methods/Materials</b> Twenty subjects were tested for our experiment using an online computer program that tests basic human reaction time. An iPod and headphones were used during the experiment so that the subjects could listen to the different types of music while taking the test. Each subject took the test five times and each time listened to a different type of music. The averages of each test were recorded as results.</p> <p><b>Results</b> Folk music had the best results with reaction time. It was the only one to beat the control. The average reaction time of folk music was .32 seconds. And the second best music was Calm Classical that had a average reaction time of .34 seconds. Intense classical had the worst, with a average reaction time of .41 seconds.</p> <p><b>Conclusions/Discussion</b> Our hypothesis was partially correct, in that music does have an effect on reaction time. However we were not correct on what type of music that would have the best result with reaction time. The music that had the best results and the only music that beat the control was Folk. However if you are trying to make your reaction time faster it is better to not listen to music. If of course you had to listen to music the best choice would be Folk.</p>	
<b>Summary Statement</b> We tested how music and reaction time coincide using five types of music; Intense Classical, Metal, Folk, Calm Classical, and Electronic.	
<b>Help Received</b> Used library quiet room to conduct the test	



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2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Edie Cote; Angelina Hwang; Ivan Morales</b>	<b>Project Number</b> <b>S0404</b>
<b>Project Title</b> <b>The Effects of Age, Gender, and the Plastic Bag Ban on Consumer Bag Choice at Santa Monica Grocery Stores</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> We aimed to determine the effects of age, gender, and the plastic bag ban (with 10 cent fee per paper bag) on consumer bag choice at Santa Monica grocery stores by comparing pre- and post-ban data.</p> <p><b>Methods/Materials</b> Over two years, 50,400 patrons were visually observed exiting five grocery stores to estimate patrons' carryout bag type, age, and gender. Stores were separated into #regular# or "eco-friendly" categories based on whether plastic bags were predominantly used prior to the ban. Graphical and statistical analyses (MANOVA and T-tests) were used to test the null hypothesis: none of the variables would affect consumer bag choice between pre- and post-ban time periods.</p> <p><b>Results</b> Comparing pre- and post-ban data for eco-friendly stores, the plastic bag ban eliminated the use of plastic bags (2% to 0%), decreased the use of paper bags (55% to 37%), and increased the use of reusable bags (23% to 47%) and no bags (19% to 21%). At regular grocery stores, the percentage of patrons using plastic bags decreased (69% to 0%), while the percentages using reusable, paper, and no bags all increased (10% to 41%, 5% to 23%, and 15% to 36%, respectively). The results also reveal that compared to younger generations, the oldest age group used more plastic bags pre-ban but more reusable bags post ban, while the youngest age category was most inclined to use no bag. Furthermore, at both eco-friendly and regular stores, a higher percentage of female patrons used reusable bags than male patrons, whereas males tended to use more paper bags and no bag than females.</p> <p><b>Conclusions/Discussion</b> The city's plastic bag ban effectively eliminated plastic bags from all stores. Our data further suggest the ten cent fee was effective in encouraging reusable over paper bag use because paper bag use went down at eco-friendly stores while reusable and no bag usage went up at both eco- and regular stores. Given the plastic bag ban's main targets were the regular stores, there was thus a "spillover effect" at eco-friendly stores. While this study did not assess patron volume per store or the number of bags used per customer, it is possible that the increased use of paper bags at regular stores is balanced by the decreased use of paper bags at eco-friendly stores. Moreover, our results suggest more educational outreach is needed for the 0-19 age group and males to encourage greater use of reusable bag and decreased use of paper bags.</p>	
<b>Summary Statement</b> Over two years, we visually estimated the carryout bag type, age, and gender of 50,400 grocery store patrons to examine the effects of the City of Santa Monica's plastic bag ban (with ten cent fee per paper bag) on consumer bag choice.	
<b>Help Received</b> 25 of our peers (science students) from Santa Monica High School assisted us in the collection of visual surveys. Dr. Tom Belin of UCLA provided guidance with statistical analyses.	



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<b>Name(s)</b> <b>Gautam Daryanani; Brianne Nguyen</b>	<b>Project Number</b> <b>S0405</b>
<b>Project Title</b> <b>Talk Around the Block: The Effect of Strong Communities on Social Awareness</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective was to find if there was a connection between a person's interactions with their community and their awareness of social issues. A side study was conducted comparing a person's activeness in social networking and their awareness of social issues. <b>Methods/Materials</b> A survey was created that graded a persons community strength, opinion strength, and social networking activeness. 145 people between the ages of 13 and 19 were surveyed. <b>Results</b> The results found no statistically significant correlation between people from strong communities and stronger opinions on social issues. <b>Conclusions/Discussion</b> The study's hypothesis was not accepted. It could be suggested that dependence upon social networks may distract individuals from the power of life in a strong community. People should seek out interaction within their community, and want to live in a strong community. Comparing individual questions to a person's awareness on social issues showed results that may suggest that being more interactive your community may lead to people being more informed on social issues.	
<b>Summary Statement</b> The project was conducted to determine whether or not community strength effects an individual's opinions on social issues.	
<b>Help Received</b> Teacher helped in the process of topic selection and helped edit written pieces; Surveyed students at High Tech High.	



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<b>Name(s)</b> <b>Ruwanthi N. Ekanayake</b>	<b>Project Number</b> <b>S0406</b>
<b>Project Title</b> <b>Determining Correlations between Indicative Dominant Sense and Comprehension Aptitude</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of the study was to conclude whether people's "dominant" sense can be determined through tests pitting several frequently-used senses against each other. The study also determined whether this "dominant" sense has any correlation to comprehension aptitude, better known as "learning style".</p> <p><b>Methods/Materials</b> To determine the subject's dominant sense, the visual, auditory and tactile influences on their perception were tested. Students from Palos Verdes Peninsula High School were given visual-vs.-tactile, tactile-vs.-auditory, and visual-vs.-auditory tests to determine which sense extended the greatest influence over their perception. Comprehension aptitude was determined by three procedures. They utilized visual, tactile, and auditory cues. The test that the subject performed the best on was dubbed their comprehension aptitude.</p> <p><b>Results</b> The data collected showed that 100% of subjects showed a clear inclination towards a particular sense as their dominant sense. In the comprehension aptitude test, 75% of subjects displayed an inclination towards a particular sense as their most favored learning cues. 67% of subjects' first comprehension aptitude directly correlated to their first dominant sense. 58% of subjects' first dominant sense directly correlated to their primary comprehension aptitude. However, 25% of subjects' second dominant sense corresponded with their primary comprehension aptitude.</p> <p><b>Conclusions/Discussion</b> The results displayed that humans do tend to favor one sense which provides the most input for their perception. It also supported the hypothesis for the most part: most of the subjects had direct correspondence between their dominant sense and comprehension aptitude. However, a significant percentage had correlations between their second dominant sense and primary comprehension aptitude. These results provide important knowledge about the senses as well as valuable information for educators to better instruct their students.</p>	
<b>Summary Statement</b> The central focus of the project was to determine whether people have a dominant sense which exudes the greatest amount of influence over their perception, and whether this dominant sense has any correlation to comprehension aptitude.	
<b>Help Received</b> My teacher Mr. Peter Starodub provided guidance and support. Ms. Sandy Gregory, Dr. Sunila Fuster, Dr. Laslo Gyermek, Dr. Jeffrey Luther, and brother Kiran Ekanayake provided valuable input regarding experimental design.	



