

Research Abstracts for Project Study I



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Ochanomizu University Senior High School

Research Titles

高層ビルにおける風穴の有用性の検証
猫の歩き方による個体の判別
二等分線で構成される入れ子多角形

偽情報の自動判定と評価の自動表示
黒板の不快感をなくしたい

健康を考慮したコンビニ食の組み合わせ

産後うつにおける一人称体験VRの効果の検証

数列の自然数 n を整数にして $2n \geq 2$ の条件をなくしたい

場面に応じた日本語変換精度の向上

初見の画像に対する特定の人物の反応の予測
3DCGによる英語の発音学習支援
家庭において大豆ミートを味と食感の点から肉に近づける
細菌類で微生物燃料電池の電圧を上げる
ゲル化でシン・知育お菓子をつくる!
反応速度から見るカラメル化
オオカナダモの紅葉要因とその仕組み
避難生活の長期化に対応した災害食をミニマムな備蓄品で
つくる!!

化合物処理によるカイワレダイコンの耐塩性向上

家庭排水でソダテル藻っ!
植物プランクトンを家庭で培養しよう!
豆苗をおいしく再生させるには

納豆をおいしく食べたい!
米麴でつくる新・補食
納豆菌によるカビの抑制
イソチオシアネートの抗菌作用を活かした防カビ剤の開発

知られざる!ハシビロガモの板歯構造

丹田の鍛錬と動きの変化
指筋トレでピアノ上達!
匂いで集中力を高めよう!!
接着剤を利用したスペースデブリ除去装置の開発

濡れにくい靴を作るには
~靴底のパターンと排水性能の関係~

ツキノワグマによる人身被害防止のためのゾーニング案
~秋田県鷹巣盆地を事例に~

樹木を活用した防災対策
海藻類のブルーカーボンにおける効果の検証
潮流発電におけるディンプルと発電効率の関係

小型の文化財を守るスライムを利用した免震装置の開発

Verifying Wind Holes' Effectiveness of a Tower Block
Identification of Individual Cats Based on Gait Pattern
On Sequences of Nested Polygons Obtained by Angle Bisectors

Indicating the Reliability of the Information on Social Media
The Investigation of Eliminating Unpleasant Sound of a
Blackboard

Proposal for Combination of Foods Purchased at Convenience
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Sprouts

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The Method for Growing Phytoplankton in Household
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Various Liquids

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Development of an Efficient Tidal Energy Generator Using Dimples
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2U14 Shimmura Hana, 2U16 Sekine Erina

Verifying Wind Holes' Effectiveness of a Tower Block

Strong winds around tall buildings affect our urban lives. Wind holes are one of the methods to solve the problem. However, past researches on wind holes are scarce. In addition, buildings which have wind holes are limited in its number. In our research, we examined effectiveness of wind holes to reduce those wind speed. We observed the movement of wind and verified the effectiveness of wind holes through visualization and wind tunnel experiments. We concluded that wind holes are effective to weaken the power of wind. Furthermore, our experiments showed it is better to have a hole at the lower half of the building.

2K4 Ikehata Sakura, 2K10 Ogawa Cocomi

Identification of Individual Cats Based on Gait Pattern

Gait recognition is a biometric method that identifies individuals based on their walking patterns. It is the only technique that allows identification from a distance. While gait recognition has been widely studied in humans, its use for animals is still limited. This study aims to identify individual cats using gait analysis. We use DeepLabCut to extract key skeletal points from videos of walking cats. Features like stride length, gait cycle, symmetry, back posture, and walking speed are calculated and used as input for a GRU-based neural network. The model learns and remembers the gait patterns of multiple cats, then compares new data to find the most similar individual. The system is still incomplete, and there is room for improvement. This method is expected to improve non-invasive identification for feline behavior research and monitoring in the future.

2U26 Hamakado Yukina

On Sequences of Nested Polygons Obtained by Angle Bisectors

It is well established that the iterative procedure of connecting the feet of the angle bisectors of a triangle generates a nested sequence of triangles that asymptotically converges in shape to an equilateral triangle (Ismailescu and Jacobs 2006). This study aims to extend this procedure to general polygons by investigating sequences of nested polygons obtained through a specific iterative procedure based on angle bisectors. Computational simulations using Python suggest that this procedure may enable a random polygon to converge into a regular polygon.

2U24 Nakahira Noe, 2K36 Yoshihara Hanako

Indicating the Reliability of the Information on Social Media

Concerned by the increase in disinformation due to the proliferation of SNS, our research aimed to develop a system to help people understand the reliability of information. Generative AI judges the reliability of the post based on four criteria: reliability of sources, location information, previous posts of the account, and the consistency between posted image and text, and displays the ratings as percentages. At present, the program for two criteria has been completed, so we hope to continue the development and complete the construction of the intended system.

2U3 Ito Reika, 2U4 Inoue Chisa

The Investigation of Eliminating Unpleasant Sound of a Blackboard

In order to make the unpleasant sound of scratching the blackboard with fingernails or chalk inaudible without

disturbing the class, a directional speaker was used to play the inverse phase of the unpleasant sound. To turn the speaker into that directivity, we covered a headphone speaker with sponges and cardboard except in one direction, and played the inverse phase of the unpleasant sound from the speaker and the pre-recorded unpleasant sound from a tablet. However, the unpleasant sounds were still audible. This result showed that the sound cannot be cancelled out unless the waves overlapped accurately.

