

# **Animal Adventure: Explore Wildlife with Colorful Data Visualization and Enhancing Kids' Visual Literacy**

***Final Process Book***

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CS573-24S: DATA VISUALIZATION





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## **1. OVERVIEW AND MOTIVATION**

“Our memories are definitely shaped by the visuals we encounter in our everyday lives”. The team recognizes the incredible potential of visuals in learning, particularly for young minds. We were inspired by the idea that a simple visual could convey complex information in a way that is easy for children to understand and remember for a long time.

In the realm of education, the fusion of technology and pedagogy has paved the way for innovative approaches to engage and educate learners of all ages. In particular, the integration of data visualization techniques offers a unique opportunity to enhance learning experience by providing dynamic and interactive representation of information. This project endeavors to harness the power of data visualization in conjunction with the timeless appeal of animal learning to create an engaging and educational platform for kids.

The idea of creating visualizations for kids was not only intriguing but also incredibly exciting for us. We were motivated by the prospect of working on a project that would be both fun and impactful.

Children have an innate curiosity about the natural world, and animals often serve as captivating subjects of exploration and discovery. By combining the fascination of animal learning with the interactive nature of data visualization, we aim to not only spark curiosity but also promote essential skills in data literacy and visualization among young learners.

In this project, we designed and implemented an interactive animal learning platform that integrates data literacy knowledge. Specifically, we aim to achieve the following objectives:

### **1. Engagement**

Create an engaging and immersive learning experience that captivates children’s interest and fosters a love for exploring the natural world.

### **2. Data Literacy**

Promote skills in data literacy by providing children with delightful videos and opportunities to interact with and interpret animal-related datasets through visualizations.

### **3. Educational Content**



Develop interesting educational content that covers common animal species, habitats, and fun facts. Help kids learn different charts and how to interpret them by making connections between the shapes of the charts and the shapes of the animals.

#### 4. Evaluation (WIP)

Evaluate the effectiveness of the platform in achieving its educational objectives through user testing and feedback collection, with a focus on usability, engagement, and learning outcomes.

## 2. RELATED WORK

We were inspired by prof. Lane Harrison and several studies and projects. , including "Construct-A-Vis: Exploring the Free-Form Visualization Processes of Children." This paper significantly influenced the visualizations created by the team. One notable aspect was the authors' use of videos to present visualizations to children, a practice we also adopted. Additionally, the paper discussed the use of colors in visualizations and their impact on children's understanding. Of particular interest was the notion that text could distract or mislead children in visualizations. This paper aided the team in planning visualizations tailored to children aged 5-12, providing insights into what might engage them. Consequently, we endeavored to minimize text in our visualizations to enhance accessibility for children. [1]

'Visualization Literacy at Elementary School' discusses kid's visualization. The paper has a wider spectrum on kids Visualizations and the team found this paper more insightful. The authors elaborated that many students had problems understanding and translating graphs, this gave the time an idea to develop a video on each visualization and explain in a way kids could understand how each chart works to enhance kids' learning and understanding of the delivered visualization. The paper also used bar charts to visualize other things to attract student's attention. [2]

In addition to the literature, the team also viewed websites on Kids and data literacy in order to familiarize themselves with how to present visualizations. 'Seeing Data. (n.d.). Top 5 Things to Look for in a Visualization 'was visited and it influenced the design of the final product of our website. [3]



### **3. QUESTIONS**

Our project aims to explore and answer several key questions to foster data literacy among elementary school children.

**Question 1:** What approaches can we use to make data visualization concepts accessible to elementary school children through animal-themed content?

**Question 2:** How can we leverage storytelling in data visualization to engage elementary school children and help them understand basic data concepts?

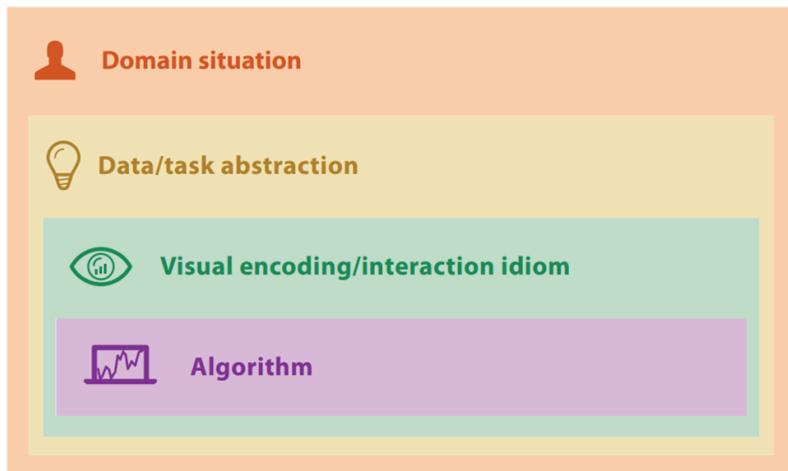
**Question 3:** How can we ensure that the animal-themed content remains educational while being engaging and fun for elementary school children?

**Question 4:** Which types of data visualizations are most effective for teaching data literacy to children?

### **4. DATA**

#### **4.1 Data Source**

The data used in this project is from reputable online platforms such as Kaggle, All Animals, and Data.gov, just to mention a few. Initially, data scraping techniques were used to gather relevant datasets from these platforms. Once the datasets were identified, they were downloaded in CSV file format to ensure easy access and compatibility with standard data analysis tools. Thorough cleaning procedures were then implemented using Python to ensure data accuracy and relevance. This included tasks such as removing unnecessary columns, handling missing values, and standardizing data formats. In order to enhance data completeness, information from trusted sources was merged with the scraped datasets. This involved cross-referencing data points with external database sources to ensure the accuracy and reliability of the data.



According to Munzner (2014), the process of data validation comprises four stages, as depicted in the diagram above. Our data underwent validation primarily concerning the 'Domain Situation'. In essence, this stage ensures that the collected data is analyzed and falls within acceptable parameters. It guided our team to verify that the data collected maintains logical consistency and relevance within the context of our study. For instance, when analyzing bee data, we used the domain situation to confirm that the data retrieved from the web aligns with the required timeframe and species expectations.

Additionally, we employed data abstraction to convert the corrected data into meaningful visualizations, aligning with our design concepts. For instance, we mapped snake data onto a line graph and ladybug data onto a pie chart. This process ensured that all necessary data was gathered before implementation. Data abstraction was applied to classified data against domain tools. The interaction idiom depicted in the figure above was not utilized, as it pertains to user interface design and interactions with visualizations.

