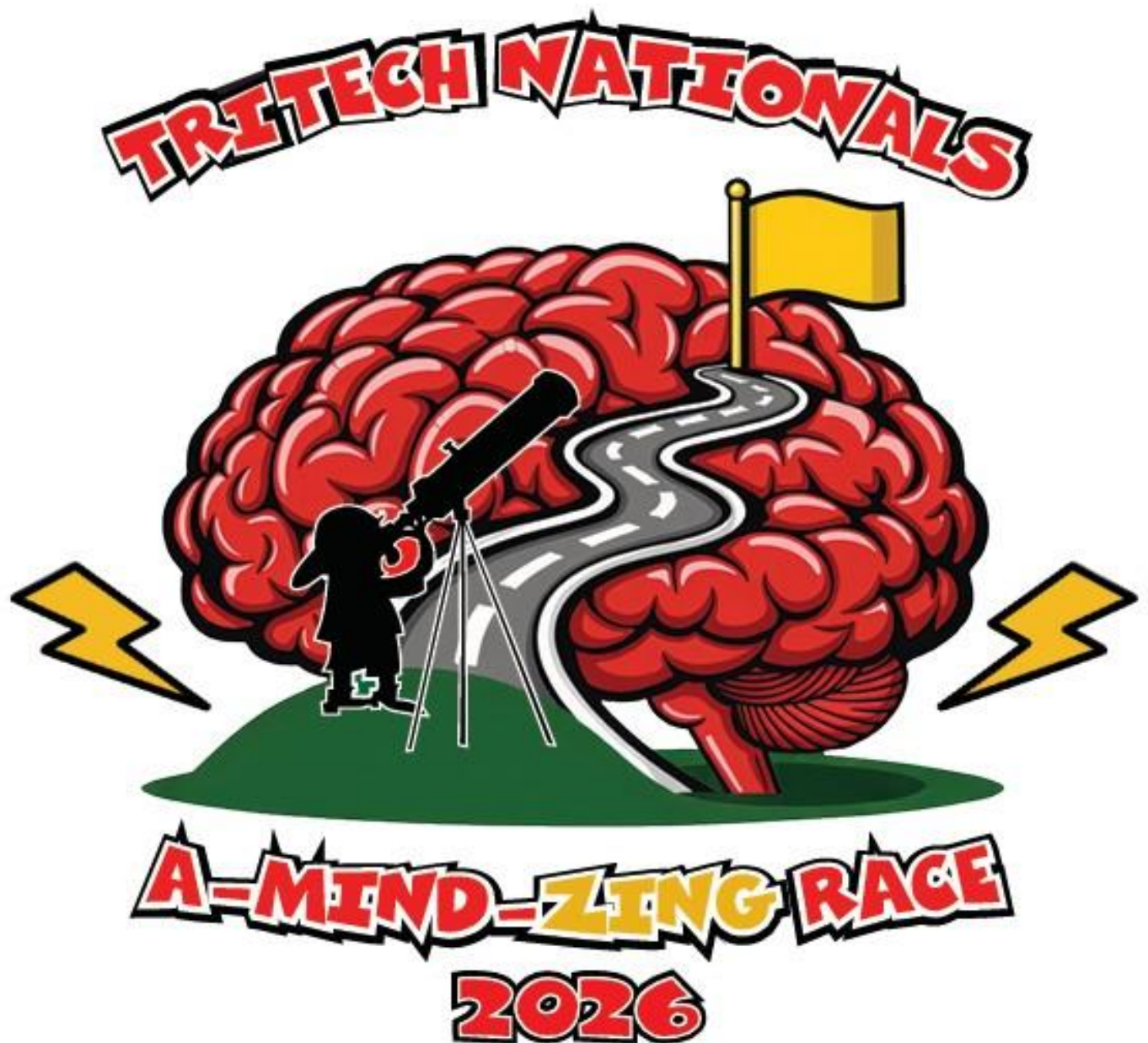


ABSTRACTS



11-12 September

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Agricultural Sciences / Landbouwetenskappe

Ann Maria Abraham-Gr 11-Kingfisher Private School-Scraps To Sprouts

Kitchen waste such as fruits and vegetable scraps, according to www.statista.com is the most common wastes around the world. Much food is wasted every year causing almost 50% of landfills to be packed with kitchen waste. Therefore, in this project, a composting system was created to grow plants in kitchen waste and normal soil to find out which grew best. During this process four pots were taken and filled in which two pots were filled with kitchen waste and two pots with normal soil. Then seeds of beans and tomatoes were planted into each pot as said in the method. From then onwards they were watered daily, and their temperature/ weather was recorded and put into a journal. The results showed that the tomatoes in kitchen waste grew 137mm taller than the ones in soil and the beans in kitchen waste grew 119mm taller than the ones in soil, it can thus be concluded that the hypothesis was correct. As a result, it is recommended to the wider community to use and recycle their kitchen waste to grow vegetables which are both healthier and cheaper.

Hope Mofenyi Mafokwane-Gr 10-All Saints College-AI Detectives

Crop diseases pose a significant threat to agricultural productivity, as they can spread rapidly and cause crop losses before symptoms are easily identified. This project investigated the effectiveness of Artificial Intelligence (AI) in detecting crop diseases at an early stage through the analysis of leaf images. Four periods of crops were grown and monitored over a period of nine weeks, during which images were collected to record changes in their health and appearance. Healthy, early stage infection and infected crops were used to train an AI image-classification model to identify the differences in leaf color, texture, shape and disease symptoms. The trained AI model was then incorporated into a crop-detection application, allowing a user to upload a crop image for analysis and receive a classification from the smart AI system. The investigation demonstrated the potential of AI-based image analysis as an early crop-disease detection tool. It also highlighted challenges such as obtaining consistent training images and maintaining suitable crop conditions. Overall, the project demonstrates how AI and agriculture can be combined to develop innovative solutions that could support earlier disease detection, reduce crop losses and improve agricultural productivity.

Melissa Malan-Gr 11-Merensky Landbou Akademie-Die GROOT deklaag geveg!

Die metode vir my projek is as volg op 1 Januarie 2026 het ek my Tritex projek begin. Ek het 100% fine coir block op 'n seil gesit en water op dit gespruit en met sproeier nat gemaak tot die grond heeltemal uitgeswel het. Ek het die 6 swart plant sakke opgevul met die grond en holte in die middel van die sak gemaak om groen soetrisie saailinge te plant. Die saailinge is in die holtes wat in die grond gemaak is geplant en mooi vas gedruk. Die grond is met die 5 verskillende deklare bedek, blare van bome, organiese verrotte blare(kompos), orgideemengsel (3dm³ bas), macadamia neutdoppe, kokkoshair-mat (coir-mat) en kontrole (wat geen deklaag gehad het nie). Laaste het ek die name van die verskillende deklare op etiketbordjies geskryf en by elke plantjie ingedruk. Die 6 plante is op 'n klein tafeltjie op goed geventileerde stoep geplaas sodat die omgewingstoestande vir al die plante presies dieselfde is. Ek het die eksperiment noukeurig gedoen met dieselfde groeimedium, omgewing en weersomstandighede. Fotos en dag tot dag joernaal inskrywings toon akkurate resultate aan. Dit kan waargeneem word in my Wetenskaplike joernaal en interpretasie van resultate. Die resultate is volgens die dra van blomme en vrugte, die hoogte van die plant en die welstand en lengte van die wortels bepaal. Die plant met die organiese verrotte blare deklaag het die beste resultate getoon en is dus die deklaag wat ek sal aanbeveel, die deklaag kort op sy hakke is die blare van bome, dit bewys dat natuurlik en organiese deklare die beste presteer. Die swakste presteerders is die macadamia neutdop deklaag en die kokkoshair mat deklaag. Volgens vraelyste op Google forms beantwoord, het die meeste mense geweet wat deklare is en dat mens plante weekliks moet nat maak. Gevolgtrekking, indien 5 verskillende deklare (blare van bome, organiese verrotte blare(kompos), orgideemengsel(3dm³ bas), macadamia neutdoppe, kokkoshair-mat (coir-mat) en kontrole) op plante toegepas word in dieselfde omgewings omstandighede en groeimedium dan sal die deklaag die organiese verrotte blare die beste groei en welstand Gee 'n groot applous!!! Die organiese verrotte blare deklaag het die GROOT deklaag geveg by verre gewen!ku

Tshegofatso Mamaila-Gr 9-Kingfisher private school-Soil retention

This investigation examined how different soil types affect the growth of tomato plants. The three soil types tested were sandy soil, clay soil, and loamy soil. Each soil has different properties that influence how much water and nutrients it can hold, which may affect plant growth. Three tomato plants of the same size were planted in identical pots containing the different soil types. All the plants received the same amount of water, sunlight, and care throughout the investigation. Over a period of four weeks, the moisture levels of the soils and the growth of the plants were measured and recorded. The results showed that clay soil retained the most moisture, while loamy soil produced the healthiest and fastest-growing tomato plant. Sandy soil retained the least moisture and supported the poorest plant growth. The investigation concluded that although clay soil holds the most water, loamy soil provides the best balance of moisture, nutrients, drainage, and air, making it the most suitable soil for growing tomato plants.

Karina Swanepoel-Gr 10-Merensky Landbou Akademie-Klein gogga, groot apteit

Voedselvermorsing is wêreldwyd 'n groeiende omgewings-, ekonomiese en maatskaplike uitdaging. Groot hoeveelhede organiese afval word daaglik weggegooi, wat bydra tot kweekhuisgasvrystellings, besoedeling en die verlies van waardevolle hulpbronne. My studie het gekyk na Swart Soldaatvlieg-larwes (*Hermetia illucens*) en of dit 'n goeie metode is om voedselafval in bruikbare produkte om te skakel. Die projek het uit twee fases bestaan. Eerstens het ek die hoeveelheid voedselafval van Merensky Landbou-akademie se eetsaal gemeet deur oorskietkos oor verskeie etes te meet. Tweedens is die doeltreffendheid van Swart Soldaatvlieg-larwes om voedselafval te verwerk vergelyk met kompostering en 'n kontrole waar die afval slegs gelos is. Die resultate het getoon dat leerders gemiddeld ongeveer 181 g oorskietkos per ete produseer, wat daarop dui dat die koshuis daaglik groot hoeveelhede organiese afval genereer. Ná 14 dae het die Swart Soldaatvlieg-larwes die voedselafval gemiddeld met 64% verminder, vergeleke met ongeveer 25% vir kompostering en 16% vir die kontrolebehandeling. Nie net het die afval vining verminder nie, daar is ook twee waardevolle by produkte gelever: frass, wat as organiese kompos gebruik kan word, en proteïenryke larwes wat as diervoer gebruik kan word. Die studie toon dat Swart Soldaatvlieg-larwes 'n doeltreffende en omgewingsvriendelike oplossing vir die bestuur van organiese afval bied. Hulle vermoë om voedselafval vinnig in waardevolle landbouprodukte om te skakel, beklemtoon hul potensiaal om sirkulêre afvalbestuur te bevorder, die hoeveelheid afval wat na stortingssterreine gaan te verminder, en by te dra tot meer volhoubare voedselproduksie.