2U33 Miura Koharu, 2K27 Fukuda Cocomi

Proposal for Combination of Foods Purchased at Convenience Stores with Nutritional Balance

Many students buy lunch at convenience stores, and we were afraid that they were not getting enough nutrients they needed. Therefore, we decided to improve the nutritional balance by proposing health-conscious meal combinations for foods purchased from convenience stores. We developed a system that calculates the optimal combination for a single product and creates a graph. The results showed that when we eat salmon rice balls, it is better to add Yangnyeom chicken and chicken pasta salad. We found that eating these together brought calories, protein, fat, and carbohydrates close to the standard values, but salt content was higher.

2U19 Te Shiho, 2U23 Nakagawa Reina

An Investigation into the Effects of First-Person VR Program on Postpartum Depression (PPD)

This study examined the impact of a first-person VR program on postpartum depression (PPD), a common condition affecting 1 in 11 women in Japan, yet still lacking a comprehensive understanding. A literature review was conducted on both the medical aspects of PPD and the technical aspects of VR. Additionally, network analysis was performed to explore common risk factors of PPD and dementia. Although the network analysis was unsuccessful, the findings suggest that first-person VR could play a key role in enhancing the understanding of PPD and psychological impacts during the postpartum period.

2K11 Ogino Yusa

To Eliminate the Condition That $n \geq 2$ by Making the Natural Number n in Sequences of Numbers an Integer

Let the factorial sequence of the sequence $\{a_n\}$ be the sequence $\{b_n\}$. When $n \geq 2$, $a_n = a_1 + \sum_{k=1}^{n-1} b_k$ holds and the general term of the sequence $\{a_n\}$ can be obtained, but one needs to check whether $n = 1$ can be substituted into the general term $\{a_n\}$ to obtain a_1 . Therefore, I considered the condition that the general term $\{a_n\}$ for $n \geq 2$ is also valid for $n = 1$. I found that when thinking S_m as $S_m = \sum_{k=1}^m b_k$, the general term $\{a_n\}$ for $n \geq 2$ is valid for $n = 1$ if $S_0 = 0$. Furthermore, if m is extended to an integer for the S_m defined as $S_m = \sum_{k=1}^m b_k$ when m is a natural number, S_m could be considered by using Σ .

2R 28 Tomoyori Mihiro

Improving Accuracy of Automatic Transcription of Japanese Language

Although there is research on conversion systems to improve the accuracy of conversion, there is no research on how to use them. The purpose of this study is to find effective ways to use conversion systems. Based on the hypothesis that conversion learning should be separated for each scene in which the language is used, modeling experiments were conducted using example sentences with and without scene separation. The results is the model

with scene separation is more accurate when the sentence is long, so they suggest the hypothesis is valid.

2R24 Takahashi Nobuko

Prediction of a Specific Person's First Reaction to an Image

The impetus for the research was to create a system to enhance the quality of daily life. The underlying hypothesis is that by incorporating external perspectives, people's perspectives could be richer, leading to a few improvements in personal well-being. To this end, contents that reflects the thoughts of a particular individual well were collected and a system was developed that displays them by judging relevance between them and the content's subject matter of entered images. Subsequent to the implementation of the system, it was determined that enhancements were necessary in the way in which the information was processed and presented.

2K28 Fujita Hana, 2R35 Mashimo Ryo

Facilitating the Learning of English Pronunciation

When Japanese learn English, improving English pronunciation skill is challenging. We thought the conventional way to learn pronunciation with flat figures was not sufficient and it was difficult to master English pronunciation. So, we attempt to make a learning support tool that shows 3DCG models of oral movements when pronouncing English using a 3DCG software. We used Blender and Metahuman to reproduce the mechanism of inside the mouth, but we could not make the shape of mouth when pronouncing a word. If this 3DCG is completed, we would like to test the effectiveness of this method of learning pronunciation with junior high school students.

2R9 Uekita Miu, 2U9 Kawakami Kyoka

Creating Soy-based Meat with Meat-like Taste and Texture

Soy-based meat has benefits such as high protein, low calories and eco-friendliness, but has disadvantages, such as the smell of soybeans and non-meat like flavor. To improve these disadvantages, we mixed soybeans with starch, flour or rice flour and compared it to chicken thigh in terms of texture. We also evaluated it by interviewing people who eat it. The result shows that soybeans to rice flour ratio of 1:0.4 was the closest to meat and that soy-based meat containing bonito flakes was evaluated higher than without it. We conclude soy-based meat with a soy to rice flour ratio of 1:0.4 and bonito flakes most closely resemble chicken thigh.

2R3 Abe Nonoka, 2R20 Kobayashi Yuna, 2R21 Sakai Yuzuki

Increasing Voltage in Microbial Fuel Cells Using Bacteria

Microbial fuel cells are a method of generating electricity by utilizing the decomposition of organic matter by microorganisms. However, they have the problem of low voltage compared to other power generation methods, and we aim to invent a solution to this problem by using lactic acid bacteria and bacillus subtilis natto. In the experiment, the higher the amount of lactobacilli per mass of organic matter, the higher the voltage. Consequently, the voltage of the microbial fuel cells were found to be correlated with the total amount of bacteria.