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<b>Name(s)</b> <b>Christopher R. Grant</b>	<b>Project Number</b> <b>S0407</b>
<b>Project Title</b> <b>The Effect of Audio Video Asynchrony on Viewer Opinion of Positive Attributes</b>	
<b>Abstract</b> <b>Objectives/Goals</b> This experiment aims to determine if asynchrony in a speech video will cause a significant difference upon a viewer's opinion of the main speaker, which will be determined by a questionnaire. <b>Methods/Materials</b> There were 25 participants (female=14, male=11) between the ages of 16-17 from a rural area in a western region of the United States, chosen as part of an opportunity sample. The control group watched the video with synchronized audio video and the experimental group watched the video with asynchronous audio video. The experimental hypothesis states that audio video asynchrony will cause a significantly ( $p < .05$ ) negative interpretation of the speaker's positive attributes. The independent variable was the asynchronous audio video and the dependent variable was the attribution score of the main speaker as determined by a questionnaire. Materials: -Video with in synch audio and video -Same video with audio displaced forward by 60 milliseconds -Laptop -Jump drive for back up -Overhead projector -50 consent forms -Calculator -25 questionnaires -Standardized Introduction -Standardized Instructions for participants of control and experimental group -25 Flash Cards for participant's number <b>Results</b> A one-tailed, between subjects design, t-test determined that the data was significant at the $p < .01$ level of confidence. The results supported the experimental hypothesis, in that significantly lower scores, which showed that the main speaker was interpreted in a more negative way, were received from those who watched the video with asynchronous audio video compared to those who watched the unaltered video. <b>Conclusions/Discussion</b> The data showed that audio video asynchrony can cause the viewer to negatively interpret a speaker's positive attributes.	
<b>Summary Statement</b> The impact of lip-synch error on positive attributes of a speaker	
<b>Help Received</b> Under the supervision of my teacher	



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<b>Name(s)</b> Irving Hernandez; Nicole Hernandez-Hart	<b>Project Number</b> <b>S0408</b>
<b>Project Title</b> Can You "Makeup" Your Self-Esteem?	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Teenage girls tend to wear a lot of makeup, but does it affect their self esteem? This study hypothesized teen girls with low self esteem wear more makeup. In order to complete this study, a survey was given to the female students of High Tech High. The results confirmed the hypothesis. The majority of the girls with lower self esteem wear more makeup. The negative effects the media has on teen girls causes low self esteem in teen girls. Counseling helps girls express their feelings and come up with helpful solutions to difficult situations.</p> <p><b>Methods/Materials</b> Develop and refine science fair project idea, Conduct preliminary research, Developed a hypothesis, Drafted survey, Completed necessary permission slips, Conducted a pilot survey, Revised survey based on pilot feedback, Conducted testing protocols, Conducted final survey, Scored and entered data from the survey, Analyzed data, Completed the findings, Conducted review of literature based off of preliminary research ,Completed notebook organization</p> <p><b>Results</b> The study showed that there were significantly more girls that don't feel good about themselves spending more time putting on makeup than girls who do feel good about themselves. The girls who do feel good about themselves significantly more girls who felt good about themselves said they wear less makeup.</p> <p><b>Conclusions/Discussion</b> Many young girls in today's society are overwhelmed by the superficial popular culture of America. To match the standard portrayed by the media, women often resort to the use of makeup. The constantly growing use of makeup among teenage girls is alarming because makeup is comfortably accepted in society today as a necessity for everyday use for girls. The majority of girls who use makeup daily may be doing so because they have low self-esteem. As a result, teen girls might be aware that they substitute their self-esteem with makeup. Makeup is able to conceal negative feelings about one's appearance and self-esteem. Teen girls can challenge this by not wearing as much makeup.</p>	
<b>Summary Statement</b> Teenage girls with low self-esteem will wear more makeup.	
<b>Help Received</b> Teacher helped edit papers, Teacher taught how to use excel	





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<b>Name(s)</b> <b>William Humphreys</b>	<b>Project Number</b> <b>S0409</b>
<b>Project Title</b> <b>The Correlation of Harmony and Dissonance in Color and Sound</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Is there a mathematical correlation in frequency between color and sound, and can the human brain detect similar frequency spans in color and sound?</p> <p><b>Methods/Materials</b> This is all about colors that look good together and notes that sound good together. There are two parts to this project: seeing if there is a mathematical relationship between color and sound, and (if there is) if the human brain can detect it. I went about this by first measuring and comparing certain color's frequency and certain note's frequency. I found the frequency distance between two certain colors (such as red and blue) and two certain notes (such as C and G) to be proportional. As it turns out, the color scale ROYGBIV (Red, Orange, Yellow, Green, Blue, Indigo, and Violet) matches up proportionally in frequency to any major scale. Now I needed to see if the brain would detect this relationship. To do this, I played the subject two to three harmonious and/or dissonant note combinations, and at the same time showed them a selection of four different harmonious and dissonant color combinations using an iPad application I created. They then picked the color combination they thought matched the notes they were hearing. There were twenty tests with four possible selections each, with only one right answer. It was difficult for some people to connect the two senses of sight and hearing, and it showed in the testing.</p> <p><b>Results</b> There is a mathematical correlation between color and sound. On the human testing side of this project, out of the twenty people I tested, the average correct score was five out of twenty. This means that the test subjects could not correlate the sound with the color combinations, and picked randomly.</p> <p><b>Conclusions/Discussion</b> The fact that there is a correlation between color and sound is not surprising. After all, they can both be measured in frequency and they both travel in similar ways. However I was expecting the brain to be able to detect the harmonic and dissonant spans of frequencies between color and sound. This test was conducted entirely on high school students ages fifteen-sixteen. Most of these teens are not proficient in art and/or music, which leads to an interesting question: Would adults with experience and/or training in art or music get more tests correct? Would their brains be more fine-tuned to color and sound, and therefore be able to pick out the correlating combinations offered?</p>	
<b>Summary Statement</b> Is there a mathematical correlation in frequency between color and sound, and can the human brain detect similar frequency spans in color and sound?	
<b>Help Received</b> Father helped print the board.	



