JUNIOR PROJECTS

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Junior Project 1
European School of Bergen
Sophie-Jaya Boots, Maria Urcola

The Closure on Screen Exposure

Abstract

The objective of this experiment is to highlight the impact of how screen exposure affects the quality of sleep.

The experiment included two groups: 5 adults and 7 teenagers. Each group had to experience 3 sleeps with screen time and 3 without for 1,5 hours before falling asleep. To understand how the body reacts, the adults were also asked to wear a Muse Brain Sensing Device to measure their brain waves, heart rate, and body movement - before and after sleep. The data was collected and analysed to provide insight into how the participants were affected by screen exposure.

Results amongst the teenage participants indicated that most received better sleep without screen time. Scientific studies have proven that electronic devices emit blue light waves which keep you awake. The blue light restrains the production of melatonin which controls your circadian rhythm. This alters the sleep cycle and makes it difficult to fall asleep at night.

The findings amongst the adult participants also confirmed this. We were able to recognise that theta and alpha brain waves were predominant whilst not exposed (Figure 2A & 2B). A valid reason could be that the mind is more at ease and calmer when not kept alert by blue light waves. Tukey's HSD test for multiple comparisons found that the degree of relaxation was significantly higher at night when volunteers were not exposed to a screen.

These results may support the idea that melatonin production is restrained when using blue light before sleep, making falling asleep more difficult.

Junior Project 2
European School of Bergen
Eirini Georgopoulou, Maria Kyratsis, Stella Tentzou

Is the 5-second rule a myth after all?

Abstract

The idea behind the *5-second rule* is that food dropped on the ground and picked up in less than 5 seconds is safe to eat. The project was looking to determine if the *5-second rule* is a myth and what factors contribute to this. The experiment was combined with a survey of all S3E students to test their knowledge of the rule and how this affects their choices. Different surfaces (table, corridor floor, carpeted floor, ground of gravel and ground of grass) were tested using dry (biscuit) or wet (kiwi) food samples that were dropped on each surface for 4 seconds and 1 minute. Samples were taken using 5mm sterile paper discs and inoculated onto Agar plates. After three days in the incubator at 37 ℃ degrees, any microbial growth was observed and measured using the ImageJ program. Analysis using one-way ANOVA and Tukey test showed statistically significant differences among test groups. Our overall results indicate no clear-cut answer to whether the 5-second rule is a myth. How often the surface is cleaned, and the type of food (wet or dry) did affect the number of microbes transferred to the food somehow. The cleanest surface was the desk, and carpet ($p<0.01$), gravel ($p<0.01$) and grass were the dirtiest. On average, food was more contaminated when wet and in contact with more contaminated surfaces. Except for the desk group, food samples in contact with the surface for a longer time (1 min) did show more microbial growth. The use of disinfectant solutions on desks may be a factor in reducing the microbial growth observed ($p<0.01$). The results show us that the transfer of microbes is unpredictable and linked with the class survey results, this well-known rule is not valid in all situations, and people should make their own judgement.

Junior Project 3
European School of Bergen
Sofia Clarke Cozar, Mathilda Lührs, Mayya Stetsenko

How energy drinks affect your body

Abstract

This study examined the effects of energy drinks on human blood pressure and brain activity. We collected data from a blood pressure monitor and an EEG headband for electroencephalography, the Muse Monitor. After the data analysis using the Mind Monitor app, we could study the reading of different brain waves (alpha, beta, delta, theta, and gamma) that represent calmness, consciousness, relaxation, and tiredness to help us get a more accurate reading of our body changes after an energy drink intake. We asked ten participants if they would like to take part in our experiment by drinking different types of energy drinks, and then later, after 45 minutes, we recorded their brain waves and blood pressure. Our aim was to find how we could identify the worst type of energy drinks and how harmful they are to our body. Red bull was the most effective for adults, whereas AH e-energy drink was for teenagers, particularly females, with an increase in numbers from both blood pressure and brain waves. These effects may result in hyperactivity, decreasing mood, decreased academic performance, and reducing blood flow to the brain, making you feel dizzy and exhausted. The regular consumption of energy drinks will affect the cardiovascular system and brain activity, leaving you physically and emotionally drained.

Junior Project 4

European School of Bruxelles 1 / Uccle
Helena Domańska

Does the amount of fluoride in toothpaste have an impact on bacterial growth?