Engineering & Design / Ingenieurswese & Ontwerp:

Musa Baloyi & Khutso Modika-Gr 9-Khanyisa Education Centre-Obstacle detecting jacket

The purpose of this project was to address the daily challenges faced by individuals with visual impairment. Simple tasks like crossing streets were stressful and hazardous, and the white cane had limitations — it only detected obstacles ahead, missed hazards above ground level, and required constant concentration. This inspired the development of a wearable assistive coat with proximity sensors that detected obstacles in all directions and alerted users through directional buzzers. The project aimed to enable hands-free mobility and help users navigate busy environments with greater safety and confidence. Device criteria were established: enhance remaining senses, restore independence, detect objects 20 cm to 50 cm with real-time latency, remain lightweight for hands-free mobility, and provide distance-scaled feedback. During construction, components were laid out on a wearable jacket. Sensors were placed in a cross-pattern on the chest, back, and shoulders for 360-degree awareness. A shared power bus was implemented so all four sensors drew from common power and ground lines, reducing cable count. Trigger and echo pins were routed to the microprocessor. Logic was programmed to convert ultrasonic wave timing into variable pulses, creating a feedback loop to sense room shape. For testing, navigation of a blindfolded obstacle course was planned to measure effectiveness. Success meant completing the course without contact. Assembly was done under adult supervision. The power source was placed in a reinforced pocket to prevent heat exposure. A sighted assistant was present during testing. Controlled testing was conducted to evaluate the 360-degree detection capabilities of the system. During the evaluation, obstacles within the designated range of 20 cm to 50 cm were successfully identified. In 90% of trials, sensors accurately triggered haptic feedback, with pulse frequency increasing as obstacle distance decreased. This confirmed that the logic effectively translated spatial data into intuitive tactile information, creating a digital sixth sense for the wearer. In navigation trials, a structured obstacle course was traversed while blindfolded to simulate visual impairment. The system enabled successful avoidance of 17 out of 20 obstacles. Although the original plan involved a wearable jacket, technical limitations resulted in validation through a box model prototype. These results demonstrated that the underlying detection field was accurate and ready for further miniaturization into a permanent wearable form. The defined design criteria were met. The system detected objects between 20 cm and 50 cm with real-time latency, provided distance-scaled haptic feedback, and

enabled hands-free operation. Controlled testing showed 90% accuracy in triggering feedback, with pulse frequency correctly correlating to proximity. Navigation trials resulted in successful avoidance of 17 out of 20 obstacles while blindfolded. The results confirmed that the 360-degree detection field was functional and accurate. The system effectively translated spatial data into intuitive tactile information, demonstrating readiness for miniaturization into a permanent wearable form that enhances remaining senses and restores user independence.

Masana Thorne Khosa-Gr 10-Relebogile High School-Smart botanical robotics glove

This project presents the Advanced Botanical Garden Glove, a wearable technology that modifies traditional botany by providing real-time, non-contact plant diagnostics. The system was constructed using FELCO garden gloves as the base platform integrating eight sensors onto a single ESP32-32S WiFi OT Development Board: an ACEBOTT soil water sensor mounted on the thumb for soil moisture, a digital waterproof LCD thermometer on the ring finger for leaf temperature, a DHT11 sensor on the back of the hand for ambient temperature and humidity, an LDR light sensor on the index fingertip for sunlight intensity, an IR obstacle avoidance sensor on the middle fingertip for precise leaf distance measurement to avoid crushing, and a PIR motion sensor on the wrist for detecting movement of pests and animals, all interconnected with 10-15cm jumper wires and secured with dark tape. The assembly procedure involved preparation and bench testing, mounting the ESP32 as the brain on the back of the hand, distributing sensors across fingertips for functional scanning, establishing a common 3.3V power bus, wiring signal pins to GPIOs 4, 5, 32, 33, 34 and 35, and final insulation to allow finger flexibility. Four field tests from 01/06/2026 to 16/06/2026 showed initial inaccuracies in loamy and dry soils but achieved accurate readings after recalibration, confirming the glove's potential to assist small-scale farmers with informed irrigation and crop care decisions.

Ruan Kruger & Ruben Steyn-Gr 10-Hoërskool Nelspruit-Termiese diefstal: Wie steel jou batterylewe?

Hierdie projek het ten doel gehad om die effek van temperatuur op die lewensduur van 'n alkaliese battery wat alledaags gebruik word, te ondersoek, om te bepaal of daar 'n manier is waarop sy lewensduur verleng kan word en sodoende koste bespaar kan word. Data is ingesamel deur drie AAA-batterye aan direkte sonlig bloot te stel (gemiddelde temperatuur is 35°C), nog drie AAA-batterye in 'n kamertemperaturomgewing (gemiddelde temperatuur is 20°C) en laastens nog drie AAA-batterye in 'n vrieskas waar die beheerde temperatuur -2°C is. Hierdie toetse is gelyktydig vir 12 uur uitgevoer en met twee verskillende batteryhandelsmerke gedoen, en hulle is toe in aparte flitsligte geplaas en die spannings is toe weer op verskillende intervalle getoets terwyl die flitsliglampe aan gelaat is. Die resultate het getoon dat spanning hoër getoets het vir batterye wat in kouer temperatuur gestoor is, wat dus 'n aanduiding gegee het dat hulle 'n langer lewensduur sal hê. Daar is ook gevind dat die battery-handelsmerke verskil het in die gemete spannings. Die hipotese Batterye wat aan koue temperatuur blootgestel word, het 'n langer lewensduur is dus bevestig. Temperatuur kan die prestasie, kapasiteit en lewensduur van batterye beïnvloed deurdat hitte elektrochemiese reaksies in die elektroliet kataliseer, wat lei tot 'n toename in energie-uitset en 'n korter lewensduur. Batterye moet gestoor en bedryf word in temperatuur wat koud is of ten minste nie warmer as kamertemperatuur nie (gewoonlik temperatuur van -2°C tot onder 20°C).

Pretty Maite Maila-Gr 11-Sebalamakgolo High-Generating electricity through compression from footsteps using piezoelectric discs

The study investigated whether electricity could be generated and stored using mechanical compression from footsteps, to provide an accessible backup power source during load shedding in South Africa. The aim was to design and develop a system using piezoelectric sensors to convert footstep pressure into electrical energy, reducing dependence on the national grid during outages. A prototype was constructed using four piezoelectric sensors connected in parallel and placed under a foam board to simulate a walkway. The sensors were wired to a breadboard and linked to a 9V rechargeable battery for energy storage. Repeated pressure was applied to the board to simulate walking, and a multimeter measured the voltage produced after each compression. The stored energy was tested by connecting an LED bulb to determine if it could be powered. Readings were recorded and analyzed using average and highest voltage values. The system generated measurable voltage when pressure was applied to the piezoelectric sensors. The highest voltage was recorded during direct footstep compression, and the stored energy was sufficient to power a low-wattage LED bulb for a short period. The data showed a direct relationship between the number of compressions and the amount of voltage produced and stored. The project demonstrated that mechanical compression from footsteps could generate and store small amounts of electricity using piezoelectric materials. The results indicated potential for use as a supplemental backup power source in high-traffic areas during load shedding. Future research could focus on improving energy storage capacity and scaling the system for practical application.

Boikano Mashishi & Moagabo Modiba -Gr 8-Pepps Polokwane College-Tri-sentry

This project solves the problem of litter-blocked storm drains at Pietersburg Comprehensive School, which causes localized flooding and transports macro-pollutants into the environment. The project's aim was to design a filtration system that lets water flow while removing debris. In this experiment we tested three different models where the independent variable was the filter design and the dependent variable was the time taken for water to pass through the system. We did 5 tests for each model. In the first model, water filtration time averaged 42 seconds. The second model's filtration time averaged 109,2 seconds, and the third model's filtration time averaged 79 seconds. The first design worked the best and most effectively as it removed the plastic and debris in the fastest time. From these results, it can be deduced that the first design is the best for school grounds because it allows drains to work effectively even with a lot of litter. This project proves that changing filter designs can prevent infrastructure damage and flooding, creating a more sustainable environment for learners. Future improvements could include using the kinetic energy of the water to generate renewable electricity for streetlights.

Keywords 1. Filter – A material or device that removes unwanted substances from water or air. 2. Debris – Pieces of waste, dirt, or broken material left behind. 3. Pollutants – Harmful substances that contaminate the environment. 4. Flooding – When water covers land that is usually dry. 5. Sustainable – Using resources in a way that protects them for the future.

Nkuriso Mawele-Gr 10-Mbhangazeki Secondary School-Community safety alert gadget

Community safety remains an important concern because people may experience situations where they need to quickly alert others and receive assistance. The Community Safety Alert Gadget was developed to investigate a low-cost technological solution that can improve communication between individuals and their communities during safety situations. The project involved researching the safety problem, identifying possible user needs, investigating existing technologies, designing the alert system and developing a prototype consisting of a personal alert gadget and a mobile-phone-based base station. The personal gadget uses three buttons: green, orange and red, representing different levels of alerts. Green is designed to notify selected friends without broadcasting the user's location, while orange provides a community warning and can provide the user's location. Red represents serious danger and can provide the user's location so that assistance can be directed to the person in need. During development and testing, the project showed that different alert levels could provide a structured method of communicating safety situations. Challenges with suitable wearable devices, software development, communication and equipment costs resulted in modifications to the original design. The project concludes that affordable technology can be adapted to improve community safety communication, although further testing and development are required before large-scale implementation. The project contributes to the community by proposing an accessible alert system that can support faster communication during safety situations and provide a foundation for future community-based safety technology. Keywords: community safety, alert system, accessibility, emergency communication, low-cost technology.

Boipelo Tshgofatso Moagi-Gr 8-All Saints College-Electric temper detection

This project seeks to explore patterns of electricity consumption within households to analyse how irregularities in usage can be identified by examining changes and inconsistencies in electrical data, the study aims to develop a conceptual approach that could assist in recognizing unusual behaviour in electricity consumption. Rather than preceding a guaranteed solution, this research focuses on understanding the problem and proposing a system that may contribute to improved monitoring and awareness through this investigation. The project aims to contribute to a benefit, understanding of electricity usage pattern within communities, while highlighting the importance of responsible energy consumption and safer effective monitoring systems.