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<b>Name(s)</b> <b>Adish Jain; Akhil Padmanabha</b>	<b>Project Number</b> <b>S0410</b>
<b>Project Title</b> <b>The Effectiveness of Reducing Social Isolation in Senior Citizens through a Website</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Computers are a source of great information and have helped mankind achieve the impossible. Yet the full potential of computers has still been untouched. Utilizing computers and the internet, we hoped that we could help the majority of senior citizens who face social isolation as a daily problem in their lives. According to research conducted by the University of Phoenix, by 2020, a staggering 75% of all seniors are estimated to face social isolation. Social isolation leads to many other negative changes such as depression, anxiety, and stress. This is why we created a website, seniorstudentconnect.com, an ideal website to connect seniors with others in their community and to get them more involved. We hypothesized that if senior citizens use seniorstudentconnect, then they will become less socially isolated because seniorstudentconnect.com is very simple and allows senior citizens to connect with other seniors, students, and look at events in their community.</p> <p><b>Methods/Materials</b> By building seniorstudentconnect.com, using Wix (a website building tool), we were able to connect seniors with both students, and other seniors, and test whether or not a website is effective in reducing the levels of social isolation seniors face on a daily basis. To analyze data, we sent a pre-survey (using Google forms) to seniors when they first joined the website. After a month of using the website we sent the seniors a post-survey, which showed the impact seniorstudentconnect had on the levels of social isolation they faced.</p> <p><b>Results</b> Our data from the pre and post surveys showed that 3 out of 4 of the senior citizens that used our website reported a reduction in social isolation, 4 out of 4 interacted with more students, and 3 out of 4 of the seniors attended more events.</p> <p><b>Conclusions/Discussion</b> Overall, we found that our data was inconclusive, thus we were unable to resolve whether our hypothesis was supported or not. Our website was effective in lowering social isolation for seniors that joined, however it was inefficient in getting seniors to join in the first place. Because of our small sample size of only four seniors, we were unable to conclude whether or not seniorstudentconnect was effective in reducing social isolation among seniors. For this reason we would like to continue this study by collecting more data, which would reduce our margin of error, increase our sample size, and help senior citizens around the globe.</p>	
<b>Summary Statement</b> This study aimed to test whether a website would be effective in lowering social isolation among senior citizens.	
<b>Help Received</b> Mountain View senior center let us present our idea to seniors; dad helped with thinking of a good website builder; akhil's mom helped us get in touch with professionals	



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<b>Name(s)</b> <b>Kylie D. Johnson</b>	<b>Project Number</b> <b>S0411</b>
<b>Project Title</b> <b>The Effects of Traditional Printers Black Ink and Electronic Ink as Used on a Kindle on Reading Comprehension</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> This experiment is an investigation into the effect of ink type on reading comprehension through the comparison of scores on reading comprehension tests.</p> <p><b>Methods/Materials</b> Participants were asked to read a fictional short story in either Traditional Printers Black ink or electronic ink used on a Kindle, and take a reading comprehension test. The participants were part of a randomized opportunity sample of students 16 years or older, in college level Sociology/Psychology classes. The research hypothesis states there will be a significant difference between the reading comprehension scores of participants when a fictional short story is read in Traditional Printers Black ink or electronic ink used on a Kindle. The independent variable is the reading medium of either Traditional Printers Black Ink or electronic ink used on a Kindle. The dependent variable is the score received by participants on the reading comprehension test.</p> <p><b>Results</b> A one tailed t-test shows a significant difference at the 99.9% confidence level. Significantly higher scores were received by participants who read the story in Traditional Printers Black ink than by participants who read the story in electronic ink used on a Kindle.</p> <p><b>Conclusions/Discussion</b> This suggests that reading comprehension is higher when stories are read in Traditional Printers Black ink.</p>	
<b>Summary Statement</b> The effects of traditional printers# black ink versus electronic ink on reading comprehension	
<b>Help Received</b> Psychology teacher, Mrs. Brown, supervised project ; Mr. Collins, media teacher, assisted with board creation.	



# CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

<b>Name(s)</b> <b>Ryan D. Kmet</b>	<b>Project Number</b> <b>S0412</b>
<b>Project Title</b> <b>Altruism, Cognitive Function, and Self-Esteem</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this experiment was to determine if the performance of an altruistic act would positively affect cognitive function and self-esteem.</p> <p><b>Methods/Materials</b> Consent forms were distributed to the entire high school student body, of which 93 were returned. Consenting subjects were subsequently divided into three groups of 31. Thirty-three (33) tests were labeled 1 to represent the control. The adviser checked in the first group of 11 students. The designated helper walked by the classroom and dropped pencils in front of the remaining students. The subjects who aided the helper in retrieving the pencils were recorded by the student aid, and their tests were labeled 2, while the remainder were labeled 3. Tests were distributed, completed, and collected, and the experiment was repeated with the two remaining groups of 31. The tests were then checked, scored, initialed, and double verified.</p> <p><b>Results</b> Upon analysis, the data partially confirmed the hypothesis. Group 2 (Helpers), representing (0.14) of the subjects, outperformed Group 1 (Control), representing (0.51) of the subjects, and Group 3 (Non-Helpers), representing (0.35) of the subjects, in both cognitive function (at 75 for males and 55 for females for Helpers, 70 for males and 50 for females for Control, and 39 for males and 49 for females for Non-Helpers) and self-esteem (at 25 for males and 22 for females for Helpers, 22 for males and 16 for females for Control, and 17 for males and 18 for females for Non-Helpers). Control unspecified gender subject scores were the only aberration, with cognitive function (50) and self-esteem (24) scores significantly higher than both unspecified gender Helpers and Non-Helpers. The significance of this aberration is unknown, however, as the unknown gender subjects were limited to a total representation of only (0.08) of the subjects.</p> <p><b>Conclusions/Discussion</b> The importance of the data collected is that it demonstrates the execution of an altruistic act may contribute to an increase in cognitive function and self-esteem. The results of this experiment can contribute to a better understanding of the sociological versus biological inheritance of altruism, relative in the recent debate regarding the validity of the Price equation. Demonstration of the positive effects of altruism may also help further social cooperation by illustrating both group and individual benefits.</p>	
<b>Summary Statement</b> The effects of altruism on cognitive function and self-esteem.	
<b>Help Received</b> Biology teacher, Mr. Hartsock, supervised experiment and double-verified data; Mother bought supplies for board; student aids, janitor, and monitors assisted in recording data and dropping pencils	



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<b>Name(s)</b> <b>Sam Kumar</b>	<b>Project Number</b> <b>S0413</b>
<b>Project Title</b> <b>True or Fake: A Stylometric Approach to Checking Originality</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of this work is to identify the true authorship of student writings using an authorial invariant, a metric based on word and punctuation usage. This project examines if three different metrics of a text - the proportion of function words, average number of function words per sentence, and punctuation frequency - could be used as viable authorial invariants.</p> <p><b>Methods/Materials</b> A total of 56 essays, two each from 28 students, were analyzed. A computer program was developed and used to calculate the above metrics for each essay. To test if each metric is consistent for different essays of the same student, Essay 1 of each student was compared to Essay 2 of the same student (Control Group). In all of these comparisons, the ideal metric would be the same for both essays; Success Rate 1 is the proportion of these comparisons for which each metric was not significantly different. To test if each metric is different for essays of different students, Essay 1 of each student was compared to Essay 1 of every other student (Experimental Group). In all of these comparisons, the ideal metric would be different between the two essays; Success Rate 2 is the proportion of these comparisons for which each metric was significantly different. By using 99% confidence in the statistical tests (<math>\alpha = 0.01</math>), special care was exercised to minimize false positives.</p> <p><b>Results</b> For the three metrics, namely the proportion of function words, average number of function words per sentence, and punctuation frequency, Success Rate 1 was 1.00, 0.96, and 0.93, and Success Rate 2 was 0.13, 0.22, and 0.29, respectively. Success Rate 1 is high for all three metrics, while Success Rate 2 is low. In an effort to achieve high values of both success rates, different combinations of the metrics were formulated and tested. This did not improve the initial outcome.</p> <p><b>Conclusions/Discussion</b> A high Success Rate 1 indicates that the three metrics would almost never give a false positive result. However, the three metrics will only distinguish between essays written by different students 20% of the time. Nevertheless, this authorial invariant approach could be applied to situations where false positives must be expressly avoided, such as detecting ghostwriting in academics. Further research is needed to find metrics that have a high success rate for both criteria.</p>	
<b>Summary Statement</b> This project investigated the ability of metrics to identify authorship based on word and punctuation usage in essays, and found that such methods could potentially be used to detect ghostwriting in academia.	
<b>Help Received</b> My parents looked at my poster board and presentation and gave me feedback to help me improve. My science teacher and parents looked at my experimental design and gave me suggestions for improvement.	