Abstract

Which ingredient in toothpaste eliminates the bacteria and does the amount of it have a significant impact on the microbial augmentation?

The preparation of the experiment started with research. I have found out that the ingredient responsible for the teeth enamel is fluoride. With that information I could start my hunt for petri dishes and toothpaste. I have settled on three toothpastes, each with a different ppm (parts per million, sometimes mg/L) of fluoride starting at 0 ppm moving to 1000 ppm and finishing on 1450 ppm. Afterwards, I prepared a lot of bacterial feed using broth from beef bones and gelatine. Meanwhile I have sterilised the dishes using heat (180°C, 30 minutes in the over). Then the laboratory glass filled with the broth was separated into 3 groups of 3. Saliva samples were taken based on this simple chart:

*Toothpaste 1 is 1450 ppm, toothpaste 2 is 0 ppm, toothpaste 3 is 1000 ppm

The process was repeated 5 times which gave 5 series at the end. I compared the photos of every series with a corresponding control sample taken on a base of a similar chart.

Junior Project 5
European School of Bruxelles 1 / Uccle
Fourestié Nicolas, Nero Gabriel,

L’hydrogène le gaz du futur ?

Abstract

Le réchauffement climatique, causé par l’émission de gaz produits par l’activité humaine est un problème à l’échelle de la planète et menace la vie sur Terre. Nous avons réfléchi à une solution qui n’émet pas de gaz carbonique, et limite donc le réchauffement : l’hydrogène, que nous allons vous exposer.

Nous vous présenterons ce qu’est l’hydrogène, sa production, ses utilisations, ses avantages majeurs et ses inconvénients. L’hydrogène est un gaz très pratique présentant beaucoup d’avantages comme le fait qu’il ne rejette que de la vapeur d’eau quand il est brûlé. Nous présenterons les méthodes de production de l’hydrogène et ses utilisations possibles, par exemple, dans les moteurs de voitures. Pour illustrer la présentation, nous avons réalisé une expérience en créant de l’hydrogène et en montrant son inflammabilité avec une explosion. Nous avons effectué des recherches et des opérations sur les quantités nécessaires pour sa production et sa consommation. L’hydrogène est une bonne alternative aux carburants fossiles, mais les techniques permettant son usage devront être améliorées dans le futur pour de meilleures performances et un coût plus faible.

Junior Project 6

European School of Bruxelles 2 / Woluwé
Justė Ilevičiūtė, Gintarė Skruodytė, Rūtilė Senkutė

The acidic impact for the thickening of agar

Abstract

Our project aimed to see if the acid affects the thickening of agar. We reached it by making jelly from different fruits/vegetable juices with various pH and analyzed the differences. As a thickener we used agar. For a wider pH scale, we chose different fruits/vegetables - lemon, mandarin, tomato, kiwi, pomegranate, cucumber, and distilled water as a control sample. We squeezed 100 ml of their juice and measured the pH. After that, we poured 1 g of agar into each liquid. Once we were done, we boiled the liquids until the agar has been dissolved and let them rest until they cooled off. After a while, we poured the solutions into ice cube trays and left them in the fridge for a couple of hours. We repeated this experiment four times and the results were quite similar every time. We find out that acid does influence the thickening of agar because the more acidic the mixture (lower pH), the less stable and less thickened jelly was. These results may have a practical application in the food industry. For example, using agar and fruits could be made into gummies, which could be served at schools as a healthy snack.

Junior Project 7
European School of Bruxelles 2 / Woluwé
Lukas Kisielius, Tautvydas Taraškevičius, Rokas Paulius Biekša

Colour experiment

Abstract

Our experiment aimed to find out if people react differently to different colour posters when asked to follow some instructions. We prepared four posters of four different colours: red, white, green and blue, asking passersby in a public place to give a high five on a poster. We used one colour poster per session and compared results after all sessions. Our data suggest that people follow the poster's instructions to act most when the poster is white and least when it is red. There are also some interesting observations as regards the gender and age of participants. First, twice as many women as men follow the poster's instructions to take action, and it does not depend on the colour of the poster. Second, it is mostly young people that follow the poster's instructions, and age does not vary concerning the colour of the poster. These results may have a wide practical application in social contexts. One recommendation is to use a white background, as the colour generates the most engagement when creating a poster, a banner or another visual calling for action. For example, a sign encouraging to wash hands at school should preferably be white. If a different colour is chosen, it should not be read as red is more effective to discourage action. Moreover, it can be expected that more women than men would follow the poster's instructions.