Mmathapelo Sakoane0m-Gr 10-Hoërskool Bergvlam-ProtectaWall

ProtectaWall investigated whether an aluminium-lined model house could reduce electromagnetic radiation tester readings associated with a mobile phone. The project addressed an engineering problem arising from concern about electromagnetic exposure in household environments. A lightweight house model was constructed using an aluminium shielding layer and a black exterior coating. An electromagnetic radiation tester was used to record readings during repeated tests with the phone outside and inside the model. The primary dataset produced a mean reading of 4.60 instrument units for the phone condition and 3.25 instrument units for the phone-inside-house condition. This represented an approximate reduction of 29.3%. A separate three-day dataset produced mean readings of 4.83, 4.73 and 5.03 instrument units for Days 1–3. The results supported the hypothesis that the tested prototype could reduce the measured tester reading under the specified conditions. However, the investigation did not measure sleep, concentration or human health and

therefore did not demonstrate that electromagnetic fields caused tiredness or that the prototype provided health protection. The findings indicated that ProtectaWall was a promising prototype concept, but further controlled testing, improved instrumentation and repeated trials were required to determine shielding effectiveness more reliably.

Keywords: Electromagnetic fields; electromagnetic shielding; aluminium; engineering prototype; EM radiation tester; ProtectaWall

Lebo Seepane-Gr 10-Relebogile High School-Solar Powered Traffic Light Suit

The inactivity of traffic lights at busy intersections due to power outages and infrastructural failures creates severe safety hazards and accidents for motorists and pedestrians. To address this danger, this project aimed to design and implement a wearable, solar-powered traffic light suit with integrated high-visibility hand signals to enhance the clarity of traffic officers during manual traffic control. The methodology involved constructing a prototype using a reflective vest, LED components, digital timers, and various power sources—including a 5V powerbank, 12V powerbank, 12V battery, and an 18V solar panel—tested across five experimental trials to evaluate operational runtime and brightness performance. The results demonstrated that the 18V solar panel achieved the longest continuous runtime of 10 hours, while the 12V battery provided a reliable 8-hour alternative independent of weather conditions. In conclusion, the hypothesis was partially supported; while the solar panel serves as an effective primary energy source, combining it with a battery backup ensures dependable operation. This project directly benefits local traffic officers and road users by improving visibility, preventing accidents, and enhancing traffic flow efficiency in the community.

Keywords: Traffic light suit, Road safety, Solar power, Wearable technology, Intersection control

Environmental & Social Sciences / Omgewings- en Sosiale Wetenskappe:

Ekene Arukwe-Gr 11-Lowveld Academy-Remove the night irritation: a low-cost mosquito trap

This project investigated whether a low-cost homemade mosquito trap could effectively attract and catch mosquitoes using a 395 nm UVA LED light and carbon dioxide produced from a yeast-sugar mixture. The aim was to compare different attractant configurations and determine which produced the highest mosquito catch. Four configurations were tested over a seven-day period: UVA LED light combined with carbon dioxide, UVA LED light only, carbon dioxide only, and a control with neither attractant. The number of mosquitoes caught was recorded and compared. The combined UVA LED and carbon dioxide trap produced the highest total catch, with 27 mosquitoes, compared with 14 for the LED-only trap, 24 for the carbon-dioxide-only trap and 0 for the control. These results supported the hypothesis that combining UVA light with carbon dioxide would improve the trap's effectiveness. The project demonstrates that an affordable mosquito trap can be built using simple materials. Further improvements include replacing the 12 V fan with a 5 V fan, improving the balance of the structure, and adding rechargeable battery, USB-C, power-bank or solar-power options for use during load shedding.

Nhlavutelo Baloyi & Ayama Tivana-Gr 8-Khanyisa Education Centre-Rebuntu (teenage morals helper)

This project aims to restore and strengthen moral skills among Grade 8–12 learners at Khanyisa Education Centre by examining how technology influences teenage ethics and by delivering a digital tool designed to enhance those skills. Data were collected through structured reviews from ten learners in the target grades who evaluated their experience with the website. Results showed positive feedback, with findings presented via graphs and tables. The website functions as intended, meets its core design goals, and performs reliably in practice. Limitations include small sample size and basic visual design. Recommended future developments include conversion to a mobile app, addition of an interactive streak widget, gamification elements, and mechanisms to verify task completion. The project also advanced the researcher's coding ability and practical understanding of software development.

Meegan Baragwanath & Chanté van Wyk-Gr 10-Merensky Landbou Akademie-'n Druk brein mis die sein - Selfs in survival mode

Hierdie projek het die invloed van verskillende agtergrondklanke op 'n persoon se reaksietyd ondersoek. Die doel van die ondersoek was om te bepaal of klanke soos kalm musiek, vinnige musiek, verkeersgeraas en ander omgewingsgeluide 'n invloed het op hoe vinnig 'n persoon op 'n stimulus reageer. Deelnemers het 'n reaksietydtoets onder verskillende klanktoestande voltooi, waarna die resultate versamel, vergelyk en ontleed is. Die data het getoon dat deelnemers oor die algemeen die vinnigste reaksie in stilte gehad het, terwyl sekere klanktoestande, veral kalm musiek, stadiger reaksie tot gevolg gehad het. Daar is tot die gevolgtrekking gekom dat agtergrondklanke 'n meetbare invloed op reaksietyd kan hê en dat stilte die mees gunstige omgewing vir vinnige reaksies bied.

Danlé Bekker & Jané van Immerzeel-Gr 10-Hoërskool Nelspruit-POPvol potentTEEL

Hierdie projek ondersoek die moontlikheid om plastiekafval wat in hospitale genereer word, te herwin en te gebruik vir die vervaardiging van ekovriendelike teëls. Die doel is om die omgewingsimpak van mediese plastiekafval te verminder deur dit in 'n bruikbare boumateriaal te omskep. Die studie fokus op die versameling, skoonmaak en verwerking van plastiek, asook die toets van die breekbaarheid en waterbestandheid van die finale produk. Breekbaarheid van die teël word getoets deur gewigte van onderskeidelik 100g en 700g vanaf verskeie vaste hoogtes te laat val en waar te neem vir skade of krake. Hierdie eksperiment word herhaal op 'n keramiekteël as kontrole. Waterbestandheid word getoets deur vervaardigde plastiekteël vir 24 uur in water te week en gewig te vergelyk met droë gewig. Dit word weereens vergelyk met keramiekteël as kontrole. Resultate dui daarop dat herwonne plastiek effektief gebruik kan word om sterk, waterbestande teëls te vervaardig. Hierdie oplossing kan bydra tot volhoubare afvalbestuur en aanwending in lae-koste behuising met gevolglike verbeterde behuisingstoestande. Dit kan veral plaaslike gemeenskappe en ekonomie bevorder.

Asimah Bux-Gr 10-Khanyisa Education Centre-Constructing Road out of plastic waste

The purpose of this project was to investigate whether plastic waste can be used in road construction to improve road durability while reducing environmental pollution in Giyani. The project focuses on addressing the problem of increasing plastic waste and poor road condition by exploring plastic modified bitumen as a sustainable solution. The researcher collected information about plastic waste, recycling and plastic road technology from books, internet sources and environmental reports. A community survey was conducted using questionnaires to determine how plastic waste is currently managed. Plastic was sorted and cut into small pieces before constructing a small road model using plastic and bitumen, arranged in layers to represent a real road structure. The strength and firmness of the plastic model will be observed and compared to a normal road model without plastic. All observations will be recorded and photos will be taken as evidence. Research findings shows that adding 5-10% shredded plastic to bitumen improves binding strength and water resistance. Plastic -modified road shows fewer cracks and potholes and perform better during heavy rainfall. The results indicate that using plastic waste in road construction reduces landfill waste, lower maintenance costs and improves road lifespan. The investigation shows that plastic waste can be effectively used in road construction as a sustainable and cost effective solution. Plastic modified bitumen strengthens roads, reduces environmental pollution and supports better waste management practices in Giyani. This method provides an innovative way to solve both plastic pollution and road deterioration at the same time.

Milan Ferreira & Maryna Jacobsz-Gr 10-Merensky Landbou Akademie-Fish-away

Die probleem is dat vis 'n goedkoop en goeie bron van voedsel is, maar is moeilik om sonder geriewe te preserveer. Die doel van ons eksperiment is om die invloed van verskillende preserveer metodes (vriesing, droging en sout) op die hoeveelheid bakterie op vis te bepaal. Sodoende kan ons vasstel wat die beste preserveer metode sal wees. Ons hipotese is dat as die temperatuur afneem, dan sal die groei van bakterie op die vis ook afneem teenoor souting en droging. Ons onafhanklike veranderlike is die vier verskillende preserveermetodes, naamlik vriesing, sout en droging sowel as 'n kombinasie van sout en droging. Ons afhanklike veranderlike is die bakteriële groei op die vis (gemeet in CFU – Colony Forming Units) op die agar in petri bakkies en ons konstante veranderlike is die tipe vis, preserveringstyd, inkubasie-tyd en -temperatuur. Ons het die vis volgens die metodes gepreserveer, toe bakterie monsters geneem en op agar gesmeer in petribakkies. Ons het die bakkies geïnkubeer, sodat die bakterie kan groei. Ons het daarna die bakterie en kolonies getel onder 'n mikroskoop en in 'n tabel aangeteken. Ons resultate was dat die vriesing die minste bakterie gehad het en die droging die meeste. Ons het ons resultate in 'n grafiek geïnterpreteer. Ons hipotese was waar. Ons gevolgtrekking was dat vir mense sonder geriewe, sal 'n

kombinasie van droging en sout die tweede beste opsie wees. Ons het ons data aan ons plaaswerkers oorgedra en werklik 'n bydra gelewer vir mense wat alternatiewe metodes moet gebruik.

Sleutelwoorde: Bakterie, osmose, preserveer, inkubator, temperatuur.

Rhandzu Fuela & Nhlanhla Nziane-Gr 9-Mbhangazeki Secondary School-StudyLock

Smartphone distraction has become a major challenge affecting learners' academic performance at Mbhangazeki Secondary School. Many learners spend valuable study time using social media, games, and other non educational applications, making it difficult to concentrate on schoolwork. This project investigated the effectiveness and psychological impact of StudyLock, a smartphone blocking application designed to reduce distractions and promote productive study habits. The aim was to determine whether restricting access to distracting applications during study time could improve learners' concentration, motivation, and academic performance. Information was collected through questionnaires completed by learners, interviews with teachers, and background research from books, academic journals, and educational websites. A working prototype of the StudyLock application was also developed and tested by learners. The collected data were analysed using tables, graphs, and percentages to identify trends and evaluate the effectiveness of the application. The results showed that excessive smartphone use negatively affected learners' focus and study time. After using StudyLock, most participants reported better concentration, increased study time, improved self-discipline, and greater motivation to complete their academic tasks. The findings supported the hypothesis that reducing smartphone distractions can improve learners' study habits and academic performance. StudyLock provides a practical solution for the Mbhangazeki Secondary School community by encouraging responsible smartphone use and creating a more focused learning environment. The project has the potential to improve academic achievement and learner well-being and could be implemented in other schools facing similar challenges.

Keywords: StudyLock, Smartphone Distraction, Academic Performance, Learner Concentration, Digital Well-being.