2R7 Inadome Rikako, 2U37 Yamashita Minako

Creating New Educational Confectioneries with Gelation

I researched the method for creating new educational confectioneries for children, aiming to use a different chemical

reaction than the two commonly used: one is a combination of sodium bicarbonate and an acidifier, and the other is the chemical reaction between sodium alginate and calcium ions. I focused on the gelation of methylcellulose, which becomes jelly-like when heated. In my experiment, I mixed water, sugar, citric acid, and methylcellulose, and heated the mixture. The best results, with more solid gelatinization, were achieved with 3g of sugar, 5 minutes of mixing, and 1 minute and 30 seconds of heating.

2R30 Naito Yuna, 2K21 Tanizaki Hina, 2U38 Yamamoto Makana

Observation of Caramelization through Reaction Rate

Caramelization is a reaction often seen in candy making whose mechanism remains unexplained. To clarify the reaction mechanism, we tested how differences in molecular size and structure between monosaccharides and disaccharides affect their reaction rates. Judging from the mass reduction after heating saccharides for 2 minutes, disaccharides reacted more quickly than monosaccharides did. Based on this result, we thought that polysaccharides would react even more quickly than disaccharides, so we also heated polysaccharides. However, no caramelization was observed; instead, a process resembling pasteurization was observed. We concluded that caramelization is a reaction in which saccharides bind, and the larger molecular size is, the faster the reaction proceeds.

2R33 Nezu Koyomi, 2K20 Tanabe Miyu, 2K29 Fujiwara Wakana

Factor and Mechanisms of Leaf Foliage of the Egeria dense

The mechanism of fall foliage has not yet been understood. The purpose of our study is to examine the appropriate conditions for plants to turn red. We incubated the leaves of the Canada Duckweed in sugar solution and observed how much the leaves turned red. The results of the experiment showed that there was no clear relationship between the concentration of sugar in the solution in which the leaves were cultured and the degree of reddening. It also showed that reddening was suppressed when the leaves were cultured in the solution with mashed stems. We conclude that the stems are releasing some kind of fall foliage inhibitor.

2U32 Fujita Sakurako

Making Disaster Food for Prolonged Evacuation

The purpose of this study was to suggest disaster food recipes for extended evacuation that can be made with minimal stockpiled ingredients. Based on the recovery process after the Great East Japan Earthquake, the study focused on meals from the fourth day to one month after the disaster using stored food. Three dishes were prepared according to the disaster food requirements and were examined and experimented with from a variety of perspectives. The results showed that using the same ingredients repeatedly made the meals less suitable for long-term use, but adding more variety could help. The study looked at the sustainability of these meals by measuring cooking methods, waste, and water usage.

2R14 Kato Emina, 2K38 Watanabe Minami, 2U21 Na Jingen, 2U29 Fukui Sakura

Chemical Priming for Improving Salt Tolerance in White Radish Sprouts

Soil salinization is a major issue that can be a harm to crops. This study aimed to enhance the salt tolerance of white radish sprouts by pretreating its seeds with KH_2PO_4 (potassium dihydrogen phosphate) or $\text{C}_2\text{H}_5\text{OH}$ (ethanol) solutions. Germination and growth were examined in various NaCl concentrations. Results showed that KH_2PO_4

had no significant effect on salt tolerance, while C₂H₅OH increased the NaCl concentration at which seeds could grow. These findings suggest that chemical priming, particularly with C₂H₅OH, may improve plant recovery from the salt stress, offering a potential strategy for cultivation in saline environments.

2R18 Gotsill Jessica Rin, 2R6 Izutsu Haruka, 2U20 Den Hakubun

Investigating Algae Growth in Household Wastewater

Recently, the carbon-capture ability of algae has garnered significant attention as a potential mitigation to climate change. However, the wide-spread adoption of algae for such use faces challenges. This study analyzed algae growth in various types of household wastewater to assess wastewater's potential as a medium for cultivation, given its nutrient content and potential for sustainable recycling. Results indicate that while algae exposed to wastewater with high phosphorus levels exhibited higher growth rates than those in low phosphorus conditions, the eventual die-off of all samples suggests that household wastewater alone is insufficient to sustain long-term algae growth due to nutrient depletion.

2R22 Sugiyama Rio, 2U30 Fukuda Akari

The Method for Growing Phytoplankton in Household

We research the way to grow *Nannochloropsis ocularta*, a phytoplankton, because it has the potential to be utilized in a wide range of fields from global warming prevention to human health. We made some types of liquid that affect growth from kitchen waste generated during cooking, then we used these liquids to grow them. The result suggests that it is better to feed food scraps to *Nannochloropsis oculata* in their pre-decay state. Going forward we want to research what we can do to grow them effectively and how to use them after growing them.