Junior Project 8

European School of Bruxelles 4 / Laecken
Ines Idrissi, Klara Letroye

L'influence de la provenance de l'eau sur la croissance d'une plante

Abstract

Nous avons choisi d'expérimenter sur des tournesols nains car ceux-ci sont des plantes à croissance rapide et ne prennent pas trop d'espace.

Les types d'eaux que nous avons sélectionnés sont : eau minérale, eau déminéralisée, eau de robinet, eau de pluie de campagne et eau de pluie de Bruxelles. En premier lieu, nous voulions observer une différence de croissance entre les plantes recevant différents minéraux en différente quantité (ex : eau minérale, eau de robinet) et celles qui n'en recevraient pas (ex : eau déminéralisée). Ensuite, nous voulions aussi observer une différence entre l'eau de pluie de campagne et l'eau de pluie de Bruxelles pour voir si la quantité de pollution exercerait une influence sur la croissance des plantes. Notre but étant de conclure quelle eau serait la plus favorable pour la croissance d'une plante.

Junior Project 9

European School of Bruxelles 4 / Laecken
Barmoshe Gabriella, Iris Foster

Generating electromagnetic energy using magnets moving over coils to power cars and streetlamps.

Abstract

For a more sustainable future it is necessary to replace fossil fuels with renewable energy. We tried to see if we could generate electricity by using electromagnetic induction to power cars or streetlights. We built a power generator to measure the amount of power generated as a function of the magnetic strength and the amount of induction coils. In our experiments, we obtained a linear correlation between the number of induction coils and the voltage measured. With a total of 6 induction coils and 8 magnets, we generated very little power, which was significantly reduced when placing a cardboard between the two layers. We demonstrated that it is possible to generate small amounts of electromagnetic energy (1 W) by the rotation of magnets over induction coils. However, to be practical on a larger scale much more energy is required. In future experiments, we will use more powerful magnets and larger induction coils to increase the amount of electrical power generated.

Junior Project 10
European School of Francfort
Christensen, Rachel, Christensen, Lauren

Insects could Vanish within a Century
Why are crickets disappearing?

Abstract

Insects are essential for ecosystems to function properly, and climate change are endangering them. According to the article “Plummeting insect numbers 'threaten collapse of nature'” (Carrington, 2019) more than 40% of insect species are declining. After reading about this worrying fact, we wondered why insects are so vulnerable to some of our conditions. The aim of this project is to find out what conditions are killing off crickets, since insect numbers are rapidly decreasing. We put 228 crickets in twelve different conditions and recorded our observations in which environments crickets thrive and suffer. The conditions that we have tested are the number of times we gave water and food to them, two different temperatures and the amount of light that they are exposed to. We did this for 60 days. The crickets kept at warm temperature with food every day had the fewest deaths, were the healthiest, most active, and the biggest. The crickets at warm temperature with food every 3 or 5 days died very quickly. All the crickets growing in cold temperature had similar results, because many of them went into diapause, so they did not eat and were not active and healthy. The light and darkness did not have a major effect on the crickets’ development. What we can see from these results is that the crickets, more specifically the species *Gyrolldes Sigallatus*, preferred the warmth and a lot of food like most insects. There are many factors which make it challenging for them to survive during climate change.

Junior Project 11

European School of Francfort
Carolina Holmes Teixeira, Agnes Samanego-Turner

How does littering biodegrade and affect our soil?

Abstract

Microplastics are an ever-growing concern that has and will affect marine life and our soil. Species in the soil, such as earthworms, are affected and die. Earthworms increase water circulation in the soil, so without them we would have parched plains of land instead of mature healthy soil.

The purpose of our experiment is to test how long it takes for our litter to biodegrade and try to understand how it affects the soil quality. In order to do this, we left plastic bags and fruit rests from our school playground and Styrofoam in small plots of soil adequately marked for around six weeks. We are monitoring these soil plots on a regular basis. After this time, we are going to assess the soil quality of the plots and compare it with litter-free soil using chemical, physical and biological indicators of soil quality.

Our hypothesis is that the quality of the soil is reduced by the number of plastics and other litter we throw on the ground.

We see littering all over the place on the streets, in schools and even thrown into gardens! This is unacceptable behaviour of course, but we are destroying our only home. Stopping littering is just one of the little things you can do to stop Climate Change. Therefore, we are doing this project to be a voice guiding and encouraging young people to act for our world we will be left with.