Umair Gangat & Ismail Vankalwala-Gr 8-Mokopane English Combined School-Solar Distillation

My project involves originality. I say this as there has not been any projects done like mine, but you may ask how I got the data. And I can tell you confidently with a lot of research and inspiration this was a Solar Still. But now you may ask how it is better, unlike a Solar Still mine can also clean all types of water, more on that later. You now may ask how I can prove my claim, well, me and my friend tested it last year and our results weren't as good but this year I chose a way to redo this project FASTER and MORE EFFICIENT.

Hannah Jordaan-Gr 11-Kingfisher Private School-How accents affect the ability of deaf people to lip read

The purpose of this research was to examine how accent variability affects the accuracy of lip-reading in a linguistically diverse country such as South Africa. This research aims to investigate how regional and foreign accents affect comprehension levels in deaf individuals. This research allowed participants to watch a video that contained ten different accents. The participants were then asked to complete a survey in which they rated their level of understanding across regional and foreign accents. Afterward, participants were interviewed and asked about the changes they observed in mouth movements. Three participants were selected and were to be as varied as possible, with both genders, different home languages, and geographical locations. The participants were chosen specifically. The Results showed that regional accents from South Africa were better understood than foreign accents. However, American English was an outlier. South African English was understood at 100% while the Scottish accent was understood at 0%. It can also be noted that accents with more visible tongue and mouth movements were generally better understood. The hypothesis was supported- South African English proved to be the most understood accent. This project shows that accented speech does have an impact on the ability of deaf people to lip-read. This research can help further education on the topic or create an app or glasses which do not require the deaf individual to lip-read.

Grace Lethabo Mahlo-Gr 9-Sebalamakgolo High-Biochar, Soil fertility and Plant growth

The study aims to evaluate the effectiveness of locally produced biochar in improving soil water retention and fertility in small holder farms in South Africa, as well to address the need for affordable and sustainable soil amendments to enhance crop productivity and food security in water scarce regions. Treatments were prepared in 3 Groups, A :100% soil-control ,Group B:95% soil +5% biochar, Group C: 90% soil +10% biochar .1:1:1 mixed biochar + compost + water was left for 3 weeks. this stopped biochar from stealing nitrogen from soil . Pots

were filled with 3 soil mixtures each pot were labeled A1,A 2,B 1 ,B 2 ,C 1, C 2 . Two maize seeds were planted 2cm deep in each pot. After 7 days, weaker seedling were removed so that only 1 plant remains per pot. All pots with the same amount were watered every 2 days. All pots were placed in the same area in the sunlight. For 6 weeks, it was measured every 7 days. Biochar improved plant growth and yield by improving soil structure, increasing nutrient availability of beneficial microorganisms in the soil. Biochar also helped to reduce the uptake of heavy metals by plants which can be a problem in contaminated soils. The benefits of biochar for plant growth promotion are due to its effects on soil physical, chemical, and biological properties. The data support the hypothesis that biochar improves soil fertility and plant growth. Key findings included a 42 % increase in maize yield and 50% improvement in south water retention with 20%, biochar application it is concluded that biochar can be an effective amendment for Improving soil productivity especially in sandy soil.

Bianca Mdaka & Leslynne Williams-Gr 8-Frans du Toit High School-Droogte breker

Water is noodsaaklik vir die lewe, baie mense in ons gemeenskap ervaar watertekorte, veral tydens droogtes. Dit beïnvloed daaglikse aktiwiteite soos drink, kosmaak, skoonmaak en persoonlike higiëne. Ons projek, die Droogte-Breker: Huishoeding Weergawe, is n laekoste- waterinsamelings-en filtrasiestelsel wat natuurlike prosesse soos kondensasie, filtrasie en mis-insameling gebruik om water te versamel en te verbeter. Die stelsel word van beskostigbare en herwinde materiale gemaak. Dit is ontwerp om maklik by die huis gebou en onderhou te word en kan ongeveer 2-4 liter water per dag versamel. Hierdie hoeveelheid kan een persoon help met sekere basiese daaglikse behoeftes. Ons doel is om n eenvoudige, volhoubare en bekostigbare oplossing te skep wat gesinne kan help om water te bespaar en meer selfstandig te wees tydens droogtes. Ons glo dat klein idees n groot verskil kan maak. Hierdie projek wys hoe ons wetenskap en kreatiwiteit saam gebruik kan word om werklike probleme in ons gemeenskap op te los en n n positiewe verskil te maak.

Angy Mohlala-Gr 10-All Saints College-Genetically modified organic food

As the prevalence of genetically modified food (GMOs) continues to rise, there has been an increasing public interest for information concerning the safety of these food. Concerns generally foals on how the GMO may affect the environment or how it may affect the consumer. One specific concern is the possibility for GMOs to negatively affect human health. Genetically modified food (GMOs) also known as genetically food or bioengineered food are food from organisms that have had changes is traduced into their DNA using the methods of genetic engineering. My goal for this project is to educate humans to stop consuming GMOs and consume organic food instead since organic products are food free of any harmful chemicals, antibiotics and herbicides. My hypothesis is that genetically modified food are not safe for human consumption. I conducted an experiment to GMO food and my hypothesis was accepted.

Malwandla Mthembi-Gr 11-Kingfisher Private School-Stretching Sustainability, The Effect of Glycerine Concentration on Bioplastic Strength

This project investigated starch-based bioplastics as a sustainable alternative to conventional plastics by examining the effect of different glycerine concentration on their tensile strength while also demonstrating how starch-based bioplastics can be produced using simple methods and determining their suitability as an environmentally friendly alternative. Bioplastic samples were produced using starch, water, and varying amounts of glycerin. These bioplastic samples were tested for tensile strength and flexibility. Increasing glycerine concentration improved flexibility but reduced tensile strength, while lowering the glycerine concentration produced less flexible but stronger samples. The most important trend observed was that there is an inverse relationship between the concentration of glycerine used in the making of the bioplastic. This shows that biodegradable plastics can be chemically engineered for strength, making them suitable for packaging.

Keabetswe Nchabeleng-Gr 7-PEPPS Polokwane-ECO-BRICK

Plastic pollution is a big environmental problem because plastic waste can remain in the environment for a very long time. The purpose of my project was to find out which type of recycled plastic would make the strongest eco-friendly brick. Recycling plastic can help reduce waste and turn used materials into useful products. I tested three types of plastic: LDPE, PET and PS. The bricks were tested by adding weight, applying pressure, hitting them with a hammer, placing them in water and exposing them to heat. My results showed that the LDPE brick was the strongest because it did not crack easily or break when hit. The PET and PS bricks were weaker and cracked during some tests. Research has shown that recycled plastic can be used as a construction material. From my investigation, I concluded that LDPE is

the best choice for making strong and durable eco-friendly bricks. Using recycled plastic to make bricks could help reduce plastic pollution and turn waste into something useful.

Andani Nelwamondo-Gr 7-Mitchell House-Can Algae clean water

Water pollution presents a serious threat to both the environment and the human population, and this research proposes an innovative and sustainable approach to water purification. Microalgae are an excellent solution for water purification since they are able to reduce the level of nitrates, phosphates, heavy metals, and bacteria in water. For the experiment, two sets of contaminated water were used, and microalgae were added to the one experimental set. As a result, after several days, the experimental set of water was observed to have a lower level of contaminants and a more acceptable odour than the control set. The results of the experiments conducted support the hypothesis that it would be possible to purify water with the help of microalgae because they can remove a significant amount of nutrients and toxins from it. Thus, it may be concluded that water purification with algae is a viable option that should be considered by the community because it is a sustainable solution to a serious problem.

Keywords: algae, water purification, pollution, sustainable, microalgae.

Didintle Nokana-Gr 9-Kingfisher Private School-Developing technology-driven strategies for human-baboon coexistence

The purpose of this project was to come up with a non-lethal solution to human-baboon conflict to create a safe environment by using technology and predator sounds to deter baboons from human spaces to promote coexistence without harming anyone. Three study sites were identified. Surveys were conducted based on their encounters with baboons. A speaker and camera traps were placed at all the study sites at different times and research was conducted by emitting predator sounds at baboon invaded areas to test whether the hypothesis would be accepted or rejected. The data from the surveys and recording from the camera traps was collected and evaluated to get the results needed. The results showed that baboons have been causing major problems in people's homes and work places, and the recordings from the camera traps showed that using predator sounds could be used as a method to deter baboons from human spaces and to promote coexistence between humans and baboons, but continuous repetition of the sounds could cause habituation to the baboons, allowing them to ignore the predator sounds. The hypothesis was accepted, and proved that using technological devices and emitting predator sounds could be used as a deterrent to keep baboons away from human spaces.

MJ Pohl-Gr 11-Merensky Landbou Akademie-'n Hengelaar se Redding

Die doel van my projek is om te toets of dit moontlik sal wees om n oplosbare omgewingsvriendelike visvangsinker te maak, met die oog op die vermindering van die gebruik van loodsinkers deur spesiehengelaars wat watermassas vergiftig. In my projek het ek die effek van verskillende substrate soos sand en klippies op die oplosbaarheid van klei sinkers toets. Die doel van die toets was om te sien of een van die substrate die oplosbaarheid van die sinkers lank genoeg sal vertraag (ongeveer 24 uur) om ten einde n visvangsinker te kan maak wat stadig op los en dan na n ruk van vislyn af val om so geen effek op die gesondheid van ekosisteme te he nie. Ek het die sinkers gemaak van klei wat bestaan uit meel, sout en water wat dan gevorm kan word met die hande. Die klei kan beide in n oond gebak word of in die son gelaat word om hard te word voor daarmee gehengel word. Ek het gekies om die sinkers te bak in n oond aangesien dit vinniger is teenoor die "air dry" wat byna n week neem. Die sinkers is dus maklik genoeg om deur enige hengelaar gemaak te word en kan ook aangepas word tot hulle vereistes. Ek het al n veldtoets gedoen met die sinkers en bewys dat hulle wel werk. Laastens sal ek n laaste paar veranderinge wil aanbring om die sinkers verder te verbeter soos n meer egalige vorm en meer natuurlike kleure. Die sinkers kan dus gebruik word deur spesiehengelaars op n veilige wyse wat die toekoms van die sport bewaar.

Carlos Rakoma-Gr 11-All Saints College-Greywater Guardian

Water scarcity is a growing problem in South Africa and globally. Greywater reuse is often suggested as a solution, but most greywater is contaminated by chemicals from soaps and detergents, making it harmful to plants and soil. This project, titled Greywater Guardian, investigates a different approach: preventing greywater pollution at the source. A biodegradable, plant-based soap was formulated using natural ingredients and adjusted to a plant-safe pH range. The effect of greywater produced by this soap was tested on plant growth and compared with clean water and greywater from commercial soap. Plant height, leaf count, and overall health were measured over a period of time. Results showed that plants irrigated with Greywater Guardian greywater grew significantly better than plants watered with

commercial soap greywater and were similar to plants watered with clean water. This study demonstrates that source-controlled soap chemistry can make household greywater safer for reuse, helping conserve freshwater and protect the environment.