2K25 Narita Sakura, 2U6 Otsuki Rina, 2U39 Yoshino Risa

How to Promote the Growth of Regenerative Vegetables Using Various Liquids

Regenerative vegetables which produce edible parts from discarded pieces have been received attention. In order to investigate how to promote the growth of these vegetables, we used various liquids such as carbonated water and caffeine to grow the vegetables in, and compared their growth rate and taste. The result suggested that carbonated water promoted the growth most, and we found its factor is not minerals but CO₂. The effect of caffeine was unclear, but we considered it has power of disinfection. Since there was no difference in taste between the vegetables raised in carbonated water and ordinary water, we concluded to grow regenerative vegetables using carbonated water is efficient.

2R2 Asai Misaki, 2R32 Nakajima Hazuki

The Relationship Between Natto and Its Expiration Date

We felt that natto tastes better the longer we keep it. We thought that if we could prove this scientifically, more people would like natto, which has high nutritional value. We used a kit to quantify glutamic acid for umami and a syringe for hardness to see if umami (glutamic acid) and hardness changed with the retention period of natto. The results showed that the glutamic acid increased rapidly after a certain day for umami, and there was no correlation with hardness. This result will lead to individuals being able to eat natto according to their personal preferences.

2R15 Kawakami Mayuko, 2K13 Kamioka Yuna, 2U Kimura Madoka

New Supplementary Food Using Rice Koji

This study aims to develop a supplementary food using rice koji, a traditional ingredient in Japan. Since existing options often have a strong taste and are not easy to eat, this research focuses on creating a more familiar and accessible alternative, similar to onigiri. Additionally, it seeks to provide nutrients that many Japanese people lack. Through experiments, a simple recipe was developed by mixing rice koji, tofu, water, soybean flour, and sugar. This mixture can be prepared in about five minutes, offering a convenient and nutritious option for daily consumption.

2K5 Indo Mao, 2R10 Umetsu Miku

Mold Suppression by *Bacillus Natto*

To understand how to eliminate mold safely without chemicals, we hypothesized that if the environment is favorable for *Bacillus natto*, which is a relatively strong and safer bacteria, it might inhibit mold growth when *Bacillus natto* and mold compete. We prepared agar medium with soybean flour as a nutrient source for the natto bacteria. After cultivating *Bacillus natto*, we put mold on the agar medium. We observed them at room temperature and 40°C. The result showed that *Bacillus natto* could suppress mold growth at the room temperature, but at 40°C, the agar medium dried out so it was impossible to observe.

2K7 Oshima Chiaki, 2K35 Yoon Jun, 2U35 Metoki Momona

Development of Mold Inhibitor Utilizing the Antibacterial Action of Isothiocyanate

Isothiocyanate (ITC) is a pungent ingredient contained in cruciferous vegetables. It has been shown in previous studies that ITC has antibacterial and anticancer effects, but only a few examples of these effects are utilized in our daily lives. Therefore, we first investigated the impact of ITC's antibacterial action and then studied its effectiveness as a mold inhibitor using ITC in vegetables. ITC was found to inhibit mold, but its effectiveness was not strong enough to prevent mold growth completely.

2R39 Watanabe Ayano, 2K18 Suzuki Saeko, 2U25 Haru Niwa

Investigating the Role of Lamellae Structure in the Beak of the Shoveler Duck

Shoveler ducks feed by simultaneously sucking in water and plankton, then filtering out the water using distinctive structures called lamellae in their beaks. Measurements of lamellae width and spacing revealed that spacing varies depending on the region of the beak, with the width gradually decreasing from the inner to the outer part of the beak. Furthermore, water flow tests using an experimental beak model demonstrated that larger particles are captured more efficiently. These findings suggest that the structural variation of the lamellae plays a crucial role in optimizing feeding efficiency by selectively trapping prey.

2K24 Mio Nakazawa

Changes in Movement by Tanden Training

I conducted research on the topic of Tanden training and changes in movement. The purpose of the study was to scientifically and objectively analyze and examine whether there are changes in karate movements because of Tanden breathing. One of the benefits of Tanden breathing is the strengthening of the inner muscles. I thought this would give me speed and sharpness. In this study, movement analysis was conducted using five karate movements.

In all the movements, the speed was faster after Tanden breathing than before doing it, and the trajectory of the movements was collected. As a control experiment, I compared the speed with the video taken three months before Tanden breathing, but there was no change in speed. Although the speed had increased, there was no wobble after Tanden breathing, suggesting that the stability of the movement had also increased.

2R23 Suzuki Chihiro

Improved Piano Playing with Finger Muscle Training

After years of playing the piano, I wanted to widen my hands to play the piano more easily than I do currently. Therefore, I implemented two methods of hand widening, an empirical method and an anatomy-based method, simultaneously to compare and verify which method widens the hands more. I conducted the two methods daily on the right and left hands separately and took records keeping of the degree of stretching and mistakes I made. The results showed that both methods were equally effective, as both had records of similar improvement.

2K31 Matsumura Riko, 2R34 Fujii Nao, 2R37 Masuda Rikako

The Most Effective Smell for Concentration

We explored the potential of aromas to enhance concentration, focusing on smell that are effective for a larger number of people. According to previous research, the degree of concentration can be determined by measuring the beta waves of brain waves, so we used an EEG measuring device to measure the brain waves of 22 members of the biology group when they were sensing aromas and when they were not. The result suggests that the degree of concentration increased when they smelled geranium, a floral aroma, compared to when they did not. Thus, it was found that the most effective smell for concentration was floral geranium.