Junior Project 12
European School of Karlsruhe
Tesevic Gauthier Victoria, Bernard Sixtine, Ceolin Anaïs

Dosage par étalonnage de l'avobenzone : principe actif de la crème solaire.

Abstract

Nous cherchons à savoir si la crème solaire protège encore du Soleil après la date de péremption. Ceci car beaucoup de crème solaire sont jetées tous les ans. C'est l'avobenzone qui protège des rayons UV et sa quantité dans la crème doit être supérieure à 2,5 % pour protéger. Afin de déterminer la quantité d'avobenzone dans la crème solaire, nous avons effectué un dosage par étalonnage. Le dosage a été fait dans l'éthanol et pas dans l'eau car la crème solaire ne se dissout pas dans l'eau étant donné qu'elle est waterproof. Nous avons effectué le dosage de différentes crèmes solaires pour trouver la concentration en avobenzone, puis la masse d'avobenzone contenue dans l'échantillon. Enfin, nous avons calculé le pourcentage d'avobenzone dans une goutte de crème solaire. Il vient que la crème solaire vieille de 4 ans écran 50+ (2,7% d'avobenzone) protège encore. La crème vieille de 1 an écran 50+ (4,5% d'avobenzone) protège encore et protège mieux que celle de 4 ans écran 50+ (2,7% d'avobenzone). Celle qui est périmé de 1 an écran 20+ (1,7% d'avobenzone) ne protège plus car la quantité d'avobenzone est en dessous de 2,5% d'avobenzone. On remarque que la crème 50+ vieille de 4 ans protège mieux que la crème 20+ vieille de 1 an seulement.

Junior Project 13
European School of Karlsruhe
Isabella Renz, Florence Hieber, Laura Vargas Aguiló

How could plants help us sustain 3 people and 2 pets on mars ?

Abstract

Space flights or Mars missions are a fascinating prospect for our generation, and they clearly are no longer science fiction. In this project, we investigated the production of oxygen by three photosynthetic organisms: Aloe vera, the cactus Marginatocereus marginatus and the cyanobacteria Arthrospira platensis, also known as Spirulina, chosen for their ability to produce oxygen and their nutritional and health added value. To mimic the atmospheric conditions on Mars, oxygen production was measured when those organisms were placed in high carbon dioxide concentrations and allowed to photosynthesise at an intensity similar to the average Martian light. In the conditions used in this investigation, Spirulina was the best candidate for O2production: it was able to bring the atmosphere content from 5% to 21% of oxygen, an oxygen content similar to Earth's atmosphere, and above the minimum O2 content needed by humans under standard conditions. By contrast, Aloe vera and Marginatocereus marginatus only reached a maximum of 18 to 19% oxygen. Additionally, Spirulina showed a greater efficiency in O2 production when the results were standardised by the amount of biomass used. Thus, more O2 could be obtained with a lower mass of cells using Spirulina, an important parameter because of the space limitations in space travel and extraterrestrial missions. Although these results are preliminary, we present and discuss calculations to try and estimate the amount of Spirulina culture that would in theory be necessary to support us three and our two pets on Mars, and we discuss some of the many factors that remain to be investigated.

Junior Project 14
European School of Karlsruhe
Benhamid Maryam, Gillian Nathalie

Empêcher la formation de buée sur les lunettes

Abstract

La COVID-19 a force tout le monde à porter un masque. Cela cause un problème particulier aux porteurs de lunettes : Dès que l'on porte un masque avec des lunettes, de la buée se forme sur les verres ce qui entrave la vision (voir sondage en annexe). Nous voulons dans le cadre de ce travail contribuer à résoudre ce problème. Pour cela, nous devons d'abord répondre aux questions suivantes :

A Qu'est-ce que la buée ?

B Dans quelles conditions la buée se forme-t-elle sur des verres de lunettes ?

C Quelles sont les solutions existantes pour éliminer la buée ?

Après avoir répondu a ces questions, nous allons concevoir un système novateur pour éviter la formation de la buée sur les lunettes.