### 4.3 Data Quality

Data quality analysis is the final step in the data stage, where the quality of the dataset is scrutinized to identify potential shortcomings, errors, and issues. To ensure data quality, several measures were taken. Firstly, all missing values were removed from the dataset, and where necessary, missing data was inferred. Secondly, inconsistent values were checked using data profiling tools to ensure data consistency. Any wrong information, such as typing errors, was corrected. Finally, metadata information was reviewed to ensure it accurately reflects the database content.



Following thorough cleansing and validation procedures, the data is securely stored in CSV format. Access to this data is facilitated through code integration, ensuring its integrity remains preserved, thereby maintaining consistency throughout its visualization on the website. Additionally, as part of our commitment to ethical data practices, we prioritized data privacy and adhere to stringent ethical standards outlined in section.

## 5. EXPLORATORY DATA ANALYSIS (EDA)

We initiated our exploratory data analysis (EDA) using matplotlib, a widely-used Python library for visualization, alongside Excel. Our visualization repertoire included a line plot illustrating snake weights, a pie chart depicting the colors of ladybugs, a bar chart representing honeycomb structures, and treemaps showcasing tortoise intelligence levels. Subsequently, we engaged in discussions to assess the suitability and accessibility of these visualizations for children's educational purposes.

Once we finalize the content to be featured on our website, we proceed with data aggregation if deemed necessary. Utilizing the initial charts as references, we translate them into visualization plots for integration onto our website, as well as for the creation of educational content for videos. In these discussions, we delve into the specifics of each plot, addressing elements such as its name, x-axis, y-axis, shape, color, and the arrangement of various components.

Here are some plots and sketches that we generated during EDA:

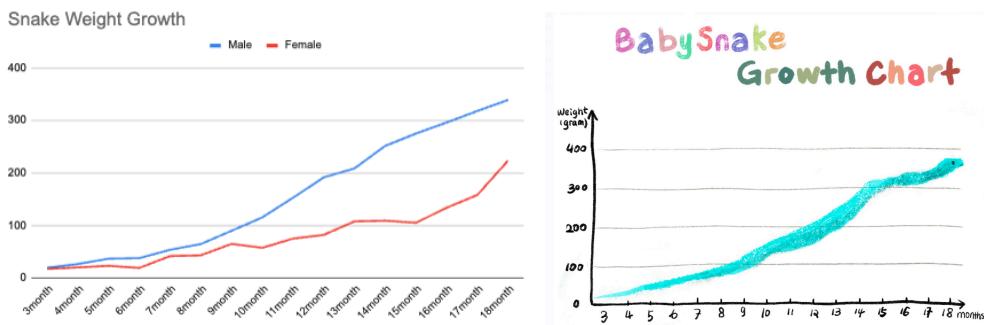


Figure 1: EDA - Snake Weight Growth Line Graph

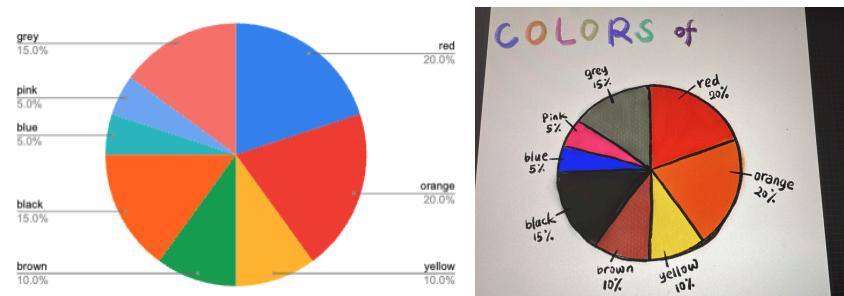


Figure 2: EDA - Colors of Ladybugs Pie Chart

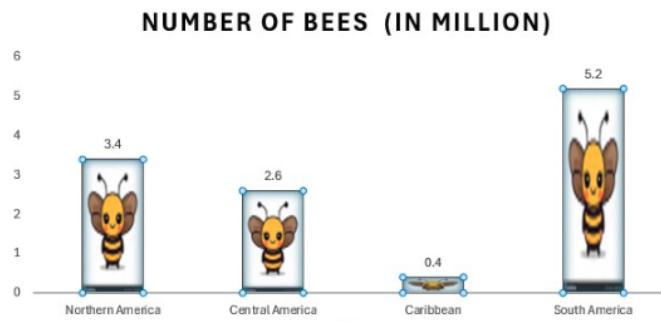


Figure 3: EDA - Bee Information Utilizing Bar Chart



Figure 4: EDA - Variation in Treemap Size and Color



## 6. DESIGN EVOLUTION

We began by creating three distinct design sketches (see Figures 5, 6, and 7) for our website, each with its own unique strengths. To develop a comprehensive initial design, we integrated the most effective aspects from these three sketches to create a fourth design, which served as the foundation for our project.