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<b>Name(s)</b> <b>Yelena Mandelshtam</b>	<b>Project Number</b> <b>S0414</b>
<b>Project Title</b> <b>The Development and Study of an Algorithm to Explain Successful Language Acquisition from an Inconsistent Source</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> This project presents a new algorithm to model and investigate the learning process of a learner mastering a set of grammatical rules from an inconsistent source. The compelling interest of human language acquisition is that the learning succeeds in virtually every case, despite the fact that the input data are formally inadequate to explain the success of learning. This outcome has been used by some scientists to say that language learners have some sort of innate feeling of grammar. However, I present a novel mathematical model that explains how a learner can successfully learn from or even surpass its imperfect sources without possessing any form of innate biases or constraints about the types of patterns that exist in the language.</p> <p><b>Methods/Materials</b> In this project, I conducted a thorough analytical study of the algorithm using the apparatus of Markov chains and also a numerical study by writing several Fortran computer codes.</p> <p><b>Results</b> I proved two theorems, rigorously establishing the boosting effect in the case with two variants. The numerical simulation showed that the boosting effect also occurs in the case with multiple variants. The numerical study of convergence of the algorithm revealed several patterns of dependence of the boosting effects on various parameters.</p> <p><b>Conclusions/Discussion</b> Both the analytical and the numerical results showed that the algorithm possesses a source-boosting property, and thus it is possible for a learner to surpass its inconsistent source without an innate sense of grammar.</p>	
<b>Summary Statement</b> In this project, I developed a mathematical model to show that a learner can learn from or even surpass its inconsistent source without any innate sense of grammar.	
<b>Help Received</b> Professor N. Komarova (UCI) provided feedback and conceptual guidance at several stages of my work. My chemistry teacher, Mr. Smay, read over and edited the final report. However, all of my research and report was ultimately done solely by me.	



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Robin A. Meister</b>	<b>Project Number</b> <b>S0415</b>
<b>Project Title</b> <b>The Effect of Twitter Use in an Educational Setting on Introverted and Extroverted Students Engagement in Class Discussi</b>	
<b>Abstract</b> <b>Objectives/Goals</b> This experiment is an investigation into the effect of Twitter# use in an educational setting on introverted and extroverted student#s engagement in class discussion, as measured by the number of comments added by each participant. <b>Methods/Materials</b> The participants were an opportunity sample of 21 student#s of both genders between the ages of 16 # 18, and were predominantly Caucasian, English-speaking students from a rural high school in the Western United States. Each participant was given an introversion-extroversion personality test to determine their temperament (9 introverted, 12 extroverted). A between-subject design was used; both samples watched a video lecture, while one verbally commented, and the other sample used Twitter to comment on the lecture. The independent variable was the use of Twitter to respond to lecture, and dependent variable was the number of comments received from the participants. The research hypothesis states that when students use Twitter# to electronically comment on a lecture they will add a significantly higher number of comments (tweets) than student#s who verbally comment on a lecture, such as in a traditional classroom setting. Materials: Consent Forms Computer Lab/Projector/Screen Twitter Accounts Introvert/Extrovert Personality Test Lecture Video/Modified YouTube video Questionnaire of Video Thoughts after lesson <b>Results</b> A one-tailed t-test was used to analyze and interpret the data, which was found to be significant with a 99.9% level of confidence; confirming the research hypothesis. <b>Conclusions/Discussion</b> The implication of using Twitter in an educational setting is that it will significantly increase classroom discussion, and give all students# an equal chance to contribute.	
<b>Summary Statement</b> How using Twitter in an educational setting can increase overall classroom discussion for all students.	
<b>Help Received</b> Under the supervision of my teacher	





**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Andrew R. Mitchell</b>	<b>Project Number</b> <b>S0416</b>
<b>Project Title</b> <b>Effects of the Asymmetry of Facial Features in the Faces of Adult Males on Their Attractiveness to Adolescent Females</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this experiment was to determine the effects, if any, of the asymmetry of facial features and structure in the faces of adult human males on their comparative attractiveness to adolescent human females. The hypothesis was that as the asymmetry of the male faces increased, the adolescent females would find them less attractive.</p> <p><b>Methods/Materials</b> Ten images of faces of adult males from a controlled source were edited to produce three similar looking variations with different degrees of symmetry in their features and structure. These 40 faces were then measured to determine their respective facial asymmetry, then composed into a test, in which female participants between the ages of 12 and 18 were asked to rate the 10 sets of faces in order from most to least attractive.</p> <p><b>Results</b> Data collected supported the hypothesis. In order of most to least symmetric, the four variations of each face averaged comparative attractiveness scores of 2.69, 2.08, 0.91, and 0.31 out of 3, respectively, with non-overlapping deviations. 7 out of 10 face-trials followed a perfectly linear correlation between asymmetry and facial attractiveness. That is, the adolescent test population rated the more symmetric faces as more attractive. While the experimental design could be improved, the data collected in this experiment still reached a high quality of statistical significance.</p> <p><b>Conclusions/Discussion</b> Some face-trials displayed results that did not fit the majority trend of the data, showing that some faces were rated as far more attractive for their given symmetry than they should have been. Review of these outliers determined them all to be original, unaltered faces; this may indicate that test subjects were able to identify and slightly favor the original face in each set. This observation, in tandem with the majority of data in support of the hypothesis, may indicate that optimal facial attractiveness is composed of a balance between perfect facial symmetry and natural, imperfect traits.</p>	
<b>Summary Statement</b> This project explored the relationship between facial symmetry and attractiveness in humans, specifically in the adult male population.	
<b>Help Received</b> Mother and Father encouraged and assisted with computers when necessary; Mr. Antrim assigned the project; all test subjects made data collection possible; all works cited in the project provided invaluable information.	





**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Manooshree R. Patel</b>	<b>Project Number</b> <b>S0417</b>
<b>Project Title</b> <b>Which Is the Fastest Human Interface when Interacting with Information Technology?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective was to find the fastest human interface device among a computer mouse, a computer keyboard, a microphone for speech, and a multi-touch touch screen used when interacting with information technology.</p> <p><b>Methods/Materials</b> Users (volunteers) between the ages of 14 and 40 were tested. Each user tested each of the four selected interfaces (computer mouse, computer keyboard, microphone for speech, multi-touch touch screen) while performing 6 tasks (one such task was go to <a href="http://www.google.com">www.google.com</a>) on each interface. Each user was timed while performing each task. In order to test all the users fairly, I had to create a computer program written in HTML (a programming language). The computer program allowed users to be tested accurately and efficiently.</p> <p><b>Results</b> The mouse interface performed the fastest; this contradicted my hypothesis which had stated that the multi-touch touch screen interface would be the fastest. To try and prove my hypothesis, I reevaluated my data and performed my data analysis in a different way. The outliers were taken out of the data and then the data was analyzed. Even after analyzing the data without the outliers, the computer mouse interface was still the fastest interface. From these two data analyses I can fairly conclude that the computer mouse is the fastest interface device.</p> <p><b>Conclusions/Discussion</b> While performing my tests, I noticed that the speech recognition functionality of the software using the microphone interface device did not seem very efficient. To present an alternative to the microphone interface (speech recognition software), I came up with a new approach and developed an algorithm for the speech interface functionality: the sound activated interface. It works by the user firstly entering in several sounds (not speech) and allotting the appropriate tasks. Then the user makes the correct sound for the desired action. For example: a clapping noise could open an internet explorer window.</p>	
<b>Summary Statement</b> The objective was to find the fastest human interface device among a computer mouse, a computer keyboard, a microphone for speech, and a multi-touch touch screen used when interacting with information technology.	
<b>Help Received</b> Mrs. Arati Patel helped me overcome some of the difficulties that occurred while writing my HTML program.	



# CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

<b>Name(s)</b> <b>Elizabeth P. Rose</b>	<b>Project Number</b> <b>S0419</b>
<b>Project Title</b> <b>Does a Compound Stimulus Improve Students' Memory?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Previous research showed that auditory and visual learning modes are the most effective among Villa Park High School students for memorizing information on a short term basis. A kinesthetic learning mode had proven less successful among the students tested last year. The purpose of this research was to determine the effect of a compound audio-visual stimulus on information retention over a longer (30-minute) interval as compared to the basic visual stimulus.</p> <p><b>Methods/Materials</b> A sample of students from VPHS was tested with two different stimuli, a basic visual stimulus, and a compound visual and auditory stimulus. Each student in the study was tested four times, twice with each stimulus. One classroom, predominantly of freshman students, received the visual stimulus first, and was asked to memorize a sequence of numbers. They were tested initially and again after 30 minutes to see how much of the information was retained. This classroom repeated the testing a week later with the combined audiovisual stimulus. In another classroom, mostly containing freshmen, students received the auditory and visual stimulus first, and were tested in the same way, with initial and delayed results. They repeated the testing a week later with only the visual stimulus.</p> <p><b>Results</b> When the four tests for each student were graded for accuracy, it was apparent that there was decay in the memory of the number sequence in the 30 minutes between the initial and delayed test, as would be expected. The results were consistent with my research from last year in that gender had no significant effect on the results. It was also found that the results were confounded in the second round of testing because the students learned how to take the test and improved their scores, whether it was on the visual or combined test, in the second round of testing. It was true, however, that when test scores from the two classrooms for the initial round of testing were compared, students had less memory decay of the number sequence with the audiovisual stimulus than with the visual stimulus.</p> <p><b>Conclusions/Discussion</b> Based on the findings, it can be inferred that combining visual and auditory learning styles can improve the retention of information. This has implications for classroom learning and study habits.</p>	
<b>Summary Statement</b> The project investigates whether a compound audio-visual stimulus is more effective than a basic visual stimulus for information retention over a 30 minute delay.	
<b>Help Received</b> Uncle helped with statistical analysis.	



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Anubhav Sarkar</b>	<b>Project Number</b> <b>S0420</b>
<b>Project Title</b> <b>An Innovative Approach to Combat Stress: Using Glucose as an Ego-Depletion Compensator to Enhance System 2 Thinking</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> According to Nobel laureate Daniel Kahneman, there are two methods of thinking: System 1 (intuitive) and System 2 (rational). When an individual is stressed, they are less able to exert self-control when challenged - a phenomenon known as ego-depletion. Under conditions of ego depletion, their blood glucose level drops, and they are therefore unable to perform to the best of their ability under stress. In this experiment, I tried to determine whether or not ego-depletion could be compensated for by ingesting glucose, in an attempt to improve critical thinking.</p> <p><b>Methods/Materials</b> 32 students from a Biology Honors class were selected as students. In this blind study, they were divided into two groups. The students were tasked to cross out as many instances of a vowel as possible in 5 minutes from an article published in a scientific paper. This act would require the students to exert self-control, and has been proven to cause ego-depletion. Then, the students in Group 1 were given 3 oz. of lemonade containing glucose, and the students in Group 2 were given 3 oz. of lemonade containing Splenda. After waiting 10 minutes for the glucose to be ingested, every student was given a 10 minute test which tested System II thinking. The entire process was repeated in two more tests: in the second test, fonts for Group 1 test papers were smaller and less legible, as harder to read fonts have been proven to exert System 2 thinking and in the third test, the amount of sugar was doubled in the lemonade but the fonts were kept the same.</p> <p><b>Results</b> Data was analyzed using 3 statistical methods # comparison of mean scaled scores, chi square tests and Euclidean distances. The students with glucose scored higher, and the chi square test results established with 97.5% to 99.9% certainty, that chance was not the factor causing the differences in scores. The Euclidean distance computations established that more glucose yielded better results, and glucose plus smaller fonts was better than glucose alone.</p> <p><b>Conclusions/Discussion</b> Based on my study, ego-depletion can indeed be compensated for by ingesting glucose or by activating System 2 thinking by using smaller fonts. This will result in higher test scores for tests that rely on System 2 critical thinking. Higher concentrations of glucose, aided by smaller fonts, can overcome ego depletion to greater extents and thus increase critical thinking ability even more.</p>	
<b>Summary Statement</b> Supplementing the brain with glucose in times of stress to enhance System 2 critical thinking.	
<b>Help Received</b> My biology teacher (also my mother) helped me with the setup at school, and my father helped me with my presentation	



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Anyu I. Silverman</b>	<b>Project Number</b> <b>S0421</b>
<b>Project Title</b> <b>The Effect of Music and Learning Genres on Exam Results</b>	
<b>Abstract</b> <b>Objectives/Goals</b> My goal was to determine whether or not exam results were affected by: a) different genres of music playing and/or b) different learning styles. <b>Methods/Materials</b> For my experiment I used a test of my creation (including questions I found online which are credited throughout my experiment), a stereo system for the music playing, and 25 students aged 15-17 enrolled in various levels of math classes. Five students were put into a room at a time and listened to a play-list of either Rap, Country, Classical, Indie/Alternative, or no music, and took the test featuring Visual, Kinesthetic, Logical, and Analytical learning styles. <b>Results</b> From their test results, I found that music had no correlation with the test results, however I also found that, when comparing all learning styles in pairs, the pairs featuring logical versus any other kind of data were statistically significant. <b>Conclusions/Discussion</b> In all, I found that my results did not support my hypothesis that the music with the steadiest tempo and soothing melody would positively support all styles of learning, and, as a result, test scores. They did, however, enable me to find that music doesn't affect exam result. When paired with logical learning analytical, kinesthetic, and visual learning, become significant. This allows us to acknowledge that when students do their homework while listening to music, parents should not be alarmed, as it doesn't affect their work.	
<b>Summary Statement</b> My experiment focuses on determining whether or not various musical genres of different tempos and/or different styles of learning affect the exam results of high school students.	
<b>Help Received</b> During my project, I was assisted by a Social Studies teacher by using his room for my trials.	