Junior Project 15
European School of Karlsruhe
Antonin Houdet, Nathan Miles-Obé

Le Séparateur de Déchets

Abstract

Nous en avions marre de nous tromper en triant les déchets alors on a voulu mettre au point un séparateur automatisé, une machine qui peut séparer les déchets, les plastiques, les métaux (l'aluminium aussi), le papier, les déchets bio etc.. Tous les déchets commenceront sur un tapis roulant. Les métaux seront attirés par des aimants qui déposeront les métaux sur un autre tapis roulant qui va a un sac poubelle. Ensuite, on va pulvériser de l'eau sur les autres déchets, les déchets bio deviendront lourds mais pas les plastiques. Les plastiques seront aspirés par un aspirateur et les déchets bio qui restent sur le tapis iront dans un compost.

Junior Project 16
European School of Luxembourg 1
SNITER-REVEST Emilie, THIELE Gabriel

Fast & Furious: Blob vs 5G

Abstract

Pour répondre à des besoins de transmission de données toujours croissants, les opérateurs de téléphonie sont en train de déployer une nouvelle génération de télécommunication (la 5G) sur des bandes de fréquence jusqu'ici largement inexploitées par les réseaux grand public (de 3 GHz à 30 GHz, voire 90 GHz dans le futur).

Comme certains rayonnements (notamment les rayons gamma et rayons X) sont nocifs pour la santé, de nombreux mouvements citoyens ont vu le jour pour questionner les conséquences sanitaires d'une exposition croissante aux ondes, et notamment du déploiement de la 5G. Les impacts sur la santé humaine pourraient être soit directs si ces ondes provoquaient des maladies sur l'homme, soit indirects si elles exerçaient une influence négative sur un élément important de l'écosystème.

Dans ce contexte, nous avons cherché à déterminer si l'exposition à des ondes électromagnétiques de différentes fréquences pouvait être nocive sur Physarum Polycephalum, plus communément appelé « blob ».

Ni animal, ni plante, ni champignon, le blob est un curieux être rampant composé d'une unique cellule géante. Bien que dépourvu de cerveau, il possède d'incroyables capacités et il est capable d'apprendre de ses expériences. Et plus surprenant encore, il peut transmettre ses apprentissages à un congénère en fusionnant avec lui.

Le blob est un organisme clé des écosystèmes dans lesquels il vit : véritable recycleur, il minéralise la matière organique. C'est-à-dire qu'il se nourrit de bactéries et de champignons et qu'il rejette des minéraux, qui permettent alors l'enrichissement des sols et la croissance des végétaux.

Si les ondes électromagnétiques influaient sur cet être « quasi immortel », les conséquences pourraient être dramatiques pour l'espèce humaine puisque son écosystème en serait modifié

Junior Project 17
European School of Luxembourg 2
Margherita Cardini, Rebecca Kranjec, Giulia Viaggi

MASK MISSION

Abstract

Pendant la crise sanitaire liée à la COVID-19 nous avons été obligé d'utiliser des masques chirurgicaux afin de nous protéger contre ce virus. L'utilisation des masques est donc devenue une nécessité et une partie de notre quotidien.

Chacun de nous devrez utiliser 2 masques par jour.Pour une famille de quatre personnes ça représente 8 masques par jour, 56 masques par semaine, 240 masques par mois, 2880 masques par an. Ces chiffres représentent une source de pollution énorme pour la planète si on considère qu'on est 8 millions d´individus sur terre[1] à utiliser des masques chaque jour.

Notre projet mise à la réutilisation de ces masques pour réduire leur impact sur l'environnement en les recyclant pour la construction d'une serre à plantes.

Junior Project 18
European School of Luxembourg 2
BROOM Nicolo

Robot fish attracting metal with magnets in the sea

Abstract

Our mission is to save the planet for the future. We focused on metal trash because it's an important resource. If it can recycle it new metal doesn't need to be processed which prevents carbon emissions. When metal decomposes in the ocean, it poisons fish.

Our hypothesis is that a robotic fish can attract metal in the water. Our expectations were that it attracts about 5-10 items and still swim straight.

Junior Project 19

European School of Luxembourg 2
Clémentine SAMSON ZILLIOX

Pourquoi l'acidification des océans est un problème majeur pour le phytoplancton et donc pour la vie sur Terre ?

Abstract

De très nombreuses publications [1] rapportent que les océans s'acidifient, du fait de l'augmentation de la teneur en CO_2 de l'atmosphère. J'ai voulu m'intéresser aux conséquences de cette acidification sur le phytoplancton [5] qui joue un rôle crucial à la fois pour l'ensemble des écosystèmes marins en étant à la base de leur chaîne alimentaire [2], mais aussi plus généralement pour l'ensemble de la planète en produisant plus de 50% de l'oxygène que tous les êtres vivants respirent [3]. Enfin, le phytoplancton joue un rôle particulièrement important dans la séquestration à long terme du carbone atmosphérique.