Keyword: Greywater: Domestic wastewater which is produced from the recycling of laundry, shower, and hand basin water. Bio-soap: A soap made from natural, environmentally friendly, and biodegradable ingredients that is designed to have minimal harmful effects on the environment. Irrigation: The artificial application of water to soil or plants to support plant growth, especially when natural rainfall is insufficient. Biodegradable: A property of a substance that allows it to be broken down naturally by microorganisms such as bacteria and fungi into harmless substances.

Chantene Schoeman-Gr 11-Merensky Landbou Akademie-Borrelende Wetenskap- van suiker tot etanol

My projek ondersoek bio-etanol as 'n alternatiewe brandstofbron in Suid-Afrika. Die doel is om te wys hoe bio-etanol kan help om hoë brandstofpryse te verlig en 'n volhoubare energie-opsie te bied. Ek gebruik 'n vraelys om gemeenskapsmenings oor die voordele en nadele van bio-etanol te versamel. Die resultate toon dat die meeste mense positief is oor die projek en dit as 'n realistiese oplossing sien, veral omdat 65% gesê het hulle sou bio-etanol gebruik as dit goedkoper as petrol is. 'n Belangrike deel van die projek is die eksperiment wat toets hoe die suikerpersentasie in die fermentasiemengsel die etanolpersentasie ná distillasie beïnvloed. Ek het 5 kg suiker gebruik teen 'n prys van R26 per kilogram, wat 'n totale koste van R130 beteken. Die opbrengs wys dat bio-etanol produksie in hierdie skaal goedkoper kan wees as tradisionele brandstof. Die opname bevestig ook dat mense bekommerd en gefrustreerd is oor stygende petrolpryse, wat die relevansie van my projek verder versterk.

Maile Seruba-Gr 10-Kingfisher Private School-Sustainable dustbin solutions for pollution reduction in Boelane Makhushane Village, Phalaborwa

Boelane Village has poor waste disposal management and has brought me up to the issue that they need a bin. Wastemanagement can help reduce disease infections and improve health; it is something that should not be ignored nor overlooked. Every single corner you take and you will find waste, everywhere. Dustbins are the first step to a better environment, that is why I was motivated to begin this project, for a better tomorrow. I had built a structure of a 3d recyclable dustbin made out of wood and cardboard boxes. I had joint everything together using wires and built it using the skills I learnt in technology (such as triangulation) and at home (such as building objects). My bin is unique as it only uses recyclable, easy-to-get materials. Once it is unrepairable, it can be used as fire wood. The bin was taken to an area with high glass waste disposal and set there. Data was collected every day for a week, Monday to Sunday. The results showed a positive attitude towards the bin as people had disposed their waste in the bin and cleaned up the area where the bin was settled. Glass waste disposal near the bin had decreased by nearly 75% only after a week, which is great progress. In conclusion, the project was a success and will be taking to the next level by introducing: more bins; more money for the community in respect of environmental issues; etc. The community appreciate my efforts and wish the best for me.

Liandri Terblanche-Gr 9-Merensky Landbou Akademie-Terug na die toekoms: Skrif na Skrabbel

Hierdie studie het die doeltreffendheid van drie bindmiddels—klei, stysel en gips—ondersoek in die vervaardiging van tuisgemaakte kryt met herwinde papieras uit ou skoolskrifte as die hoofmateriaal. Die doel was om 'n omgewingsvolhoubare, gemeenskapsvriendelike en koste-effektiewe metode vir krytproduksie te identifiseer, terwyl 'n alternatiewe gebruik vir skoolskrifte ondersoek word. Die ou skoolskrifte is verbrand om as te produseer, wat daarna met elke bindmiddel in beheerde verhoudings gemeng is om krytmonsters te vorm. Die kryt is gebak of gelugdroog om te bepaal of die drogingsproses 'n verskil aan die kwaliteit van die kryte maak. Die produkte is geëvalueer op grond van sterkte, tekstuur, skryfkwaliteit, duursaamheid en produksiekoste. Die resultate het getoon dat beide klei en gips hoëgehalte-kryt lewer het met goeie tekstuur en gladde skryfvermoë. Stysel, hoewel maklik bekombaar, het swak en bros kryt opgelewer en is dus minder geskik vir praktiese gebruik. Tussen die twee beste bindmiddels het klei as die mees ekonomiese opsie na vore gekom weens sy lae koste en wye beskikbaarheid, veral in landelike gemeenskappe. Uit 'n omgewingsperspektief bevorder die gebruik van papieras herwinning en verminder dit afval op stortingssterreine, wat bydra tot volhoubare hulpbronbestuur. Verder verminder die gebruik van klei as bindmiddel die afhanklikheid van aangekoopte materiale en verlaag dit die koolstofvoetspoor van produksie. Die projek toon sterk gemeenskapsimpak, aangesien dit laekoste, plaaslik verkrygbare krytproduksie moontlik maak wat landelike kleuterskole en dagsorgsentrums kan ondersteun.

(Sleutelwoorde: Herwinning, Papier, Kryt, Bindmiddels, Omgewings- en gemeenskapsimpak)

Nhlalala Vukeya-Gr 9-Khanyisa Education Centre-Plantable bioplastic

The purpose of this project is to develop a biodegradable, water-soluble bioplastic embedded with chia seeds that can break down naturally in soil and dissolve in water after a few days, while still allowing the seeds to germinate and grow. This aims to provide an eco-friendly alternative to traditional plastics by reducing pollution and turning waste into a useful material that supports plant growth and environmental restoration. To make the bioplastic, mix 2 tablespoons cornstarch, 1 tablespoon glycerin, 2 tablespoons water, and 1 tablespoon white vinegar in a small pot and stir until smooth. Heat on low while stirring continuously for about 3–5 minutes until it thickens, turns clear, and forms a soft ball, then remove from heat. While still warm, spread it thinly onto baking paper or a silicone mat using a spoon. Leave it to dry for 1–2 days, or speed it up by placing it in an oven at 50–60°C for 2–4 hours until fully dry and not sticky. Once hardened, peel it off to get your bioplastic sheet. The experiment showed that starch-based bioplastic works well as a biodegradable material, as it began breaking down in soil after 3–4 days, helping reduce environmental pollution. The embedded chia seeds were able to germinate, although they only started sprouting on the fourth day, suggesting that the bioplastic may not provide ideal conditions for quick growth. While several seeds sprouted, most were not able to develop into full plant, indicating that factors like water, sunlight, or the structure of the bioplastic may have limited further growth. Overall, the results show that seed-embedded bioplastic is a promising eco-friendly solution, but improvements are needed to support stronger and more consistent plant growth. The experiment showed that starch-based bioplastic is biodegradable, breaking down in soil within 3–4 days and helping reduce pollution. The chia seeds were able to germinate, but they sprouted slowly and only one grew into a full plant, suggesting that the bioplastic may not provide ideal conditions for strong growth. Overall, the results show that seed-embedded bioplastic is a promising eco-friendly solution, but it still needs improvement to better support plant development.

Health Sciences / Gesondheidswetenskappe:

Elizabeth Erasmus-Gr 11-Lowveld Academy-Seamless Sterility: Advancing infection control in dental workflow

Infection control is essential in dentistry because dental procedures involve frequent contact between instruments. When disinfection practices are lacking, the risk of microbial contamination increases. This project investigated the effectiveness of dental surface disinfection and explored the potential of a system to improve infection-control practices. The investigation compared microbial growth on disinfected instruments. Three samples were treated using Dürre disinfectant, while three untreated samples served as controls. The samples were cultured on nutrient agar and incubated for eight days. After incubation, visible microbial colonies were counted and the results were compared. The untreated samples produced an average of approximately 16 colonies per Petri dish, whereas the disinfected samples produced an average of only 0.33 colonies per Petri dish. This represents a substantial reduction in microbial growths following disinfection. The results demonstrate the disinfectant's effectiveness in reducing detectable microbial contamination under the conditions tested. However, effective infection control depends not only on the availability of disinfectants, but also on their consistent and correct application. To address this issue, the project proposes the Seamless Sterility Watch, a tool designed to help dental practitioners verify that instruments have undergone appropriate disinfection. By combining effective disinfection with systematic monitoring, the system aims to reduce contamination risks, improve compliance with infection-control procedures, and promote safer dental workflows.

Mpho Hlongwane & Mmapaseka Seodisha-Gr 9-Thorntree Senior College-Biofilm inhibition test with lemon, ginger, and garlic

In many rural areas, the high cost of antibiotics and limited access to healthcare makes it challenging to treat bacterial infections. When bacteria quorum senses and creates biofilms it makes them become highly resistant to treatment as well as the immune system. We wanted to investigate whether natural substances like lemon, garlic, and ginger could prevent bacteria from forming biofilms. This experiment tested low-fat plain yogurt bacteria grown on Agar media prepared using Agar-Agar, sugar, distilled water, and chicken stock. We soaked clear plastic strips in lemon juice, fresh ginger extract, fresh garlic extract, and water for five minutes, placed the plastic strips into the inoculated Agar dishes and incubated them for 3 days. After 3 days we removed the plastic strips then, stained them with blue food colouring, rinsed them in water, then measured the light transmittance using a Lux Light Meter app. Across the 2 experimental trials garlic had the highest average light intensity (176,5 LUX), ginger and lemon had the same average light intensity (169 LUX), and water had the lowest average light intensity (131 LUX). The plastic strips soaked in lemon, ginger, and garlic were clear, indicating that these substances stopped bacteria

from creating a biofilm, while the plastic strips soaked in water had blue spots indicating that a biofilm was formed. These findings supported our hypothesis as we thought that garlic would be the most effective at stopping bacteria from creating a biofilm. Our project demonstrates that affordable household ingredients have antibacterial properties.