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Olivia D. Songster</b>	<b>Project Number</b> <b>S0422</b>
<b>Project Title</b> <b>The Placebo Effect: Caffeinated vs. Decaffeinated Coffee</b>	
<b>Abstract</b> <b>Objectives/Goals</b> Human subjects will show physical and mental signs of caffeine use regardless of the caffeine content of their beverages. They should feel "better" emotionally and physically, have an increase in blood pressure, and be more focused by the end of two testing periods. <b>Methods/Materials</b> This experiment required caffeinated coffee, decaffeinated coffee, the Operation! board game, and a blood pressure cuff. The subjects (20) took a series of tests before and after drinking a cup of coffee. Their blood pressure was recorded every 15 minutes. The test was performed twice per subject on separate days. <b>Results</b> The majority of the data trends increased steadily until the 30 and 45 minute marks, when they either stayed the same or decreased. The drawings from the subjects show that there was a general loss of focus around 30-45 minutes in; this focus was regained for the last round of tests. This experiment was performed such that all of the subjects did the tests at once and were given the opportunity to openly discuss how they were feeling with each other. If someone who had caffeinated started to show signs of the caffeine, such as more flushed cheeks or a slight headache [in some cases], before long, the subjects who had decaffeinated stated they had the same symptoms. <b>Conclusions/Discussion</b> Looking at the results of this experiment, it's clear to see that drinking decaffeinated and caffeinated coffee can yield similar results. The decaffeinated averages of how each subject felt and looked deeply resembled the caffeinated averages; however, they weren't exactly identical. In terms of blood pressure averages, the decaffeinated averages generally followed their own patterns separate from the caffeinated averages. The Placebo Effect played a significant role in this experiment. The subjects were not aware of the fact that they were given decaffeinated coffee until all of the data had been collected; ergo, they must have subconsciously convinced themselves that drinking [perceived caffeinated] coffee would make them feel happier and more energetic.	
<b>Summary Statement</b> In an effort to understand the placebo effect, subjects were monitored after drinking decaffeinated coffee that they thought contained caffeine..	
<b>Help Received</b> Used classroom space at Technology High School under the supervision of Dr. Joseph Immel	



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> Alexandra N. Vredenburgh	<b>Project Number</b> <b>S0423</b>
<b>Project Title</b> <b>Adolescent Mental Health: What Sleep Related Factors Contribute to Depression and Anxiety?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> People's perceptions can affect their health. For example, perceptions about pain can affect how much pain someone feels. Only 7.6% of teens get the needed 9 to 10 hours of sleep, according to Centers for Disease control and Prevention. The average high school starts at 7:30. The goal of this study evaluates whether perceptions and self-reported measures of sleep can help explain the variance in levels of adolescent depression and anxiety.</p> <p><b>Methods/Materials</b> There were 160 participants: 62 (39%) males, and 98 (61%) females. They ranged in age from 14-17, and 9th through 12th grade. Participants were all students at a public High School in Vista, California that starts at 7:30 a.m. Participants completed a 3-part questionnaire. The first part included 22-items developed for this study that assessed their sleep habits and perceptions. Participants also completed an Anxiety scale (AFARS) and a Depression scale (CES-DC; both used with permission). Multiple regression analyses were used to determine whether different aspects of sleep predict depression and anxiety.</p> <p><b>Results</b> The overall depression model was significant (<math>F(10,132)=7.581, p &lt; .01. R^2=.365, \text{adjusted } R^2=.317</math>). The overall anxiety model was also significant (<math>F(7,138)=9.892, p &lt; .01. R^2=.334, \text{adjusted } R^2=.300</math>). Preferred school start time was a significant predictor of depression, and often being tired at school predicted anxiety (<math>B = .182, p &lt; .05</math>). Additional sleep-related factors were also significant predictors of depression: staying up worrying (<math>B = .242, p &lt; .05</math>); remembering your dreams (<math>B = .161, p &lt; .04</math>) and taking sleeping medications (<math>B = .246, p &lt; .01</math>). While the school start time predicted depression (<math>B = .156, p &lt; .05</math>), it was not a significant predictor of anxiety (<math>p &gt; .05</math>).</p> <p><b>Conclusions/Discussion</b> While an early school start time has been found to have many negative consequences, the average high school starts at 7:30. Why does society generally refuse to offer a later start time to protect this vulnerable age group? Based on my results, I am advocating for the option to start school at 9:00, when the student's bodies are physiologically ready. We are the future. With such high levels of depression and anxiety, what does that say about our societies values? The benefits of starting school later far outweigh potential inconveniences.</p>	
<b>Summary Statement</b> This study evaluated how sleep-related perceptions explain the variance in depression and anxiety scores.	
<b>Help Received</b> Michael Kalsher, Rensselaer Polytechnic Institute, helped me with statistics. My father let me collect data at his school where he teaches. My mom edited my report and poster.	



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Jon P. Wheeldin</b>	<b>Project Number</b> <b>S0424</b>
<b>Project Title</b> <b>Creating False Memories</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective of this experiment is to study the recollection rate of false memories using visual prompts and audio prompts as well as compare that rate between boys and girls and a variety of age groups. <b>Methods/Materials</b> I began by constructing two lists of words, each list 12 words long, each lists' words were an associate of a non-presented word. I explained to all my subjects that I would be testing audio recollection versus visual recollection since the experiment wouldn't work if they knew what I was looking for. I took each subject into a quiet room at a time, took their age and gender, and read them the first list of words. Each word was approximately 2 seconds apart. I had them repeat to me as many words as they could remember. I then showed them the second list of words with the same time interval using Microsoft Powerpoint. After reading the list back to me, I sent them out and had the next subject come in. <b>Results</b> It is necessary to understand that my experiment is ongoing. Also, I've changed certain aspects of the experiment rendering my oldest data unusable due to the change in list length. The old data showed a 40% recall rate of the non-presented word from the visual list and a 50% recall rate of the non-presented word from the audio list. My new data shows a 46% recollection rate from the visual list and a 40% recollection rate from the audio list. There was an 83% recollection rate in females and a 68% rate in males. Again, these numbers are subject to change. <b>Conclusions/Discussion</b> My current conclusion is that the recollection rate is higher if the memory was seen rather than heard and that females are more likely to have false recollections than males. However, my conclusion will change along with my results.	
<b>Summary Statement</b> My experiment tests a common phenomenon of the brain, false memories, in two scenarios and finds correlations of false memory rates between age groups and gender.	
<b>Help Received</b> None	





**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Lina Yagan</b>	<b>Project Number</b> <b>S0425</b>
<b>Project Title</b> <b>Subliminal Messages: Do They Really Work?</b>	
<b>Abstract</b> <b>Objectives/Goals</b> With this experiment, I plan on further proving the danger of subliminal messaging. I also intend to raise people's awareness of the abnormally extreme lengths advertising companies are going through to appeal to a client. If subliminal messaging can alter a person's mentality, it should be restricted severely. Otherwise, congressmen or private companies can use subliminal messages on TV shows to sway votes one way or the other. Even worse, the military can muffle outcries against war. <b>Methods/Materials</b> This experiment will be done in an empty, quiet room since the subjects must not be distracted. The Ipod will have a song recorded with an entrenched undertone that states #Orange colored M&Ms taste better than the other colors# using <a href="http://www.talkbackwards.com/">http://www.talkbackwards.com/</a> . The 20 boys and 20 girls will be divided into 2 groups of 10 boys and 10 girls each. The 1st group (control group) will not be given the recording. The 2nd group will listen to the recording with the embedded message. This particular group will listen to the song for a total of 5 times, the average number of times advertising companies place sexual references into a single song. Moreover, it may take several times for the subconscious to recognize obscure subtexts. Then, each participant will be given 20 pieces of M&Ms each. The 20 M&Ms will consist of 5 orange, 5 yellow, 5 green, and 5 blue pieces. The participants will be asked to choose 5 out of the 20 pieces given to them. <b>Results</b> The members of the 2nd group who were subjected to subliminal messages that promoted the orange colored chocolates tended to choose the orange M&Ms as opposed to the 1st group who did not receive the surreptitious music. <b>Conclusions/Discussion</b> The capabilities of subliminal messages have not been proven to a significant extent. While they have been able to demonstrate they can prime an individual's responses and stimulate mild emotional activity on certain people, the consensus among scientists and psychologists is that subliminal messages do not produce a strong, enduring effect on an individual's behavior. Nonetheless, they do influence a person to some degree which is what I have established with this experiment.	
<b>Summary Statement</b> This project evaluates the effect of subliminal messages on a person's decisions	
<b>Help Received</b> Neighbor helped me with printing	