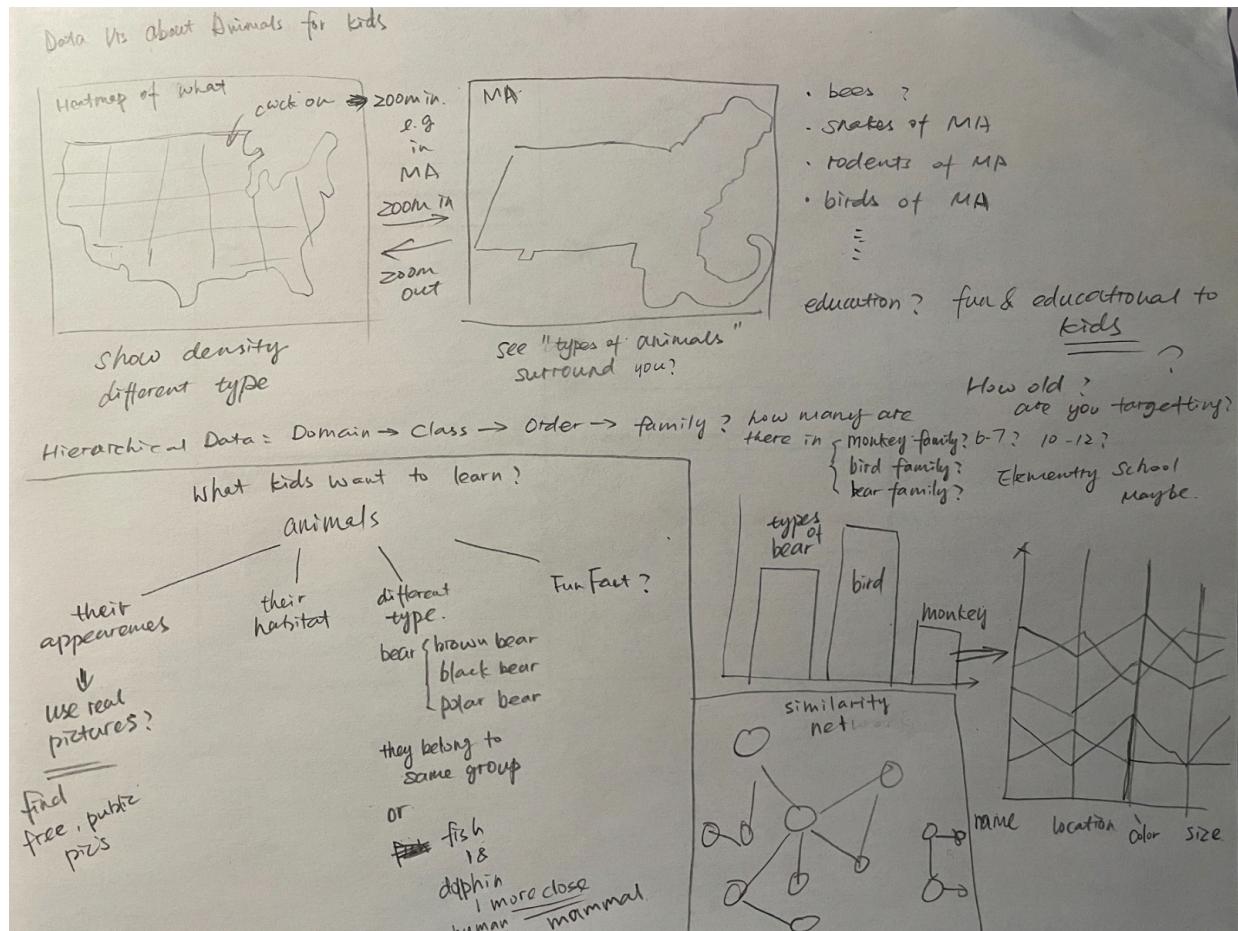


Figure 5: Brainstorm and Prototype 1



## Animal Adventure

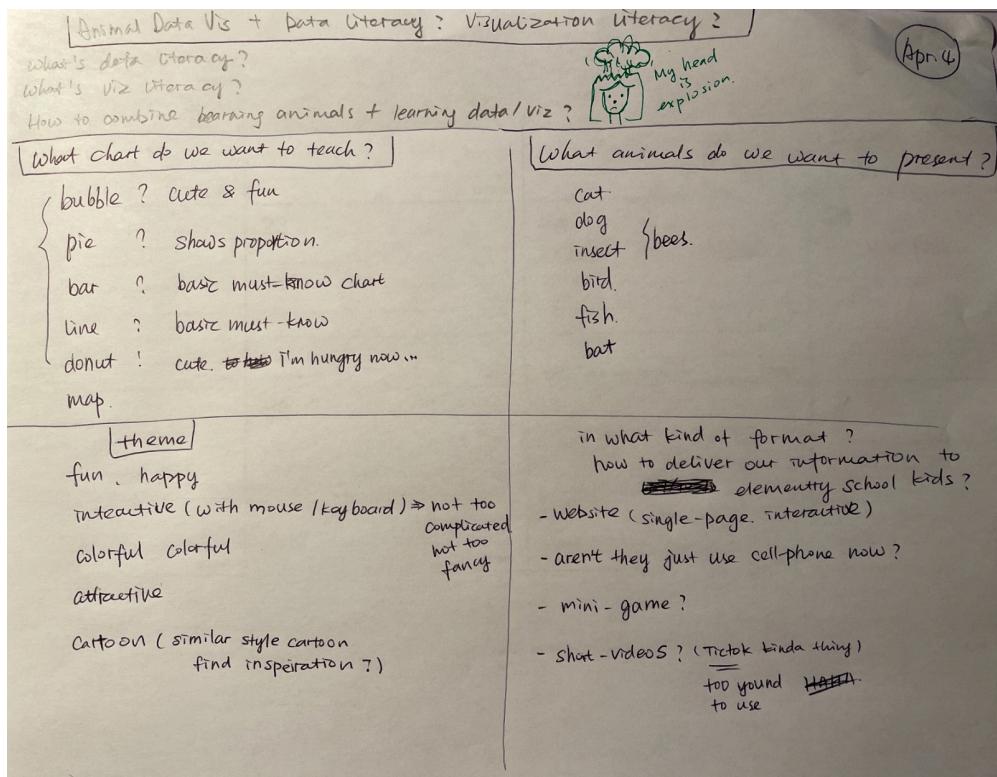


Figure 6: Brainstorm and Prototype 2

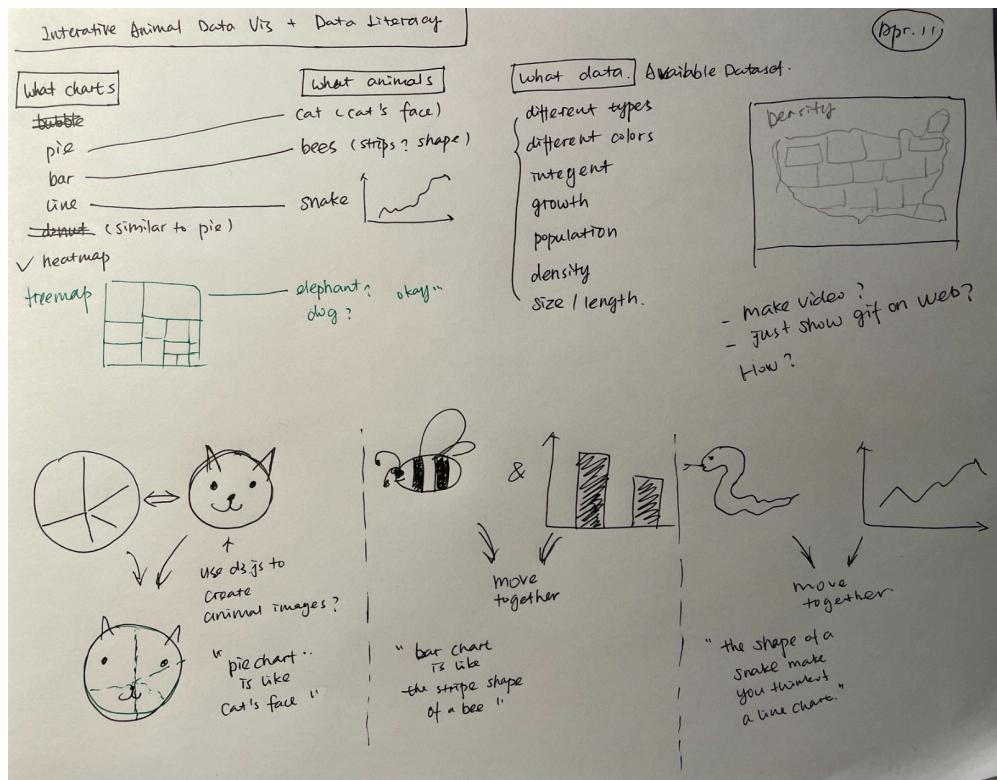


Figure 7: Brainstorm and Prototype 3



This initial design concept organized all animal visualizations on one page, with an interactive button for each visualization that linked to explanatory videos (Figure 8). We continued to adjust and refine this design throughout the course of the project.