Shayna Lea-Gr 10-Hoerskool Nelspruit-Blikkies vol Angs

Die doel van hierdie ondersoek was om te bepaal hoe die inname van energiedrankies die ang van graad 10 leerders beïnvloed deur faktore soos bloeddruk, harttempo en angsmetings te evalueer. Die hipotese dat indien 'n graad 10 leerder 'n energiedrankie inneem, sal sy ang vermeerder, teenoor 'n graad 10 leerder wat 'n plasebo drankie inneem, mits die omgewing, tydverloop tussen metings, volume ingeneem en metingsmetodes konstant bly, was korrek bewys deur die ondersoek. 'n Dubbelblinde eksperimentele ondersoek was op 18 vrywillige Graad 10-leerders gedoen wat lukraak in drie groepe verdeel was, en elk 'n gealokeerde drankie ontvang het (A- Suikervrye energiedrankie, B- Suikervrye plasebodrankie, C- Standaard energiedrankie). Deelnemers het voor en 45 minute na die inname 'n gestandaardiseerde STAI-angsvraelys voltooi, en hul bloeddruk en harttempo was ook gemeet met 'n digitale bloeddrukmonitor. Die wagtyd en toetsomstandighede was vir almal konstant gehou om te verseker dat die resultate betroubaar is. Albei energiedrankiegroepe het stygings in sistoliese en diastoliese bloeddruk, harttempo en STAI-angstellings getoon. Die plasebogroep het afnames in al hierdie veranderlikes gewys. Die resultate wys dat energiedrankies die angsvlakke, bloeddruk en harttempo van Graad 10-leerders laat styg, in vergelyking met 'n graad-10 wat 'n plasebo drankie inneem. Hierdie bevindings wys op moontlike gesondheidsrisiko's van energiedrankies vir tieners, veral hul geestesgesondheid, en gee 'n basis vir toekomstige navorsing oor die langtermyn-effekte van energiedrankies, die invloed van verskillende hoeveelhede kafeïen en suiker, en die uitwerking op groter en meer verskillende steekproewe. Dit kan ook bydra tot die moontlike regulering rakende energiedrankiegebruik van tieners.

Sleutelwoorde: energiedrankies, ang, graad 10-leerders, bloeddruk, harttempo.

Bonolo Michelle Makgoba-Gr 9-Merensky Landbou Akademie-MissB's Cosmetics

Acne affects people of all ages, especially teenagers. With the high cost of living in our country, buying expensive skincare products is not always possible. Many teens suffer in silence because they can't afford treatment. Can a natural combination of Rooibos tea, honey, and cinnamon reduce the appearance and severity of acne? The homemade mask will start reducing acne within 24 hours. Studies show that honey and cinnamon have antibacterial properties that can help reduce persistent acne. Controlled Variables: Rooibos tea + honey + cinnamon combination as the main active ingredients. Ingredients Used: Honey-antibacterial and healing, Cinnamon-reduces inflammation and bacteria, Rooibos tea-rich in antioxidants, soothes skin, Lemon-added to prevent bacterial growth and increase shelf life, Herbal oil / Tissue oil-moisturizes without clogging pores. Method 1. Apply the face mask 2 times a week 2. Follow with a setting spray 3. Store in the fridge for better preservation, OR make fresh for each use New Improvement: To prevent bacteria and make the product last longer, lemon was added. MISSB COSMETICS shows that you can save money, save the environment, and take care of your skin by making your own skincare products instead of buying unnecessary, expensive ones. Natural solutions can be powerful, affordable, and accessible to everyone.

Kartina Maruta & Tatiana Olivier-Gr 10-Hoërskool Nelspruit-Slither Solutions

Die doel van hierdie ondersoek was om te bepaal watter van die drie droogmetodes naamlik vriesdroging, oondroging en uitdroging met silikakristalle, die mees effektiewe en praktiese metode was om 'n proteïengebaseerde vloeistof (rou geklitse hoendereier as model vir teengif) in 'n stabiele poeier vorm om te skakel. Die hipotese was dat vriesdroging die beste kwaliteit gedroogte produk sou lewer. Rou geklitse hoendereier was as model vir teengif gebruik. Die monster was afsonderlik met oondroging, uitdroging met silikakristalle en vriesdroging gedroog. Die droogtyd van elke metode was aangeteken en vergelyk. Die voorkoms, tekstuur en vermoë om die gedroogde produk tot 'n poeier te verwerk, was as bewys gebruik om die metode te vergelyk. Die gedroogte monster was met Combur urienestokkies verder getoets. Al die droogmetodes get die vloeibare monster suksesvol in 'n droë produk omskep. Oondroging het die korste droogtyd gehad terwyl die vriesdroging die beste kwaliteit poeier gelever het. Die monster wat met silikakristalle gedroog was, het die langste geneem en was steeds effens vogtig. Die combur-urienestokkies het aangedui dat proteïene in al drie teenwoordig was, met die sterkste proteïenreaksie by vriesdroging. Die hipotese is aanvaar aangesien vriesdroging die beste kwaliteit produk gelever het. Die resultate dui dat vriesdroging die geskikste was om die proteïene te behou. Daar is aanbeveel dat verdere navorsing met regte teengif en laboratoriumtoetse uitgevoer word. Die projek het bydrae tot groter begrip en alternatiewe berging en vervoer van teengif.

Sleutelwoorde: Teengif, Vriesdroging, silikadroging, oondroging, poeiervorm

Marika Marx-Gr 8-Merensky Landbou Akademie-Is jy Timon of Pumba?

Hierdie projek handel oor hoe verskillende soorte musiek en klanke mense met ADHD beïnvloed. Ek wou uitvind of sekere musiek kan help om beter te konsentreer en te onthou. Vier klanke was getoets: popmusiek, klassieke musiek (barok), drommusiek en bruin geraas. 26 Graad 8 en 9 leerders het aan die projek deelgeneem. 10 van hulle het ADHD gehad en 16 nie. Elke deelnemer het na die verskillende klanke geluister voordat hulle geheue-, patroonherkenning- en reaksietoetse voltooi het. Daarna het hulle gesê watter musiek hulle die beste gehelp het. 'n Spesiale borrel-eksperiment is gedoen om te wys hoe klank vibrasies patrone kan vorm. Dis gedoen om te wys hoe die vibrasies lyk wat jou liggaam en brein beïnvloed. Die resultate het gewys dat musiek verskillende invloede op die brein het. Bruin geraas en drommusiek het meestal die beste resultate gegee. Deelnemers het beter gevaar met die toetse wanneer hulle na hierdie klanke geluister het. Popmusiek het die swakste resultate gegee omdat die lirieke maklik aandag kan aftrek. Waarnemings is in klasse gedoen om te bepaal hoe leerders in klas situasies reageer tydens gebruik van bruin geraas. Dit ondersteun die finale gevolgtrekking. My gevolgtrekking is dat sekere klanke mense met ADHD kan help om beter te konsentreer. Bruin geraas en drommusiek kan nuttige hulpmiddels wees wanneer leerders huiswerk doen en studeer. Hierdie projek wys dat sekere musiek gebruik kan word as agtergrondklank tydens studie en stil werk en kan 'n positiewe invloed hê.

Remoratile Mojapelo & Precious Shipalana -Gr 7-Pepps Polokwane-Can homemade toothpaste remove stains effectively?

Many people use homemade toothpaste because it is cheap and made from natural ingredients. However, not all homemade toothpastes clean teeth effectively. The aim of this investigation is to find out which homemade toothpaste is the most effective at cleaning teeth. Different homemade toothpaste recipes will be used using common ingredients and tested under the same conditions. Their effectiveness will be compared by seeing how well they remove stains from testing surface which is an egg. The results will be recorded in a table and compared to decide which homemade toothpaste performs the best. This investigation will help show the most effective homemade toothpaste and show whether natural ingredients can be a good substitute to commercial toothpastes.

Abegirl Ngwenyama & Charisma Sambo-Gr 10-Hoërskool Bergvlam-Iron Colourmetric meter

This project demonstrates the principle behind clinical iron tests using affordable electronics. In hospitals, doctors test blood iron levels to check for anemia or iron overload using machines that cost over R500,000. The goal of this project was to see if a R600 Arduino-based colorimeter could demonstrate the same scientific principle. 28% of children in South Africa are anemic. In many rural clinics, lab results take up to 2 weeks because samples have to be sent to big hospitals. That delay can make treatment late. That is why we chose to create this project. The method used is called the "ferrozine method." When iron reacts with ferrozine reagent, the solution turns purple. According to the Beer-Lambert Law, the darker the color, the more iron is present because absorbance is directly proportional to concentration. Our device uses a white LED as a light source and a TCS34725 color sensor to measure how much light passes through the sample. The Arduino calculates absorbance using the formula $A = \log_{10}(I_0/I)$. A light-tight black box was built with the LED and sensor 2cm apart. Different iron standards of 0, 50, 100, and 200 µg/dL were mixed with reagent and placed in the box. After a 10-minute reaction time, the absorbance for each sample was recorded. The results showed a strong linear relationship. The graph of absorbance vs iron concentration gave the equation $\text{Absorbance} = 0.0023 \times \text{Iron} + 0.001$ with an $R^2 = 0.998$. This supports the hypothesis that absorbance increases linearly with iron concentration. In conclusion, this project proves that a cheap colorimeter can demonstrate how hospitals measure iron. However, it is for education only. It has ~15% error, requires liquid samples, and cannot test through skin.

Lehlogonolo Phasha-Gr 8-PEPPS Polokwane-The Effect of AI Use on Memory and Understanding

This study investigated how the use of artificial intelligence (AI) affects memory and understanding in pupils. Three groups were used: one group used AI, the second group used AI and then summarised the information, and the third group did not use AI. Pupils first completed a 25-minute test, followed by a 30-minute break with games. A surprise memory test was then given for 10 minutes. The results showed that pupils who used AI performed better overall than those who did not use AI. All groups had high memory scores, showing that most pupils were able to recall information. However, understanding scores were much lower in all groups. The group that used AI and summarised their work had very mixed results, with some pupils performing very well and others performing poorly. The study shows that AI can help improve memory, but it does not always improve understanding. Active engagement, such as summarising, may improve understanding, but only when done correctly.

Reabetswe Ramahlako-Gr 11-Merensky Agricultural Academy-PulmoDetect: TB Risk Screening

Tuberculosis (TB) is a major health issue in South Africa. An estimated 54 000 deaths occur annually. In Limpopo, TB remains a severe public health crisis, historically ranking as one of the province's leading causes of mortality. The burden is uniquely shaped by the province's mining sectors, vast rural terrain, and high cross-border migration. Unfortunately, many cases go undetected early due to misconceptions about TB transmission and symptoms. Or, clinics, particularly in high-burden regions, are often overwhelmed, leading to staff focusing on urgent cases rather than routine screening. And late detection leads to worse outcomes. So my aim in this project is, I wanted to figure out a way in which I can create an opportunity for people to learn about TB symptoms, risk factors, transmission, as well as getting them access to an 'at home' TB risk screening. And that is how I ended up creating "PulmoDetect", a TB risk screening app. I conducted research and found 10 of the most common TB symptoms and I assigned a certain number of points to each one based on severity. So all the user has to do is select the symptoms that they are experiencing and the points of the symptoms are added together to determine the user's risk level. Although it does not diagnose TB, PulmoDetect uses technology and scientific thinking to address real-world health problems by playing a role in awareness and early risk detection. The aim of the project was to try and create a solution to this problem.