2R8 Inoue Yudoku

Development of an Adhesive-Based Space Debris Removal System

Space debris, one of the problems related to the space environment, has a great effect on space activities. However, there is no formal method for its removal, and debris continues to be left unattended. To solve this problem, I conducted an experiment in which I attached adhesive tape to sponges of various thicknesses and rolled a ball imitating debris onto it from five different angles. I concluded that debris can be captured and easily removed by adding cushioning properties to mitigate the impact at the time of collision.

2R13 Okamoto Saeko, 2K12 Kato Hiyomi, 2U12 Sato Miu

How to Make Shoes Less Wet

When walking in the rain, we noticed that not only the falling rain but also water droplets flying from the soles of shoes wet our shoes. In order to reduce the amount of water flying from shoe soles, we verified the pattern of shoe soles with high drainage performance by making an eraser that imitated shoe soles move in a pendulum motion. The result suggests that the thickness and position of the shoe sole grooves had a great influence on the drainage performance. In conclusion, the one with narrow grooves and no grooves in the center was found to have the best drainage performance.

2R17 Kosehira Hanako, 2K23 Tomohiro Yuino, 2U5 Egawa Sara

Proposal for Zoning to Prevent Personal Injuries by Asian Black Bears

-Using the Takanosu Basin in Akita Prefecture as an Example-

Personal injuries caused by bears have been increasing, but the zoning system that separates bears and humans to protect humans hasn't been adequately implemented in Akita. To reduce injuries and enable coexistence between them, we interviewed experts on bear behavior and predicted that due to poor harvests, bears descend from mountains, traverse streets where people are rarely present, and enter smelly urban areas. We used GIS to overlay maps of bear sightings, injury incidents, garbage collection points, vacant houses, and population distribution. We conclude the prediction was largely confirmed, and we propose a zoning plan based on this map.

2k17 Sakamoto Mao

Disaster Prevention Measures Using Trees

It has been reported that trees prevented the spread of fires in densely build-up areas in the Great Kanto Earthquake of 1923 and the Great Hanshin-Awaji Earthquake of 1995. I began my research with the idea that trees could be used as a fire prevention measure to increase the safety of evacuation sites and evacuation routes. As a way to increase the fire prevention effect of trees, I selected fire-resistant trees and considered planting methods. Tall trees with high leaf moisture content have a longer ignition time due to radiant heat. I also found that evergreen broad-leaved trees are effective. I created planting methods to further increase the effectiveness of trees in densely built-up evacuation area and shelters.

2R5 Ishihara Mana

Verification of the Effect of Seaweeds on Blue Carbon

The carbon that coastal and marine ecosystems take in and accumulate CO_2 is called blue carbon. Since this contributes to the deterrence of global warming, I investigated the effect of seaweeds living in the seas around Japan and proposed a unique Japanese approach to carbon neutrality. The amount of CO_2 absorption was calculated using the absorption coefficient, the area of seaweed beds, and the length of cultivated ropes. The result shows that the absorption capacity of kelp, which is a type of seaweed, is not low. However, for Japan to go carbon neutral with blue carbon, it is necessary to work harder while making the most of diverse ecosystems.

2K6 Ueda Waka, 2K22 Chiba Sana

Development of an Efficient Tidal Energy Generator Using Dimples on the Propellers

Tidal current energy is completely unused in Japan, despite its significant potential as a renewable energy source that could help combat climate change. To improve the efficiency of generating systems, we decided to test the effect of dimples on propeller surfaces, drawing inspiration from how dimples enhance the flight distance of a golf ball. We created models with varying numbers of dimples and dragged them through water. The results showed that while dimples have the possibility to improve performance of the generating system, too many hindered the efficiency. Our study concludes that optimizing the number of dimples, among other factors, is crucial for maximizing power generation efficiency.

2R12 Okura Haruka, 2U2 Itagaki Haruna, 2U36 Yanagisawa Yuina

Development of Seismic Isolators Using Slime To Protect Small-sized Cultural Assets

Many earthquakes occur in Japan. To protect precious cultural assets in Japan from earthquakes, we developed a seismic isolation device with a mille-feuille structure using slime. An experiment was conducted to examine the effectiveness of our seismic isolators. A PET bottle filled with water was shaken from side to side, with and without the seismic isolator underneath. The results showed that PET bottles were less likely to fall over with the seismic isolation device. The seismic isolation device which we developed was found to be able to reduce the shaking.

2R25 Takamiyagi Yunoka, 2U17 Takahashi Reino

Study on Improvement of Water Resistance of Cellulose Nanofibers by Difference in Starch Structure

Cellulose nanofiber (CNFs), produced by nanofibrillating pulp, is light, strong, and eco-friendly, making it a potential plastic alternative. However, its poor water durability limits its use since plastics are often used where they could come in contact with water. Previous research found that blending CNFs with starch improves water resistance due to hemiacetal crosslinking between them. This study hypothesized that bonding efficiency depends on starch structure. In order to verify this, we prepared TCNF/starch films by mixing TCNF with potato starch (30% amylose, 70% amylopectin) or glutinous rice starch (100% amylopectin) at different weight ratios, and measured wet tensile strength. This experiment showed that films with 60% potato starch to TCNF had the highest water resistance.