**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Shruti Aggarwal</b>	<b>Project Number</b> <b>S0494</b>
<b>Project Title</b> <b>Effect of Construal Levels on Academic Procrastination</b>	
<b>Objectives/Goals</b> To determine whether construal levels (abstract/concrete) affect procrastination. Based on Construal-Level Theory (CLT), I hypothesized that students would perceive a longer time for an abstract or "High-level" task, as compared to a concrete or "Lower-level" task. I also hypothesized that this effect would be independent of the students' inherent tendency to procrastinate.	
<b>Abstract</b>	
<b>Methods/Materials</b> 135 high school students participated in the study to measure their tendency to procrastinate by taking a PASS test (Procrastination Assessment Scale for Students). 36 of these students filled in questionnaires designed to estimate time associated with activities at "Lower-level" construal (Objects / Concrete) -15 questions, and at "Higher-level" construal (Traits / Abstract) -15 questions. Tests were given during class. Construal tests were administered a week apart, and a week after the PASS Test. Students were split into 2 groups - A&B. Groups were counter-balanced by reversing the sequence of the questionnaires ( $p > 0.05$ , 30 values ranging from 0.0861 to 0.9986).	
<b>Results</b> PASS test data was normally distributed ( $n=129$ , $mean=19.233$ ). Students with higher scores were designated "Procrastinators (Pro)" ( $n=19$ , $mean=15.158$ , $s=2.651$ ) and those below "Non-procrastinators (Non)" ( $n=17$ , $mean=23.412$ , $s=2.763$ ). The highest endorsed reasons for procrastination were: "too many things to do" -54.3%, "too lazy to complete" -51.9%, and "overwhelmed..." -39.5%. Paired t-tests were run for each student and a significant difference was observed - Objects vs. Traits ( $p < 0.05$ , 9 values from 0.0002 to 0.0454), Concrete vs. Abstract ( $p < 0.05$ , 5 values ranging from 0.007 to 0.0496). 2 variable t-tests were applied to the Pro vs. Non, for Objects, Traits, Concrete and Abstract data. No significant difference was observed ( $p > 0.05$ , 28 values ranging from 0.0520 to 0.9543).	
<b>Conclusions/Discussion</b> My hypothesis was completely validated. The effect of construal level on temporal distance was found to be independent of the students' inherent tendency to procrastinate. Interestingly, the students estimated more time for themselves than for others. These findings allow teachers to devise methods to address procrastination by their own actions, rather than by only addressing student behavior. On abstract projects, teachers should instruct students to create shorter sub-assignments that build on one another, while regularly consulting the teacher.	
<b>Summary Statement</b> This project evaluates the effect of construal levels on temporal distance in the context of a students' inherent tendency to procrastinate.	
<b>Help Received</b> My teachers allowed me to administer the test in class. My dad helped me with the statistical analysis.	



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> Patrick Casebolt; Charley Huang	<b>Project Number</b> <b>S0495</b>
<b>Project Title</b> <b>Auditory Reception as a Factor in Cognition: A Study on Selective Attention</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objective of this experiment was to determine to what degree various auditory distractions affect concentration. Additionally, we identified factors, such as gender, academic performance, and individual study habits that might correlate with one's ability to work in an environment manipulated by selective attention. We hypothesized that a subject's efficiency would deteriorate in the presence of auditory distractions, and that the amount of deterioration would correspond to that individual's typical work environment. For example, we would expect a subject who normally studies in a distracting environment to have a lesser decline in score in the presence of auditory variables during experimental testing. <b>Methods/Materials</b> A sample of 32 subjects, grades 9-12, participated in experimentation. To test our hypothesis, we developed surveys collecting information about individual study habits, specified based on a five point Likert scale, as well as a three part series of parallel tests that required completion of several simple math equations. The first section (A) was our control, which subjects completed in an environment free of auditory manipulation. The second (B) required subjects to complete the math problems, while simultaneously counting beeps, played intermittently into the subjects ear. The third (C) was conducted in the same fashion as the second, but with classical music played in the background. Subjects wore noise cancelling headphones to ensure a fully controlled environment. <b>Results</b> On average, we observed a 33 percent decline in performance once auditory variables were played in a subject's ear. Additionally, participants who studied more often in distractive environments had a less dramatic decrease in score from tests A to B than those who studied in quiet environments. We also determined a strong correlation between GPA and typical study environment of the subjects. Students with higher GPAs also tended to study in quiet environments, suggesting that academics can be affected by studying in distractive environments. <b>Conclusions/Discussion</b> Working in a distractive environment is not conducive to efficiency, and can even be linked to a decline in academic performance. Turning off the music and logging out of facebook while studying can have a substantial, positive effect on one's performance in school.	
<b>Summary Statement</b> This project examines factors, such as academic performance and individual study habits, that may correlate with the ability to concentrate in a distractive environment.	
<b>Help Received</b> Parents paid for supplies	



CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY

<b>Name(s)</b> <b>Radhika Rhea Sahai</b>	<b>Project Number</b> <b>S0496</b>
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**Project Title**  
**Comparing the Gender Differences in REM Sleep and the Possible Implications in Neurological Disease**

**Abstract**

**Objectives/Goals**  
Dreaming has fascinated us all over the ages. Dreaming occurs during REM (rapid eye movement) phase of sleep. There are some neurological diseases which are caused/intensified by a lack or surplus of REM sleep. There are differences in sleeping patterns, brain activity and potential neurological disease between the genders. This study aims to recognize the affect that gender has on REM sleep.

**Methods/Materials**  
polysomnographic studies were conducted on 214 patients, 162 male and 52 female were examined for REM duration, BMI, age, and presence or absence of sleep apnea. Patients were divided into 4 groups based on severity of apnea. Data in each group was analyzed by calculating mean and t-test and  $p < 0.05$  considered significant.

**Results**  
men averaged higher time in REM (51.3 min) however they averaged younger age (38.5) and lower BMI (30.5). Women averaged shorter time in REM Sleep (31.7 min); however they averaged older ages (50 years) and higher BMIs (32.5). The difference between REM duration between men and women was statistically significant (probability  $< .05$ ).