Considering our emphasis on data literacy for children, we chose a colorful, informal design with visualization colors corresponding to each animal. This created an appealing aesthetic while maintaining educational value.

We implemented a drag-and-drop functionality allowing users to select which animal they wanted to view. Once the animal is inside the box, the visualizations (pie chart, bar chart, line chart, or treemap) corresponding to each animal, will display, along with a heatmap of the U.S. showing the population estimates over time controlled by a slider (Figure 9).

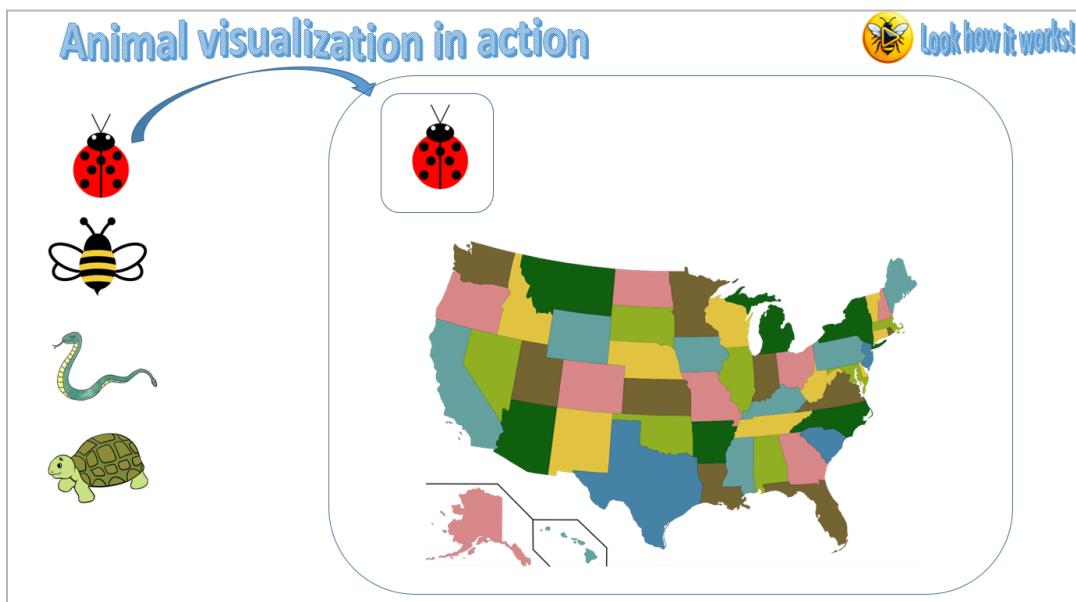


Figure 8: Initial Design for Landing Page

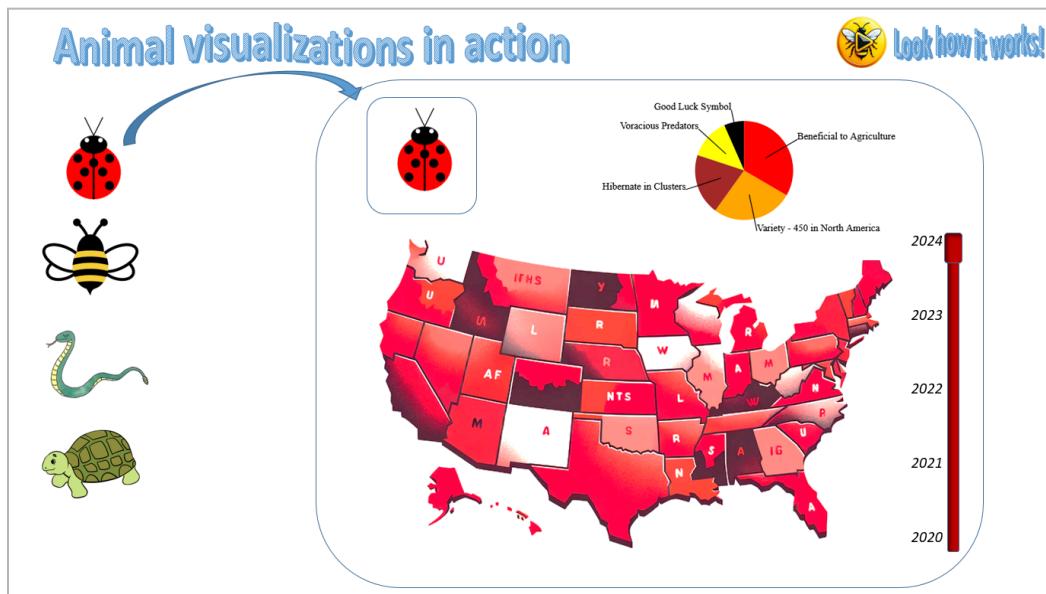


Figure 9: Initial Design for Animal Visualization Section

To better align with our goal of data literacy, we made other two changes relative to the design. The first one is relative to embedding the corresponding video directly within each animal's section rather than linking out. We also relocated the animal image and visualization to the center of the screen, with the U.S. map moved to the right side (Figure 10). This center placement draws the user's focus to the key comparison components.