Mamoso Ramokgopa-Gr 7-Thorntree Preparatory School-Smoke exposure to lungs - a comparative study between cigarettes and vape

This study investigated whether vaping is safer than cigarette smoking by comparing their visible effects using a cotton wool lung model. Three plastic bottle models were used to represent a smoking lung, a vaping lung, and a normal lung breathing clean air. Cotton wool was placed inside each bottle, and air was pulled through the cigarette and vape models using syringes for five days. The investigation observed changes in smell, colour, residue, texture, moisture, and mass. Copper sulphate was added to all the lung models to help show whether moisture from the vape aerosol was absorbed by the cotton wool, cigarette and normal lung. The results showed that cigarette smoke caused more visible changes than vape aerosol. The smoking bottle developed a strong unpleasant smell, brown discolouration of the cotton wool, and visible residue from burnt cigarette flakes. The vape bottle showed fewer brown stains and no visible residue, but the cotton wool became slightly moist, had a strong flavoured smell, showed a blue colour change where copper sulphate was present, and had a slightly higher final mass. The clean-air bottle showed no changes as it was unaffected by anything. The findings supported the hypothesis that cigarette smoke causes more visible damage in the model than vape aerosol. However, the results also showed that vaping should not be considered safe, because vape aerosol still affected the cotton wool through moisture and smell. The main conclusion is that both smoking and vaping can negatively affect lung health, and breathing clean air remains the healthiest choice.

Elizabeth Shai-Gr 7-Apex Academy Private School-My Fair Lady (bacterial growth)

Bacteria are tiny living organisms that can be found on many surfaces we touch every day. The purpose of this project was to investigate which commonly used personal item carries the most bacteria. The items tested were a cell phone, handbag, keys, and purse. Samples were collected by swabbing each item and transferring the samples onto agar plates. Each item was tested three times to improve reliability. After observing bacterial growth, the cell phone showed the highest amount of bacteria compared to the other items tested. This supports my hypothesis that the cell phone would have the most bacteria. The findings show that everyday objects can carry large amounts of bacteria and should be cleaned regularly. This project helps create awareness about hygiene and encourages families and community members to keep frequently used items clean to reduce the spread of germs.

Emma Stewart & Alison Glanvill-Gr 11-Merensky Agricultural Academy-The Five Kingdom Bandages

Traditional synthetic plasters can contribute to environmental pollution because they are not biodegradable. This project investigated whether biomaterials from the five biological kingdoms could provide a more sustainable alternative to conventional plasters. The aim was to compare algae, egg membrane, aloe vera, mushroom, and yoghurt-based plasters with a synthetic plastic plaster. The biomaterials were prepared into plaster samples and tested on potato tissue as a model for a wound. The samples were observed over five days. Tests measured healing, breathability, absorption, biodegradability, and cost per plaster. The results were recorded using observations, ratings, and graphs. Algae performed best overall. It achieved the highest healing and biodegradability ratings and had a relatively low cost. Yoghurt also showed high biodegradability, while aloe performed strongly in absorption. The synthetic plaster had the highest cost and no biodegradation. The results therefore supported algae as the most effective overall biomaterial tested. The project contributes to the

relevant community by demonstrating a possible low- cost, biodegradable alternative to synthetic plasters and increasing awareness of sustainable biomaterials. A survey also showed strong interest in the concept, with 78.9% of 19 respondents saying they would use an algae plaster if it were professionally tested and approved.

Keywords: Biomaterials, Biodegradable plasters, Algae, Wound healing, Sustainability

Izelri Theron-Gr 12-Merensky Landbou Akademie-Snuffel Sagteware

Hierdie projek ondersoek of 'n self-opgeleide diabetiese waarskuwingshond lae bloedsuikervlakke by 'n Tipe 1 Diabeet kan opspoor. Tipe 1 Diabete loop die Risiko om gevaarlike hipoglukemie te ervaar, wat nie altyd betyds opgemerk word nie. Diabetiese waarskuwingshonde is opgelei om die diabeet vroegtydig te waarsku oor die daling in bloedglukose voor dit in die gevaarsone is, maar die koste om hierdie hond professioneel op te lei is tussen R100000 en R120000 in Suid-Afrika. Die doel van hierdie ondersoek is om vas te stel hoe betroubaar 'n self-opgeleide hond hierdie veranderinge waarneem. Die hond is opgelei deur lae bloedglukose- monsters met belonings te assosieer. Daarna is die hond se reaksies op lae bloedglukosemonsters waargeneem. Die resultate het getoon dat die hond suksesvol die lae glukosemonsters kon identifiseer. Dit dui daarop dat 'n self- opgeleide diabetiese waarskuwingshond 'n waardevolle aanvullende hulpmiddel kan wees. Dit dien ook as bewusmaking van die rol van dienshonde in gesondheidsorg.

Tipe 1 Diabetes; diabetiese waarskuwingshond; reukopsoring

Life Sciences / Lewenswetenskappe:

Tshepang Makwala & Akani Mbalati-Gr 7-The King's Court Christian School-Teeth Vs Drinks

Acidic drinks such as cola and fruit juice are commonly consumed, yet their effects on tooth enamel are often underestimated. This study investigated the impact of these beverages on enamel using free-range eggshells as a safe and reliable model and examined whether simple protective measures—rinsing with water or using a straw—can mitigate damage. Eggshells were immersed in each drink for 24 hours, and changes in mass, surface texture, discoloration, and cracking were recorded. A second set of eggshells tested the effectiveness of protective strategies under identical conditions. Results indicated that cola caused the most significant enamel-like damage, with notable mass loss and visible surface cracks. Fruit juice and lemonade caused moderate effects, whereas water had negligible impact. Protective habits were effective in reducing erosion, particularly for eggshells exposed to cola, highlighting the importance of practical daily actions in preserving enamel integrity. This project provides evidence-based guidance that is simple, actionable, and relevant to the community. Recommendations such as rinsing with water, using a straw, and alternating sugary or acidic beverages with water can significantly reduce enamel erosion. These findings are valuable for learners, parents, and the wider community, promoting oral health awareness through practical, scientifically supported strategies.

Keywords: Acidic drinks, enamel erosion, eggshell model, protective habits, oral health, community awareness

Letšema Makwinja-Gr 7-Mitchell House-LetšCare Baby App

LetšCare Baby App is a mobile app designed to help parents assess their baby's symptoms and make informed decisions about their baby's health. Parents enter their baby's age, weight and symptoms, and the app provides guidance on whether the condition may require urgent medical attention or can be managed at home with general home-care advice. The app was inspired by the need for reliable and accessible health guidance for parents. Information used in the app was gathered from trusted medical sources, including the World Health Organization (WHO), UNICEF and the Mayo Clinic, with AI assisting in the planning and organisation of the project. Although the app does not replace professional medical advice, it demonstrates how technology can be used to solve real-world problems and support parents in making quicker, more informed decisions about their baby's health.

Medene Malan-Gr 8-Merensky Landbou Akademie-Gesondheid uit die grond uit

Die metode vir my projek is as volg op 1 Januarie 2026 het ek my Tritex projek begin. Ek het 100% fine coir block op 'n seil gesit en dit nat gemaak tot die grond heeltemal uitgeswel het. Die coir is met my rooi grond gemeng en gebruik as groeimedium vir aartappels. Vir die

kontrole is 'n gat in die grond gegrawe en dieselfde grondmengsel wat vir ander houters gebruik is in die gat gegooi. Die volgende houters is gebruik: motorbande, plastiese bottel, geweefde sak en 'n swart plant sak. Die aartappel moere is in onderskeie houters geplaas met ogie wat boontoe wys en die grond mengsel is bo-oor gegooi om die aartappels te bedek. Ek het die eksperiment noukeurig gedoen met dieselfde groeimedium, omgewing en weersomstandighede. Fotos en dag tot dag joernaal inskrywings toon akkuraate resultate aan. Dit kan waargeneem word in my Wetenskaplike joernaal en interpretasie van resultate. Resultate toon aan dat groen aartappel plantjies van spruite eerste ontwikkel op dag 8 by die waterbottel. Tweedens op dag 9 was plantjies sigbaar by die kontrole. Derdens is groei sigbaar by beide die motorband en geweefde sak op dag 11. Die swart plant sak het eers op dag 13 groei getoon. Volgens vraelyste op Google forms beantwoord, hou die meeste mense van aartappels maar het nog nie self aartappels geplant nie..Verere navorsing is vir interessante onthalwe gedoen en die aartappelplante is tot einde Maart waargeneem. Tzaneen het ongelooflike hoë reënval beleef gedurende die drie maande plante het verdrink, verspoel en siek geword maar nie te min steeds goeie resultate getoon: die kontrole het heeltemal verspoel, swart sak se aartappelmoere het gevrot maar die waterbottel se aartappel (nog nie heeltemal reg vir oes) was die grootse en 2de keer se plant in die swart plant sak het die meeste aartappel gelewer. Gevolgtrekking, indien aartappelmoere in verskillende houters (motorband, plastiese bottel, geweefde sak, swart plant sak en kontrole) geplant word sal die spruit eerste groei in die 10 literplastiese waterbottel dus is die houer die beste om vinnige aartappel plantjies te lewer. So plastiese bottel verseker vinniger “gesondheid uit die grond uit!”

Maths, Science & Technology / Wiskunde, Wetenskap & Tegnologie:

Favour Chauke-Gr 11-Khanyisa Education Centre-Crime Alert

Crime remains a major challenge in South African communities, including Giyani. Many residents fear victimization and lack trust in current reporting systems. Traditional reporting methods, such as visiting a police station or calling, are often intimidating, time consuming, and do not guarantee anonymity. This leads to under reporting of crime, delayed police response, and reduced community safety. To address this, a community based survey was conducted among residents and learners in Giyani to assess attitudes towards crime reporting. The results revealed a strong need for a safe, anonymous, and accessible digital reporting platform, which served as the backbone for the solution. In response, the Digital Vigilance: Crime Alert App was developed as a mobile based solution to bridge the gap between the community and law enforcement. The application was developed using JavaScript, HTML and CSS on an ASUS ExpertBook, with YouTube used as a learning resource for secure system design. It is designed to run on Android devices to ensure accessibility. The improved system now consists of two integrated portals: a public portal for anonymous reporting with automatic location tagging, case category, and photo evidence, and a SAPS admin portal to verify and manage reports and to broadcast real time crime alerts via the Digital Vigilance site, while maintaining reporter anonymity. The prototype was presented to SAPS Giyani and was positively received. Initial user testing confirmed the app is user-friendly and increases willingness to report, indicating its potential to improve reporting rates, enable faster response through location-based alerts, and strengthen trust between the community and law enforcement.

KEY WORDS Digitalization, Crime Reporting, Community Safety, Anonymous Reporting, POPIA

William Fouche-Gr 11-Merensky Landbou Akademie-Digital Street Smarts

Firewalls and security software keep getting better, but people are still the weakest link in cybersecurity. This project set out to build and test a custom phishing simulation program in Delphi, giving users a chance to apply what they know by picking out fake emails in situations that felt real. Twenty participants took part, split into three age groups: Young Students, Young Adults, and Older Adults. Participants filled out a baseline survey so we could see where their phishing detection skills stood before any training happened. From there, they worked through the Delphi simulation itself, which threw a mix of realistic fake emails at them, some styled like PayPal alerts, others like Takealot notifications, and quietly logged how they reacted to each one. Once that was done, a post-test measured whether their ability to catch phishing attempts had actually changed. Accuracy started at 52% before training and rose to 81% after, a jump of 29 percentage points. Young Students ended up with the highest score overall at 88%, while Older Adults improved the most, going from 40% at baseline up to 74%, a 34- point jump. This backs up the idea that practicing on a simulation teaches people to spot phishing better than just reading safety tips. That said, the sample was small at only 20 people, and there was no control group to compare results against, so this should be treated as an early, promising result rather than solid proof.