J'ai cherché à démontrer la relation entre l'acidité du milieu et la présence ou la croissance de phytoplancton, en milieu naturel marin et en conditions artificielles. J'ai tout d'abord mesuré à différents espaces maritimes le pH de l'eau de mer et estimé la quantité de phytoplancton présente à l'aide d'un disque de Secchi [4]. En laboratoire, j'ai ensuite mesuré la variation du pH de l'eau en fonction de sa teneur en CO_2, et évalué la variation de la croissance de l'espèce de phytoplancton nannochloropsis en fonction du pH.

Les résultats que j'ai obtenus en milieu naturel n'ont pas permis de démontrer, de façon scientifiquement recevable, l'existence d'une relation directe entre le pH de l'eau de mer et la quantité de phytoplancton. Mes expériences en conditions artificielles ne m'ont pas non plus permis de démontrer l'existence d'une relation directe entre l'émission de CO_2 humaine et la croissance du phytoplancton. Toutefois nous pouvons tirer une conclusion de mes expériences : si nous n'arrêtons pas de produire du CO_2, nous risquons d'anéantir le phytoplancton et par conséquence manquer d'oxygène et anéantir toute la faune et la flore marine et dépendante de la faune et la flore marine, mais aussi d'accélérer le changement climatique par arrêt du stockage de CO_2 dans les océans par le phytoplancton.

Par ma participation à l'ESSS 2022, je voulais également enrichir mes connaissances scientifiques sur l'acidification des océans et m'exercer à la démarche scientifique. Grâce à ce projet, j'ai pu m'entraîner à la démarche scientifique : j'ai pu apprendre à définir une question de recherche, à mettre en œuvre en milieu naturel et en laboratoire des expériences, à présenter mes résultats sous forme de tableau et de graphique et à m'exercer à discuter des résultats en en présentant les limites.

Junior Project 20
European School of Parme
Saisha Harrington, Jasper Sclep, Nola Olieslagers

pour la paresse du cycliste

Abstract

Comme beaucoup de personnes, le vélo fait partie de notre vie quotidienne, et nous avons décidé de vérifier si c'est possible d'accélérer une roue avec des aimants permanents. Le concept était d'avoir un motif d'aimants sur notre roue prototype, et d'y approcher et éloigner un aimant pour la faire tourner. Puis faire des tests avec ceci et en tirer des conclusions.

Après avoir effectué les recherches nécessaires, nous avons construit un support pour la roue avec des LEGO® Technic™ pour qu'elle puisse tourner librement. Ensuite nous avons testé la faisabilité de notre projet, consistant à savoir si c'est possible de faire tourner la roue en bougeant l'aimant extérieur par nous-même. Une fois qu'on a pu constater que c'était possible, nous avons fabriqué un mécanisme pour que l'aimant extérieur puisse s'approcher et s'éloigner sans notre aide de façon régulière. Pour ceci on a dû passer du mouvement circulaire de la roue en mouvement linéaire en utilisant toujours du LEGO® Technic™.

On a fait différents tests. Après avoir donné à chaque fois une poussée standardisée avec des élastiques, nous avons compté combien de tours la roue réussissait à faire sans mécanisme attaché, puis avec le mécanisme et les aimants pour pouvoir constater les éventuels changements.
Nous avons essayé trois motifs d'aimants différents sur la roue : un aimant, deux aimants côte à côte, et plusieurs aimants formant un «V». Pour changer la force magnétique des aimants sur la roue, nous avons changé le nombre d'aimants empilés l'un sur l'autre de ceux-ci, et avons compté les tours de la roue à chaque changement. Nous avons gradué notre roue avec des points coloriés pour pouvoir compter les tours avec plus de précision.

Ce que nous avons constaté après nos premiers essais est que notre mécanisme nous fait perdre beaucoup de vitesse. Ceci est dû à plusieurs facteurs : son poids, le frottement entre les différentes parties de Lego, les blocs de Lego non adaptés pour certains cas. En outre, un facteur supplémentaire est que l'aimant extérieur descendait juste une fois par tour. Pour ce dernier, on n'avait pas encore réussi à trouver un moyen pour faire descendre l'aimant extérieur deux fois par tour, comme on a pu le réaliser manuellement lors de nos tests d'étude de faisabilité. A la date de rédaction de ce rapport, on pense savoir maintenant comment faire et voulons tenter notre chance.