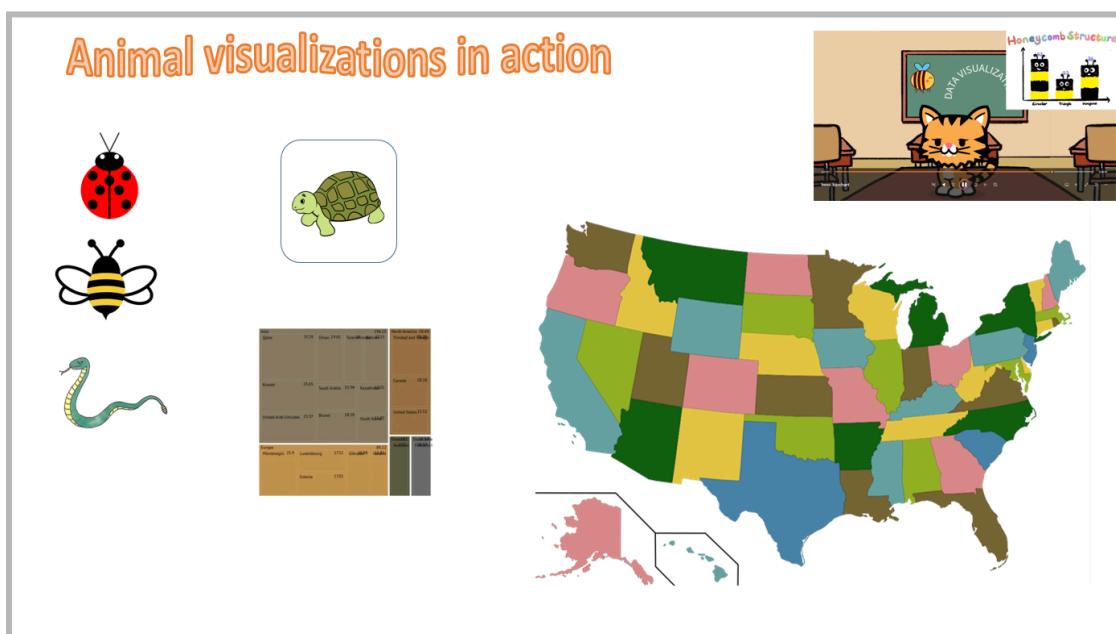


Figure 10: New Design for Animal Visualization Section



Figure 11 shows the final landing page layout, and Figure 12 the design of the animal visualization section.

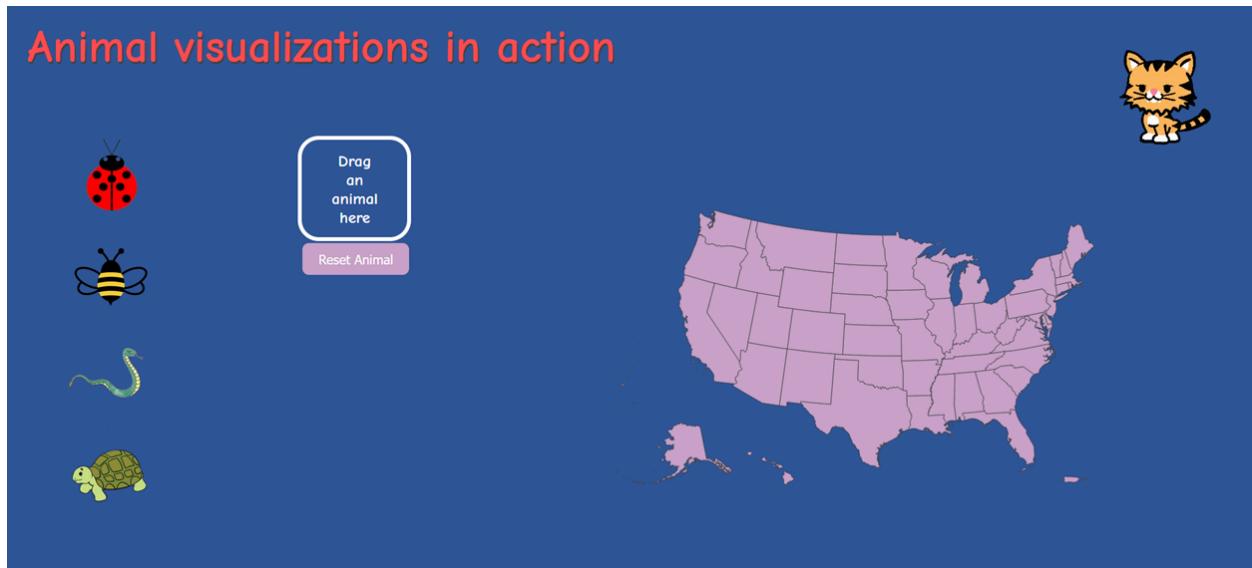


Figure 11: Final Design for Landing Page

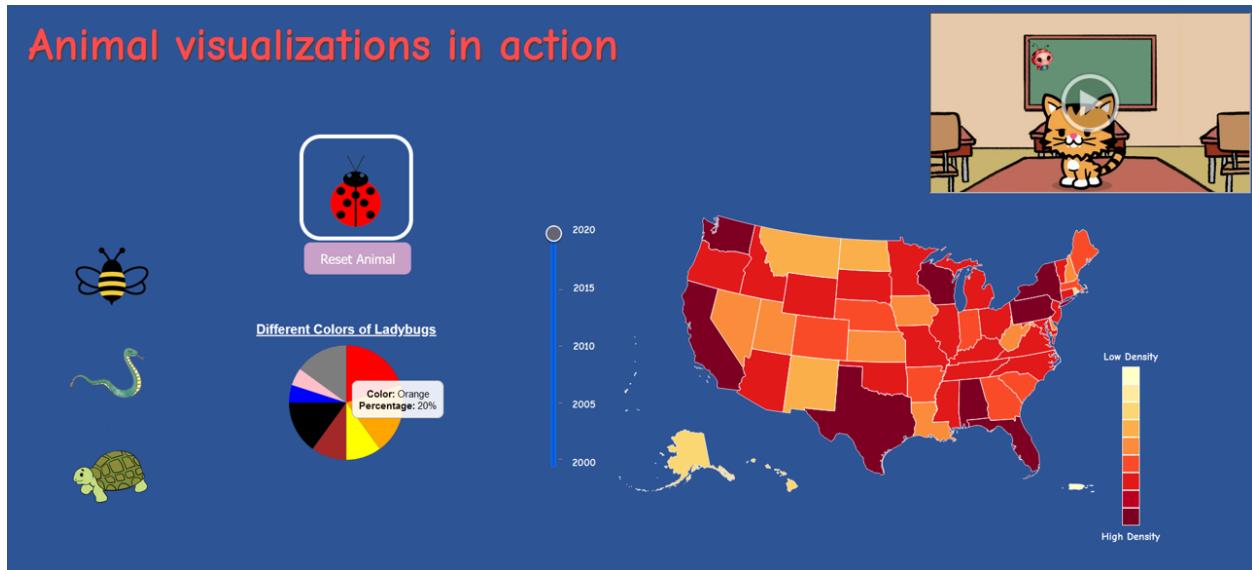


Figure 12: Final Design for Animal Visualization Section

### Video development:

In our second iteration of the website, we focused on delivering educational content in a simplified manner to enhance data literacy. We created a series of videos featuring different



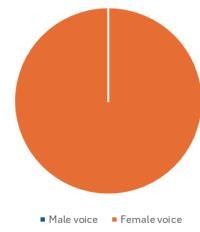
animals, each narrated with a unique storyline. Initially, we selected a baby girl named Aditi (Figure 13a) as our primary narrator, but we soon realized that involving children in the development process could bring a fresh perspective. We invited young students to participate in creating the videos, choosing the characters, and setting the tone for the narration. We presented the outcome of the children's votes, which determined the choice of character and voice for our website's educational content. After gathering input from our young collaborators, they unanimously selected a cat named Gemma (Figure 13b) to be the narrator, with an AI-generated female voice featuring a cute accent.