Khanimamba Hlane-Gr 11-Khanyisa Education Centre-Collision Vigilante!

The purpose of this project was to study satellite collisions and how they can be predicted and prevented using real satellite tracking data and orbital simulations. The project aimed to analyse satellite motion, calculate collision risk, and understand how small changes in orbital parameters such as altitude and velocity can improve space safety. In this project, real satellite orbital data was collected from CelesTrak and analysed using orbital mechanics formulas. Python programming was used to simulate satellite motion and calculate the distance between satellites over time. 3D graphs were created to visualize satellite orbits and possible collision points. Small adjustments in satellite altitude and velocity were also tested to observe how these changes affect collision risk. The data revealed that satellite collisions occur when the minimum separation between them is very small (approximately 10 km). From the simulation run, the separation distance between the two satellites resulted as 5,35 km. This is below the minimum collision threshold of 10 km and therefore indicative of a high risk. Changes in velocity on the trial runs also altered the satellite's positions along their orbital paths, causing the time and location of their closest approach to change. In conclusion, the hypothesis in this study is accepted. The data revealed that small changes in satellite orbital parameters such as altitude and velocity result in large changes in satellite position over time. The results showed that when satellites remain on the same orbital path, collisions occur, but when orbital parameters are adjusted, the satellites move far apart and avoid collision. This confirms that satellite collisions can be predicted and prevented using orbital calculations and simulations.

Hlayiseka Hlongwane-Gr 10-Khanyisa Education Centre-Academic Helper App

The project focused on the impact of the Academic Helper app. The Academic Helper app is a web based application designed to help Grade 8 and 9 scholars in Natural Sciences and Mathematics. It includes features like quiz questions, predefined notes, tutoring videos, past papers, detailed study guides, VR simulations, mind games, a personalised study planner and progress tracking. The aim of the project is to design an app that can assist Grade 8 and 9 scholars in Mathematics and Natural science using various study methods and revision tools. Questionnaires were produced and were given to various grade 8 and 9 learners at Malamulele High school. The questionnaires asked whether the learners are good in Mathematics and Natural Sciences and whether they think the Academic Helper app can assist in improving their academic performance. About 158 questionnaires were distributed. Many respondents stated that they are bad in mathematics and Natural sciences. Majority of the learners suggested that they think the Academic Helper can assist in improving their performance. After producing the questionnaires, the 158 learners tested the application. All of the 158 users stated that the app is useful and that it will be able to enhance their mathematics and natural science marks.

Fatima Khan-Gr 11-Koa Academy-MESH - Rewire your Brain

Social media has become a central part of teenagers everyday lives. From the survey I conducted, on average teenagers spend 3 -7+ hours on their phones daily. Besides procrastination, spending excessive time on one's phone negatively affects attention spans and focus. Doom scrolling and consuming large amounts of short-form content overwhelms the brain's prefrontal cortex, which results in brain fog, a lack of motivation and emotional drainage. Dopamine is a chemical that is responsible for reward and motivation. The brain chases after dopamine, it is more about the anticipation of reward than the reward itself. This is why social media is so addictive; one's brain gets stuck in dopamine loops. My project dives into neuroplasticity, which is the concept that the brain is not fixed and can be rewired with intentional effort. I created an app prototype that assesses one's attention, exercises one's working memory through a cognitive game and helps one be more intentional with their time through journaling activities. Teenagers know the problem exists and 95.2% are aware that social media is addictive and 91.7% wish they could improve their focus and attention, therefore developing an app like MESH would benefit teenagers and support their goals.

KEYWORDS: Neuroplasticity , social media, journaling, dopamine, brain fog

Nhlayiseko Mabasa-Gr 11-Khanyisa Education Centre-SafeSpace

Cyberbullying is a growing problem among young people who use social media and digital communication platforms, exposing learners to harmful messages that can negatively affect their emotional wellbeing, self confidence and academic performance. This project aimed to design, develop and evaluate SafeSpace, an artificial intelligence powered multilingual social media application that detects and prevents harmful communication before it reaches the intended recipient. SafeSpace was developed using React Native for the mobile application, Python for the backend, and the Google Gemini API for multilingual message analysis, classification and rewriting. The system classified messages as safe, slightly harmful or clearly harmful and also included an AI component for detecting potentially harmful images. Testing

involved 150 messages across the three categories and 30 images, with five participants providing user feedback on the application's performance and usability. The results showed that SafeSpace detected 44 of 50 clearly harmful messages, 48 of 50 slightly harmful messages, and all 50 safe messages. This resulted in 92% harmful message detection accuracy and 94.7% overall classification accuracy, exceeding the project's 90% target. User ratings were highest for message detection (9.2/10) and message rewriting (8.7/10), while app speed received the lowest rating (5.6/10). The findings support the hypothesis and demonstrate that SafeSpace can help promote safer, more respectful multilingual online communication. Further optimisation is recommended to improve processing speed.

Keywords: Cyberbullying, Artificial Intelligence, Social Media Safety, Machine Learning, SafeSpace

Abundance Maluleke-Gr 10-Kingfisher Private School-The effective use of Artificial Intelligence for academic performance

This investigation studied the impact of four methods of studying using artificial Intelligence. The four methods used were : direct answer, step by step explanation, Scaffolding and socratic questioning methods. These methods were tested on the academic Performance of secondary school learners in the subject of mathematics. This investigation determined which ai study method was the best performing method. Using the experimental data, The best performing method was built towards developing a web application prototype learners from grade 8 – 11 were chosen to participate in the experiment. During the sessions, participants would study for an hour applying the method of studying using ai, immediately the wrote the test for 30 minutes. The test scripts were then submitted through Whatsapp and marked and converted to percentages to the measure the performance of ai on academic performance. Using node.js, Express, html,css and javascript , a offline web application was built based the best performing method of using ai. The socratic questioning method was the best performing method at 64%, followed by scaffolding at 55% step by step at 43%, and direct answer method 29%. The performance of the ai instructional method increased as the level of cognitive ability also increased. There is a 35% difference between the worst and best method. The results show that the ai instructional methods matters more the ai tool itself , as it the primary cause of improvement in academic performance.in future a larger sample will be introduced and better software architecture will be implemented.

Eddie Mostert-Gr 11-Merensky Landbou Akademie-Trapkrag - Verlig 'n gemeenskap

Sokker is die vernaamste vorm van vermaak vir die informele nedersettings in Suid-Afrika. Hierdie nedersettings sukkel egter met onbetroubare kragtoevoer vir aandwedstryde weens beurtkrag en onwettige verbindings. Boonop, is 40% van hierdie gebiede glad nie aan die nasionale kragnetwerk verbind nie. Ek wou op 'n volhoubare manier hierdie gemeenskappe in staat stel om hulle eie krag op te wek om spreilgte aan te dryf vir hulle sokkervelde. Ek het deur middel van 'n oefenfiets getoets hoe lank 'n mens teen 'n konstante spoed moet trap om genoeg krag te kan opwek om modern LED-spreilgte aan te dryf vir die duur van 'n sokkerwedstryd. Deur 'n grafiek te trek kon ek 'n gemaklike ewewigspunt kry waar 'n mens verskeie fietse gelyk laat trap om toe te laat dat elke persoon slegs 'n uur hoef te trap om die verlangde krag op te wek. Ek het moniters gebruik wat Kilokalorieë lees en dit omgeskakel in Kilowattuur, wat die eenheid is waarin elektrisiteitsverbruik gemeet word. Deur my konstante veranderlikes konstant te hou, kon ek lineêre grafieke kry wat my met gemak in staat stel om voorspellings en vooruitskattings te maak. Ek het 'n vraelys aan individue van 'n paar omliggende informele nedersettings gestuur om hulle gevoel oor my idee te toets. Hulle terugvoer het my drang om hulle te help hernu, aangesien hulle gretig was om 'n ander vorm van kragopwekking aan te neem ten einde aan die stuur van hulle eie sokkerambisies te wees.

Rhulani Nkuna-Gr 7-Thorntree Preparatory School-Water Level Indicator:Know before it overflows

Water is an important natural resource, but it can be wasted when water tanks overflow because people do not know when the tank is full. The purpose of my project was to create a simple water level indicator that could help people monitor water levels and reduce water wastage ,my project was built using a plastic container, wires, four LEDs, resistors, a buzzer, a switch, a battery connector and a 9V battery. Wires were placed at different heights to represent different water levels. When water reached each wire, it completed the electrical circuit, allowing the LED to light up. When the water reached the highest level, the buzzer sounded to indicate that the container was full. I also researched on electrical circuits, LEDs, resistors and how water conducts electricity. A survey was conducted to investigate people's experiences with water tanks and water overflow. The results showed that the water level indicator worked successfully. The LEDs turned on as the water increased ,and the buzzed made a sound when the container reached the full level .The survey also showed that many people had experienced water overflow and would use a system like this .This project shows that a simple water level indicator can help people monitor their tanks and reduces water wastage.

Paballo Nkwane-Gr 11-Kingfisher Private School-Weighted Sequence Instability Index: A higher sensitivity alternative to standard deviation for early instability detection in heart rate signals.

The purpose of this research was to develop and test a new mathematical index (WSII) as a more sensitive alternative to standard deviation for detecting instability early in heart rate signals. It investigated whether analysing changes between consecutive heart rate values could identify instability earlier and more clearly than measuring the spread of values from the mean. A quantitative approach was followed, where the WSII was developed by focusing on weighting first differences between consecutive heart rate values, which gave greater importance to recent changes. Heart rate data were collected from credible articles and from MarulaMed clinic with the assistance of a doctor, as well as through controlled physical activity to simulate temporary instability. Python programming was used to process the data, calculate both standard deviation and WSII to compare their performance across time windows of 5 values. The results showed that WSII consistently detected instability more clearly and earlier than standard deviation, especially in datasets with irregular changes in heart rate where WSII produced clearer instability signals, with the highest values recorded being 67,76 bpm compared to 24,49 bpm for standard deviation. In stable datasets, WSII remained low, indicating that it did not falsely classify normal variability as instability. The hypothesis was supported —WSII proved to be a more sensitive measure for early instability detection in heart rate signals compared to standard deviation. The findings suggest that WSII could improve heart rate monitoring by enabling earlier identification of irregular heart rate behaviour before a health problem escalates.

Keywords: Instability, Heart rate signals, Standard deviation, Weighted Sequence Instability Index (WSII), Python programming.