Pour le moment, en nous basant sur les premiers résultats de nos tests, on voit qu'il est possible d'accélérer une roue avec des aimants permanents mais la vitesse gagnée par ceux-ci est largement inférieure à celle qui est perdue par le mécanisme nécessaire à faire bouger l'aimant extérieur. Ainsi, utiliser des aimants permanents pour accélérer la roue de vélo n'est pas efficace.

Junior Project 21
European School of Parme
Pietro Ferretti, Carlo Bettocchi

The brain and the optical illusion

Abstract

The human brain has different stages of maturation, which change according to the age. In particular, different brain regions develop over time (from 5 to 20 years old).
Our research aims to investigate the relationship between the visual perception of the optical illusions and the different cerebral maturation.
Our project consists in creating a closed question questionnaire based on 8 different optical illusions, 4 for each main category.
The questionnaire will be submitted to 4 groups as following. The first three groups, are identified in the three sections of the European school. For group 4 will be used a sample of university students.
Group 1: Sample 7 years at the very beginning of the SYNAPTOGENESIS;
Group 2: Sample 12/13 years at the end of the SYNAPTOGENESIS;
Group 3: Sample 15/16 years at the PRUNING phase and pre-frontal cortex formation;
Group 4: Sample 20/21 years Brain at the MYELINIZATION phase - complete formation of the prefrontal cortex.
The method also involves the recording of 4 EEGs (chosen at the ends of the 4 samples) while viewing the images. Perception is the process, by which the brain elaborates visual data, so we would like to see the brain process it. EEG, will be performed to see the stress given to the brain.
Data collection will take place through:
The answers to the questionnaire;
The EEGs
The data will be collected and processed within the same group and among groups, to define if there is a relationship between the visual perception and the age (the different cerebral maturation) and additionally if gender diversity is present.

Junior Project 22
European School of Tallinn
Klim Stepanenko

Qualitative Study on student's academic progress with the consideration of their social interactions and after-school activities

Abstract

The interest in studying the correlation of students' social relations with their learning achievements has attracted increasing attention of researchers in recent years. This project is dedicated to the study of the impact of social relationships factors on student academic performance. The research focuses on how the students' social life, hobbies, personal issues, and school atmosphere support their learning. The data for the research is collected using a combination of systematic literature review and qualitative analysis of an online survey for secondary level students. Based on the review of publications selected for the research, the questionnaire for an online student survey has been developed. The answers of 33 secondary level students of Tallinn European School, who participated in the survey anonymously, have been taken for the analysis. The data obtained make it possible to correlate the results of the literature review stage with the outcomes of qualitative analysis and form recommendations for students on improving their learning strategies taking into consideration the social factors influencing student life. The findings of the study can be used to better understand how to optimize the learning environment and improve the academic performance of high school students. It could also help to predict what kind of social interactions and after-school activities would prevent hindering student academic performance.

Junior Project 23

European School of Varese
Sofia Baj, Maja Stepniak, Judy Abdelhamid

The water lift

Abstract

We created this project based on the principle of communicating vessels. The principle states that when you connect two communicating recipients with different amounts of water, they will automatically reach the same level. This is because of the homogenous air pressure on top of each water body.

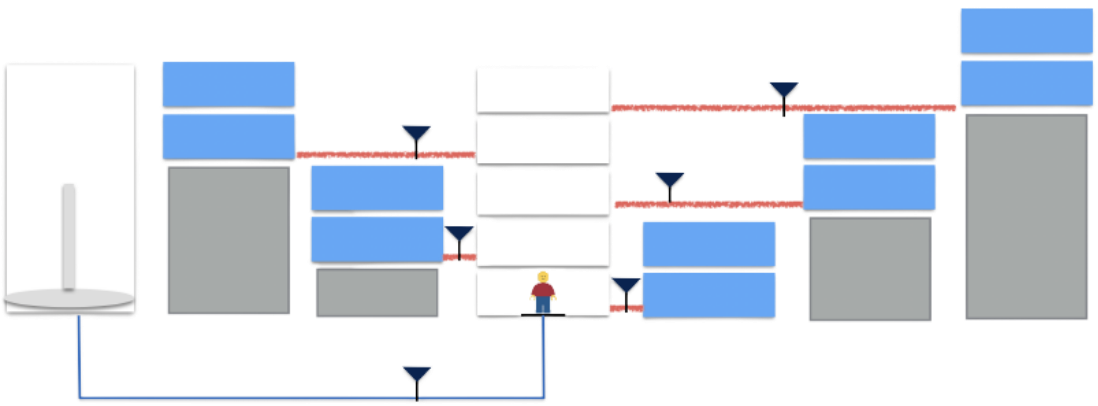
For this project, we used six plastic bottles, rubber tubes, Lego stands of different heights, plastic platforms, clothespins, a syringe, and a Lego figure.