Figure 13a Aditi

Figure 13b Gemma

Chart 1 - Character choice



This decision, based on the preferences of our student representatives (5 students), reflects the engaging and whimsical approach they envisioned for our educational videos. Although the style might seem playful to adults, the children were delighted with the process and took great pride in their contributions. Their involvement not only drove the creative direction but also added a unique touch to the project, making it more inclusive and enjoyable for everyone involved.

The enthusiastic participation of children in this process not only provided valuable insights into the preferences of our younger audience but also offered clearer guidance for the design of both the videos and the website. Drawing inspiration from our student representatives, we crafted video sketches that reflect not only their interests but also showcase our creativity and imagination.



### Sketches for data literacy content for Pie chart using Ladybugs

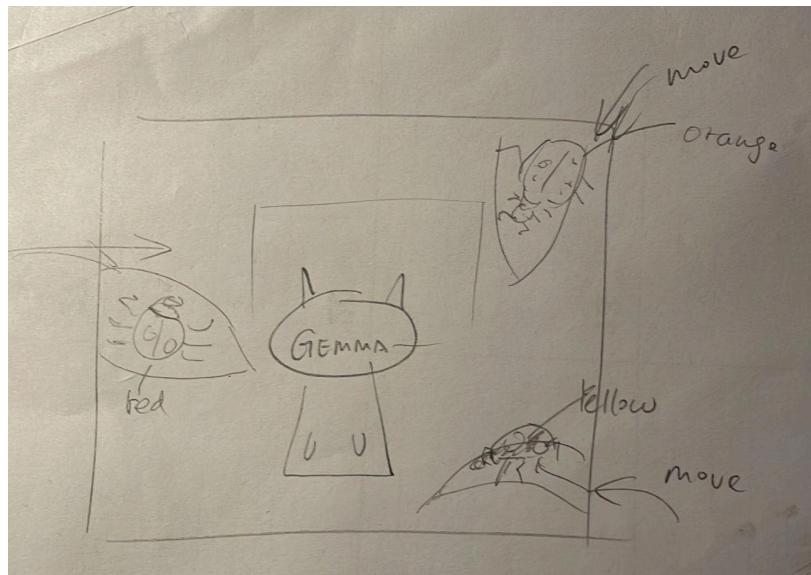


Figure 14: Sketch for ladybug video



Ladybug sketch 1



Ladybug sketch 2



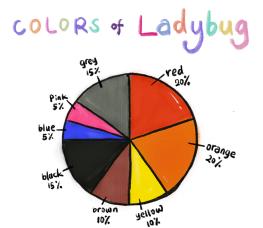
Ladybug sketch 3



Ladybug sketch 4



Ladybug sketch 5



Pie chart - sketch 1

### Sketches for data literacy content for Bar chart using Bees



Bee sketch 1

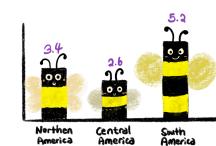


Bee sketch 2

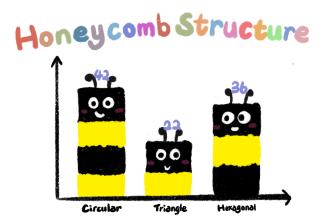


Bee sketch 3

Number of Bees  
(in million)



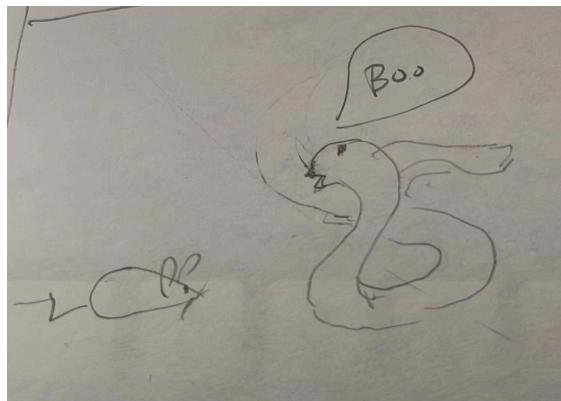
Bar chart sketch 4



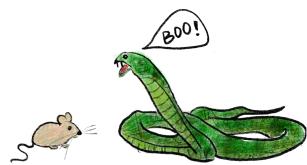
Bar chart sketch 5



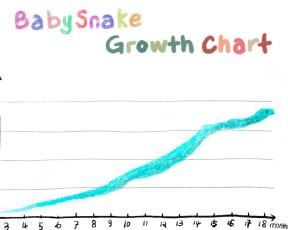
## Sketches for data literacy content for a Line chart using Snakes:



*Figure 15: Sketch for Snake video*



## Snake sketch 1



## Line chart sketch 2

## Sketches for data literacy content for a Treemap using Turtles:

# Perceived Intelligence of Turtles in the Americas



**Figure 16: Treemap sketch for Turtle Video**



## 7. IMPLEMENTATION

### 7.1 The intent

The website is designed with two primary visualizations components: graphs and videos, each aimed at presenting data related to various animals. The videos serve as tutorials for understanding the displayed visualizations, while the graphs are tailored specifically to highlight information and provide a chance to interact (play) with this website, in order to increase kids' interest.

To optimize user experience, the website is divided into three distinct sections, ensuring easy navigation for children to access their desired content without extensive searching. They are: 1. Drag and Drop Area, 2. Visualization Display Area, and 3. Tutorial Video area:

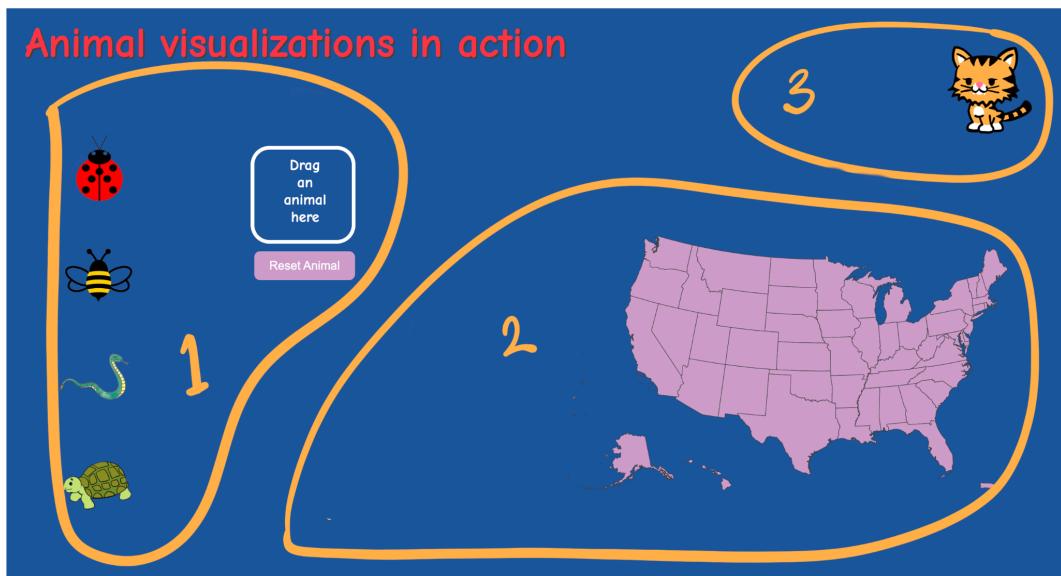


Figure 17: Three Sections of Website for Easy to Access

On the website, we designed a lineup of animal images strategically arranged to facilitate easy identification and encourage engagement, aligning with our theme of visualization for kids. Adjacent to these images is a designed “Drag Animal Here” box, complemented by a reset button. This serves as a control mechanism, allowing kids to interactively sequence play with the visualizations.