2R4 Ishii Ryo

Creating Comfortable Space through Color

The influence of color is seen in our minds and behavior. Therefore, I focused on the color of the room to create a comfortable space. I paid attention to hue, and examined the colors of the works that received JID AWARD and color psychology. In fact, colors of Y, YR and N are often used on the walls and floors and the colors of Y and YR are mainly the colors wood. These colors have an effect to make us feel warm, bright and so on. Wood and desaturated colors are thought to make the space comfortable.

2R11 Okawa Saki, 2U22 Nagao Akane

Examination of Pork Texture Improvement Using Enzymes from Fruit By-products

Recently, food loss has become a significant issue, with a considerable number of out-of-spec fruits being discarded. To solve this problem, we focused on the enzymes in fruits, particularly the pineapple enzyme known for its ability to tenderize pork. The pineapple was separated into flesh, core, and skin, and three experiments were conducted: comparison of enzymatic activity, measurement of pork tenderness using a physical property measuring instrument, and sensory evaluation. The results showed that both the core and skin had similar enzymatic activity to the flesh, and these parts contributed to the tenderness of pork, both quantitatively and sensorially. Therefore, it is possible to effectively utilize the waste parts of pineapple.

2R26 Takeda Hinata

Differences of Scent Diffusion among Different Kinds of Fragrance

In this study, I compared the diffusion rates of four fragrances (rosemary, eucalyptus radiata, lavender, and orange) to examine the effect of molecular weight on diffusion. Fragrances were diffused using aroma sticks, and the time

it took participants to perceive each fragrance was measured at different distances. Contrary to my hypothesis, the diffusing patterns and speeds varied, and it was not possible to evaluate diffusion efficiency based solely on molecular weight. These results suggest that factors such as environmental conditions and measurement methods, in addition to molecular weight, influence the diffusing of fragrances.

2R27 Tani Mizuho

Investigation of a Numerical Method of Expressing Air Perspective

Air perspective refers to the phenomenon in which the farther away an object is, the bluer the contrast appears and the more indistinct its outline becomes. I extracted colors from pixel images using the RGB color system and confirmed two points: the farther away the object is, the more bluish it appears, and the amount of color is greater in the order of blue, green, and red. Based on these results, I assumed that by using the RGB color system and analyzing the colors in the image, it would be possible to investigate whether the air perspective method is effective or not by numerical values.

2R29 Toyoda Ruri

Creating a house that fits your lifestyle with effective use of the site

I conducted research on floor plan design that promotes comfortable living. I focused on three points : natural lighting, ventilation, and barrier-free access. I prioritized efficient living lines and considered a two-story floor plan with sufficient lighting, adequate ventilation, and barrier-free access. The floor plan was designed with ease of movement and comfort in mind, with wide doorways and strategically placed windows to enhance the residents' sense of living. This approach aims to create a home that seamlessly balances functionality and comfort.

2R36 Masui Sumire

Knowing the Price of Earthquake-Resistant Homes -You Can Afford Based on Your Annual Income-

I analyzed home prices in Tokyo's 23 wards, Shizuoka, and Miyazaki using At Home and LIFULL HOME'S to determine the land and building area affordable in each region. The result of my research suggests that the best time to buy a well-conditioned home is in one's 40s or 50s. Additionally, the average income in Japan makes it difficult to buy a home in Tokyo. Rather than land and building size, factors like transportation access and overall convenience have a greater impact on home prices.

2K1 Akazawa Rin

Pigments vs Dyes in DSSCs : Voltage and Stability

Recently, the development of dye-sensitized solar cells (DSSCs), which is a novel solar cell type that utilizes dyes, has advanced. However, its long-term stability remains a challenge. To solve this problem, I began investigating whether pigments whose durability is higher than dyes could replace dyes. I respectively fabricated DSSCs using dyes and pigments of the same color and measured both voltage and durability. Considering a comparison of total power output and operational lifespan, the results of the experiment showed that dye-sensitized cells possess superior long-term stability to pigment-sensitized ones, suggesting that pigments cannot substitute dyes.

2K2 Arakawa Miwako

The Composition of a Smartphone Photo That Subject “Baeru”

The purpose of this study was to examine the optimal composition for “baeru,” the subject in smartphone photography looks good, so that I can convey my feeling and attract others through my pictures. I focused on three compositions: a composition that places the subject in the center, a composition that creates a C-shape, and a composition that places the subject in the three dividing lines. After taking pictures in these compositions, effectiveness of the compositions with number of pixels, vanishing point, perception, and angles are discussed. It was concluded that the subject needs to be emphasized, and perspective is created for “baeru”.

2K15 Saiki Rin, 2K26 Nomura Rebun, 2U28 Hiraga Saki

Effects of Writing Materials in the Learning Environment on Concentration: A Proposal of a Method to Evaluate Materials Using “d2-R test”

In recent years, plants have been introduced into offices and other places on the ground that they have a relaxing effect. We thought that relaxing would help people maintain and improve their ability to concentrate, and we decided to examine whether natural materials can actually improve concentration or not. For this purpose, 30 high school students were divided into three groups, and each group was given “d2-R test” with different pencils and desk with different surface materials. The achievement level and error rate were calculated. No significant differences were found in the achievement level and error rate among any of the materials, suggesting that differences between materials do not have much effect on concentration.