We prepared the experiment by cutting the plastic bottles and placing them on the Lego stands next to the syringe. Then, we connected the bottles and the syringe with rubber tubes and placed the Lego figure on a plastic platform in the main bottle. Lastly, we blocked the tubes with clothespins and poured water into the five bottles.

To carry out the experiment we took the clothespins away one by one. The water “travels” to the main bottle and the Lego figure on the platform rises. Between each step, we closed the tubes again.

The second part of the experiment is to make the water go back down. To do that, we pulled the water from the main bottle into the syringe. The Lego figure descends.

We also wanted to increase the level of water again, so we pushed the water back into the bottle. There are two outcomes, depending on the state of the tubes: if they are closed, the water will only raise in the main bottle, if they are open, the water will go into all the bottles.



Junior Project 24
European School of Varese
Beatrice Perucchetti, Gaia Pisoni, Eleonora Zanovello

The effect of external stimuli on student concentration

Abstract

This project tested the concentration of school students when completing a logics test while being exposed to various external stimuli. The three types of stimuli used are: cold temperature, intermittent and colorful lights, high-volume audio with distracting sounds. A control group was also used, testing the students with the same logics test but without stimuli to alter their concentration. Each stimulus group was composed of circa 130 students, of varying ages and nationality.

The hypothesis states that the students who were exposed to the distracting stimuli would perform poorer on the logics test compared to the control group, due to the difficulty of concentrating appropriately while distracted.

The results show that the average score does not have a significant difference between the stimulus groups and the control group.

Junior Project 25
European School of Varese
Viola Maffioli, Federica Ricciardi, Alessia Bragagna

The effects of different leavening agents on the same mixture of water and flour$

Abstract

Our project consists in the observation of the different reactions that take place when combining the same mixture of water and flour with different types of leavening agents; in addition, we aim to observe how these reactions affect not only the leavening, but also the texture, appearance, taste and smell of the loaves produced.

We have chosen six types of leavening agents with the aim to represent the widest possible spectrum of this kind of yeast: bicarbonate, instant yeast, fermented water, brewer's yeast, polish and sourdough. We observed the consistency and adaptability of these six different types of yeast applied to the same dough of flour with strength of W 190, natural water and salt.

During the preparation, leavening and baking times, we observed and recorded all the characteristics of the doughs made with the different yeasts. The observations made and the evidences recorded allowed us to design an exhaustive picture of the different leavening reactions generated by the different leavening agents, the characteristics of each of them, the results to which they lead together with the fact that, in the world of baking, timing and attention to procedures are key to achieve the desired results.

The objective of clarifying the efficiency and effectiveness of the different leavening forces selected was achieved, along with clarifying in a precise and clear way the efficacy and leavening power of the various agents used. We were also able to cross our observations with sustainability, availability and digestibility of the substances used.

Junior Project 26
European School of Varese
Dimitros Kephalopoulos, Francisco Caldeira Marchini,

The alarm pillow.

Abstract

Currently more than 1.5 billion people (nearly 20% of the global population) live with hearing loss (WHO data). The alarm pillow's purpose is to not only to not wake up people around you but also an alarm clock for deaf people who wouldn't be able to hear a regular alarm clock. The materials we used were an RC Toy Car and its controller, an alarm clock, a vibration motor, a switch, 2 CR2032 batteries, cables, Styrofoam to make a protective case, a balloon to protect the batteries, sellotape and isolating sellotape and the tools we used were a soldering iron, various screwdrivers, regular scissors and engineering scissors, pliers and a small lever. The alarm pillow works with the activation of a vibration motor on an RC Toy Car chip which occurs whenever you set the time on an alarm clock whom is connected to the RC Toy Car controller, and thus sends signals to the vibration motor.