Upon dragging an animal image onto the “Drag Animal Here” box, the Visualization Display Area displays fun fact information related to that selected animal, and its density will be shown on the map of the USA.

Positioned in the upper right corner, an educational video will be displayed. These videos offer valuable educational content, providing kids with opportunities to further their understanding of data literacy concepts.

To select a different animal, kids can simply click on the “Reset Animal” button, resetting the “Drag Animal Here” area to accept a new choice.

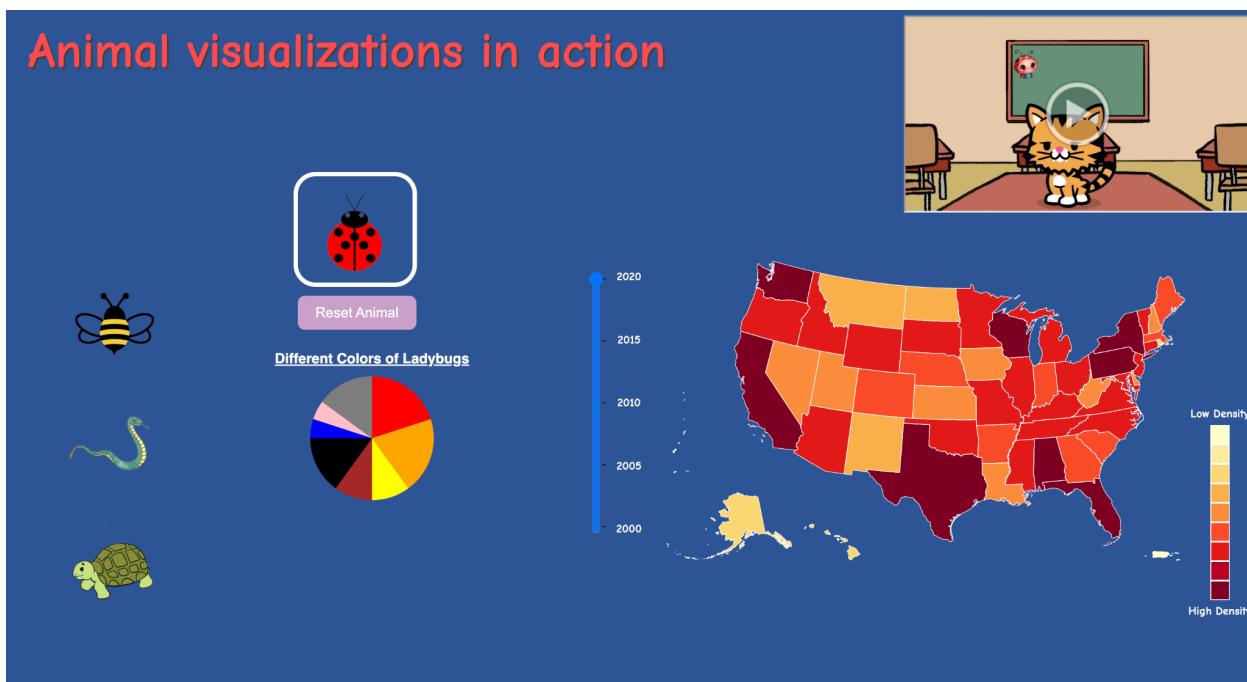


Figure 18: Three Sections of Website Details

## 7.2 Functionality

In this section, the highlighted area displays the visualizations, demonstrating how different actions or inputs influence the other visualizations on the page. This dynamic feature allows children to see the interconnectedness between various visualizations and how their interactions impact an overall analysis.



### 7.2.1 The Ladybug functionality

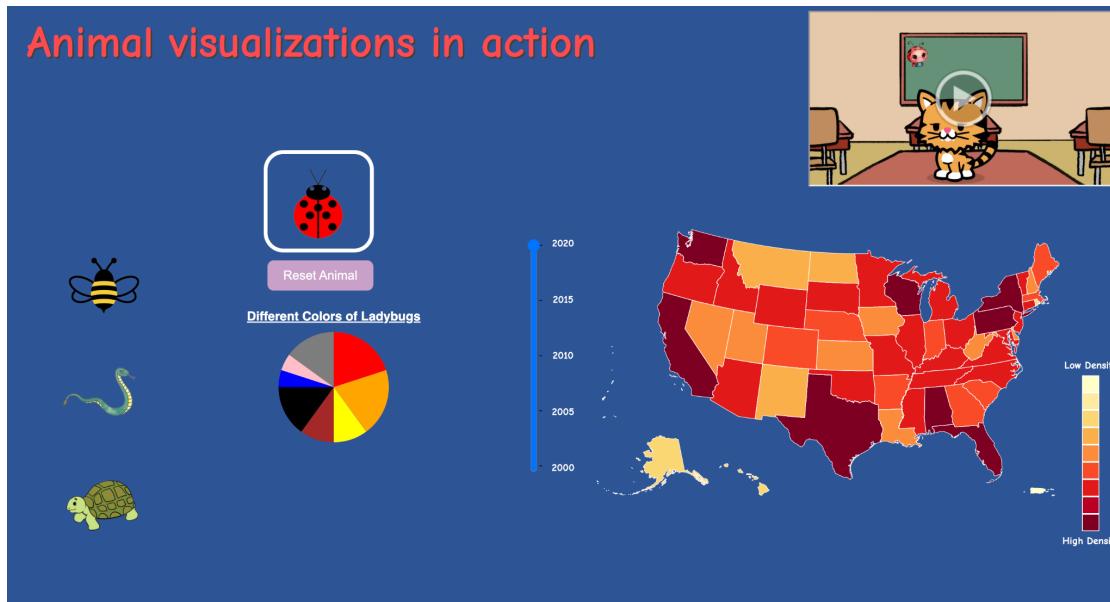
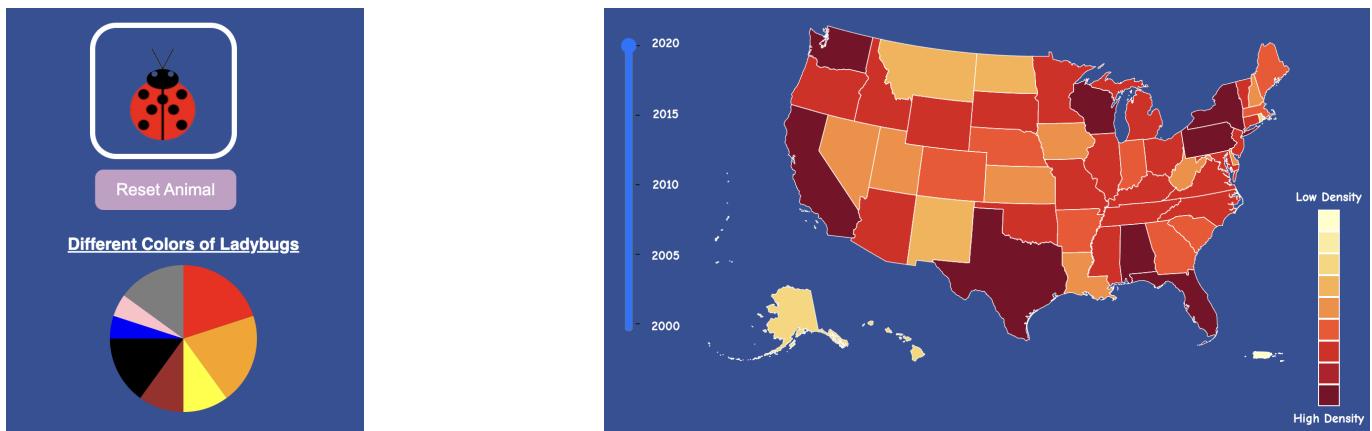