2K37 Lin Yuka

Bringing Hungarian Dance No.5 Closer to Hungarian Folk Music

Hungarian Dance No.5 has been performed in various ways. In order to investigate what enables Hungarian Dance No.5 close to Hungarian folk music, I analyzed the structure of Hungarian Dance No.5 and identified the characteristics of Hungarian folk dance. There are three characteristics of Hungarian folk dance that can be reflected in Hungarian Dance No.5. The first is that when there is a repeating motif, it accelerates with each motif. The second is that when a motif is not repeated, it often inherits the previous tempo. The last point is that the tempo is renewed with each major musical section.

2U8 Osabe Miyu

The Effects of Fan Noise on Learning Efficiency

I found that I was more likely to study in an environment with fan noise than in an environment without noise, and I began research to determine the cause of this finding. Prior research showed that for women, white and pink noise among colors of noises improved short-term memory. Therefore, I conducted an experiment to compare the power spectral density of various fan noises and colors of noises to see which colors of noise fit the fan noise. The results of the experiment showed that fan noise fits into brown noise, not white or pink noise.

2U 31 Fukumaru Mao

The Relationship Between Chest Voice Resonance and Formants

In my daily life, I noticed that some voices are easier to hear in noisy environments, while others are not. This led

me to question its cause and I begin my research. Human voices are made up of multiple frequencies, and certain frequencies become stronger due to resonance in the vocal tract. These amplified frequency bands are called formants. Through my experiments, I found that voice loudness, measured in decibels (dB), does not determine how well voices are heard. Instead, voices with formants that are particularly strong in the 3000-4000Hz range tend to be clearer and more audible, even in noisy surroundings.

2R1 Aoki Kyoko

Representation of the First-person Pronoun “僕” in Japanese

Unlike English language, Japanese language has three types of writing systems: Hiragana, Katakana, and Kanji. In general, the meaning of the word remains the same regardless of these different representations. I'd like to explore the reason why some people choose specific representation in books, and carried a research on the written representation of the first-person pronoun “Boku” in Japanese. Referring to previous research and Japanese dictionaries, I focused on books from the Showa and Heisei eras to analyze changes in its usage rate over time. Additionally, I examined specific examples to identify notable characteristics in its usage.

2R 31 Nakao Misaki

The Differences of the Perspectives Regarding “Water” in French and Japanese Proverbs

I found it interesting that the differences in the words used in the French and Japanese proverbs reflect cultural differences. First, I defined 11 words related to water such as “sea”, “rain” and “flood”. Then I collected proverbs containing those words by looking them up in dictionaries. Analyzing them from various perspectives, I aimed to clarify the differences in attitudes toward “water” and the natural environment in each country. The research results showed that there are similarities in the way both countries see “water,” and that Japan’s natural environment as an island nation surrounded by the sea has considerably influenced the Japanese proverbs.

2K8 Otsuki Tsukushi

Characteristics of conversational and endings in Haruki Murakami’s “Kazenukawokike”

The way the protagonist in Haruki Murakami’s ‘Kazenukawokike’ speaks made me have strange feeling. To explore the cause of that, I decided to study the sentence endings. I defined sentence endings which do not necessarily make sense as distinctive endings. Several scenes were extracted from the novel to examine the proportion of distinctive endings. In conclusion, the types of sentence endings change due to the context of the conversation. The reason I felt strange is endings are neither distinctly feminine nor masculine. Additionally, the sentence endings are generally neutral, but they can give more masculine impressions depending on the person who the speaker talks to.

2U15 Suzuki Sakurako

The Usage of “Omae” and “Kimi” in “The Pillow Book” and “The Diary of Lady Murasaki”

Both *omae* and *kimi* are honorific terms used to address superiors. While reading “The Pillow Book”, I noticed a distinction in their use based on social status, and analyzed their usages by considering factors such as meanings, grammatical roles, users, referents, and their status. To verify whether this pattern was unique to the writer, Sei-Shonagon, I also examined “The diary of lady Murasaki.” The results showed that *omae* mainly referred to imperial family members, while *kimi* was used for aristocrats and court ladies. Additionally, both terms were rarely used as

pronouns. This suggests that *omae* and *kimi* were primarily nouns and used in accordance with social status in Heian period.

2U18 Tsuruoka Sayuri

The Influence of Western Mystery Novels on *The Honjin Murders*

The Honjin Murders by Seishi Yokomizo is Japan's first full-length mystery novel, and was written with reference to Western mystery novels. To clarify the specific influences of these novels on *The Honjin Murders*, I analyzed the amount of foreshadowing concerning the characters and the deductions by comparing it with *The Mystery of the Yellow Room* and *The Plague Court Murders*. The results suggest that there are two types of foreshadowing influenced by Western mystery novels: an equal distribution of foreshadowing between the criminal and other characters, and a balanced occurrence of foreshadowing concerning deductions in each part of the story.