Type	REM Sleep Duration	Probability Values
Male No Apnea Avg.	54.3 minutes	.0419 significantly different from females
Female No Apnea Avg.	31.9 minutes	
Male Mild Apnea Avg.	59.2 minutes	.0002 significantly different from females
Female Mild Apnea Avg.	30.2 minutes	
Male Moderate Apnea Avg.	55.2 minutes	.0183 significantly different from females
Female Moderate Apnea Avg.	28.3 minutes	
Male Severe Apnea Avg.	30.6 minutes	.1662 not significantly different from females
Female Severe Apnea Avg.	1.9 minutes	

**Conclusions/Discussion**  
My hypothesis was correct: There are differences in REM sleep duration between the genders. If we can fully understand the brain chemical changes during REM, we could approach treating neurological diseases differently. Not only can this experiment be useful in approaching disorders, brain development, and diseases, but it can also be useful in determining our evolutionary development. Dreaming has been expressed in the history of mankind and its evolutionary purpose is still unknown. Exploration of REM sleep can help us discover our evolutionary past and predict our future.

**Summary Statement**  
My project is a retrospective study on the gender differences in REM sleep duration in patients with varying severities of sleep apnea and the possible implications in neurological disease.

**Help Received**  
sleep technician taught me how to identify sleep stages and conduct polysomnographs; Dr. Varma at Trika Medical allowed me to work in the lab and collect data from reports.



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<b>Name(s)</b> <b>Jennifer Nguyen; Apoorva Panse; Amy Xu</b>	<b>Project Number</b> <b>S0497</b>
<b>Project Title</b> <b>Cognitive Neuroscience: The Effects of Numeric and Language Auditory Stimuli on Arithmetic Responses of the Brain</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> This experiment is designed to analyze the effects of numeric and language audio on responses of the brain regarding arithmetic cognitive functions. Hypothesis: If students are exposed to audio (numeric/language) containing the same subject material as the test given, then students' test scores will be lower than if exposed to a dissimilar audio and test.</p> <p><b>Methods/Materials</b> Students were given standardized arithmetic tests to assess their performance when simultaneously challenged with varying audio. We conducted 427 tests altogether, exposing a relatively equal number of students to no audio, arithmetic audio, and language audio. The arithmetic test consisted of ten problems, five that required calculations and five that required comparison. Students were given five minutes to complete the test.</p> <p><b>Results</b> The control group had a mean of 8.51007 questions correct, the language group 8.0741, and the arithmetic group 7.84615. The means for the control group's calculation scores and comparison scores were 3.85906 and 4.65101 respectively, numeric 3.41258 and 4.42657, and language 3.74074 and 4.33000.</p> <p><b>Conclusions/Discussion</b> After analyzing the data, we found that the students who were exposed to audio containing the same subject material as the test scored the lowest on average. In order to compare the mean scores, we ran a one-way ANOVA test, finding a p-value of .0000176. This caused us to reject the null hypothesis and conclude that the means were not equal. The differences in test performance for each audio can be attributed to the dissimilar regions of the brain that control the functions. While the parietal lobe and the corpus callosum are largely responsible for arithmetic functions, Geschwind's territory, Broca's area, and Wernicke's area are accredited with language abilities. We also found that students scored higher on the comparison problems than on the calculation problems across each auditory stimulus. This phenomenon can be explained by the dependence of calculations on the regions associated with language, while comparison tasks rely on nonverbal brain networks. Thus, the latter is not as affected by auditory distractions, yielding higher scores. Based on the results, our hypothesis correct.</p>	
<b>Summary Statement</b> This experiment was designed to determine the effects of different audio (numeric, language, or silence) on arithmetic brain responses through the conduction of tests and statistical analysis.	
<b>Help Received</b> Mrs. Hampton helped guide us throughout the duration of the experiment and kept us on track.	



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2013 PROJECT SUMMARY**

<b>Name(s)</b> <b>Hondo G. Gonzalez</b>	<b>Project Number</b> <b>S0498</b>
<b>Project Title</b> <b>A Relationship between Teacher Gender and an Increased Achievement of Female Students in Secondary Science</b>	
<b>Abstract</b> <b>Objectives/Goals</b> To determine if there is a relationship between teacher gender and the achievement of female students in secondary science. <b>Methods/Materials</b> My hypothesis states that female students in the 8th grade will show a higher achievement in science when compared to the males when instructed by a female teacher. My hypothesis will be proven by looking at the difference between males and females average test scores in the 8th grade CST (California Standardized Test) for the 2011-2012 school year. Initially I analyzed the science CST scores for all of the counties in the state of California, and female students on average scored 3% below male students. I then picked one of the large counties in the state of California. I identified the science CST scores of the students by gender. I looked at all 85 middle schools in that county. I asked each school for the gender of the science teachers for the 2011-2012 school year. I then grouped the schools into five categories: only male teachers; only female teachers; both male and female; male and female; majority male; male and female, majority female. <b>Results</b> My hypothesis was supported by this experiment. The data shows that 8th grade female students will score better on the 8th grade science CST if they had a female teacher. If 8th grade science students were enrolled in a school with only male 8th grade science teachers, females on average will score 10% below the male students. If students were enrolled in a school with a majority of male 8th grade science teachers then the average score dropped where 6% of female students scored below the male students. Schools that had an even number of male and female teachers had females scoring 5% below the males. In schools with all female teachers, female students were scoring below males by 3%. When a majority of the teachers were female, females students scored only 1% below the male students. <b>Conclusions/Discussion</b> The data shows that there is a relationship between the female achievement scores on the 8th grade science CST scores and the gender of the teacher. Is it possible that female science teachers are able to explain physics concepts to female students in such a way that if the female student does not have the back ground information from childhood experiences, the female student is now able to reason through the test questions? Does having a male teacher to collaberate with enhance the females teaching?	
<b>Summary Statement</b> To determine if there is a relationship between teacher gender and the achievement of female students in secondary science.	
<b>Help Received</b>	



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<b>Name(s)</b> <b>Amir S. Kelly</b>	<b>Project Number</b> <b>S0499</b>
<b>Project Title</b> <b>I Think I Can</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of my project is to understand the effect of encouragement on the vocal range and sustenance on a single note, so singers and vocal instructors everywhere, can understand whether or not verbal encouragement can help their voice, have no effect on the voice at all, or in a way hurt their voice.</p> <p><b>Methods/Materials</b> To conduct my scientific experiment, I tested the amount of notes the volunteer could sing, and the amount of seconds each singer could sustain a note as my control. For the actual experiment, I gave each singer 4 preselected phrases of verbal encouragement while testing the range once again. Before they started sustaining the note, I gave them each a selected #pep talk#, and I encouraged them with three selected phrases of encouragements.</p> <p><b>Results</b> I compared the amount of half notes with no encouragement to the amount of half notes the singer could sing with encouragement, and the seconds each singer could sustain a note with and without encouragements. My hypothesis was proven correct, I realized that with the verbal encouragement and boost of the singer's self-esteem, the singer was able to achieve a larger range, and was also able to sustain a note longer than before.</p> <p><b>Conclusions/Discussion</b> Overall, this project helped me understand the effect of verbal encouragement on the overall ability of a singer, and as a singer and aspiring vocal instructor, it informed me that a simple word of verbal encouragement can go a long way.</p>	
<b>Summary Statement</b> My project is about the effect of verbal encouragement upon the vocal range and sustenance of a single note.	
<b>Help Received</b> Hannah Geiger helped assure that project was properly controlled.	