2K19 Tagi Kizuna

Regional Differences in the Use of Laughter in Conversation

"Laughter" is considered to play an important role in conversation. The purpose of this study is to reveal whether there are any regional differences in the use of laughter in conversation. I compiled the role-play data of apology scenes recorded by National Institute for Japanese Language and Linguistics. The result shows that in the Kansai area, most of the laughter tends to come from the forgiving side, while in the Tokyo metropolitan area, most of the laughter tends to come from the apologizing side. I conclude that "laughter" plays a role of easing tension, and which side uses laughter more depends on regional differences.

2K34 Yamada Hiyori

Reasons to Become a Comedian with Focus on Women

-The Interview Research of University Students Who Belong to Comedy Club-

When I was watching the videos of a preliminary round of a Manzai contest, I noticed that its number of females is bigger than one that I saw on TV. This research aims to uncover why women decided to be a comedian. The main method of this research is interview. Interviewees are university students who belong to comedy club of their university. Through this research, it was revealed that female underwent more colorful youth than male's counterparts. In addition, TV programs which are on broadcast in their childhood influenced both male and female.

2U11 Kono Meina

Evaluation of the Former Prime Minister Ardern in New Zealand

-From student and teacher interviews at Whanganui City College-

Jacinda Ardern was a NZ former prime minister who became famous for her COVID-19 policy. How is she evaluated by the NZ citizens? This question led to my research. To clarify it, I studied in NZ and conducted interviews at a local school. In the interview, people gave a positive evaluation of her response to the mosque shooting. However, some have shared the opinions that there are critics of the 'Zero-COVID' policy among NZ citizens. Compared to previous reports, which have given her high evaluation from her policies, the interviews gave the impression that the interviewees understood inside of her.

2K30 Matsui Hina

Proposal to Promote Acceptance of LGBTQ+ into Society

Recently, I began to hear about diversity issues, including gender issues, and upon researching the topic, I found that Japan is lagging in its acceptance of LGBTQ+ people. Therefore, based on interviews with LGBTQ+ people, I considered what kind of society we should create to promote acceptance of LGBTQ+ people in Japan. To advance my research, I hypothesized that a society in which it is easier for people to choose whether to come out would promote acceptance of LGBTQ+ people. Based on the hypothesis and the results, I thought that knowing, thinking about, and respecting the dignity and individuality of all people would lead to a society that is more accepting of diversity.

2U27 Hino Aiko

Investigation of the Effect of Early Career Choices for High School Students on Their Future: Interviews at Local High School in France

I became interested in French school system after hearing my French friends complain about the fact that they have to choose their career paths early. To understand it better, I researched French school systems as a reference for Japanese school systems in terms of career choices. I interviewed two teachers and four students from a private high school in France where I belonged to, asking about 20 questions. They emphasized the importance of the baccalauréat examination, which combines high school diploma and university entrance qualification. Previous studies suggest that French people prefer jobs that interest them, so I thought that an early career selection system might be beneficial for them.

2U34 Mizuno Aki

Survey on the Benefits of Introducing Long-term Internship in Small and Medium sized Companies

This study explores the benefits of implementing long-term internships in small and medium sized companies. While previous research has highlighted many benefits for students participating in long-term internships, it has also pointed out that long-term internships pose challenges for companies. This study focuses on small and medium-sized companies that have long-term internship programs and aims to identify specific benefits for these companies. The research methodology consisted of semi-structured interviews with HR managers and university students. The results suggest that interns make a significant contribution to small and medium companies as part of their workforce and provide value beyond assumed internships.

2R38 Yumiki Reina, 2K14 Kishimoto Kyoko, 2K32 Mibe Komi

Developing a Safety Index Based Solely on Buildings

Crime rates are generally measured using security indices. However, I hypothesized that public safety could also be assessed based on the use of buildings like shops or houses. The aim of this study was to determine whether there is a relationship between conventional security index and safety assessments based solely on buildings. This study focused on individuals under 18 years old, the Higashi-Ikebukuro area. A scoring system for buildings was developed and a map based on these scores was created. Finally, I validated the results by comparing them with actual crime data. The findings showed a relationship in areas with notably high crime rates. While the method successfully identified dangerous areas, it was not effective in measuring the level of safety in the location with

lower crime rate.

2U13 Shibahara Rinka

Proposals to Improve Water Supply Businesses in Japan

Japan's waterworks projects are financed independently and managed by water charges paid by users, not by local governments. The management of water utilities in Japan is under pressure due to the fact that although Japan's population is declining, the number of households has not changed much, leading to the inability to reduce the number of pipelines and facilities needed to supply tap water. I analyzed the business conditions of municipalities facing financial difficulties using waterworks business management indices to clarify the requirements for enhancing the overall management of Japan's waterworks utilities. According to this analysis, indicators for fixed assets varied greatly from municipality to municipality. I concluded working to improve water supply facilities are essential for improving the management situation of waterworks based on these results.

2K33 Miyoshi Yuna

An Analysis on Slander Comments about Online News

The incidence of slander has been increasing with the development of the Internet. To solve this issue, I do research on the characteristics of comments on online news and propose an effective rule to reduce slander. Using a polarity dictionary that assigns positive or negative scores to each word, along with a distribution table that categorizes the content of comments as positive or negative, I assign scores to the comments. By applying this method, I found that slanders are often posted after positive comments. Considering the result of the research, I propose a rule that regulates extreme comments, regardless of their polarity, to reduce harmful content online.



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