Figure 18: Pie Chart

The image presents a pie chart illustrating the distribution of ladybug colors, alongside a heatmap depicting the density of ladybugs from 2000 to 2020, broken down by county. Additionally, a video segment is included, which provides data literacy content focusing on the pie chart, using a ladybug as a visual aid. The heatmap's default setting shows 100% density.



The pie chart depicts the distribution of ladybug colors by percentage. Each segment corresponds to a specific ladybug color, illustrating the relative proportion of ladybugs that exhibit that color.

The heatmap illustrates the density of ladybug populations across various states over a specific period, as selected through a time filter. Each color gradient represents the concentration of bees, with deeper colors indicating higher bee density.

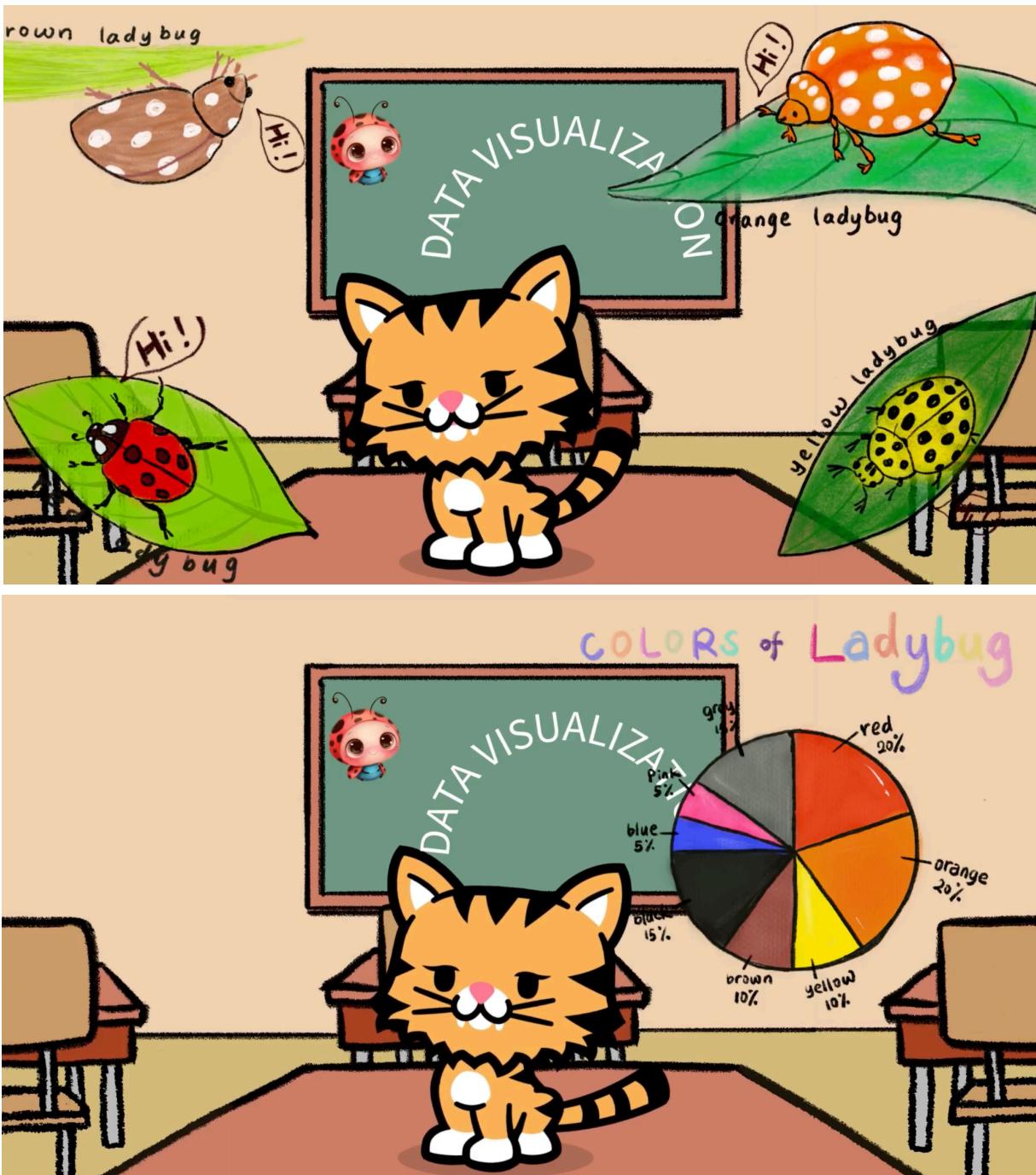


Figure 19: Video Screenshots for Pie Chart

The screenshot from the video shows Gemma explaining the types of ladybugs based on their colors. She uses this explanation to introduce the concept of a pie chart, illustrating how each color segment represents a different type of ladybug.



## 7.2.2 The Bee functionality

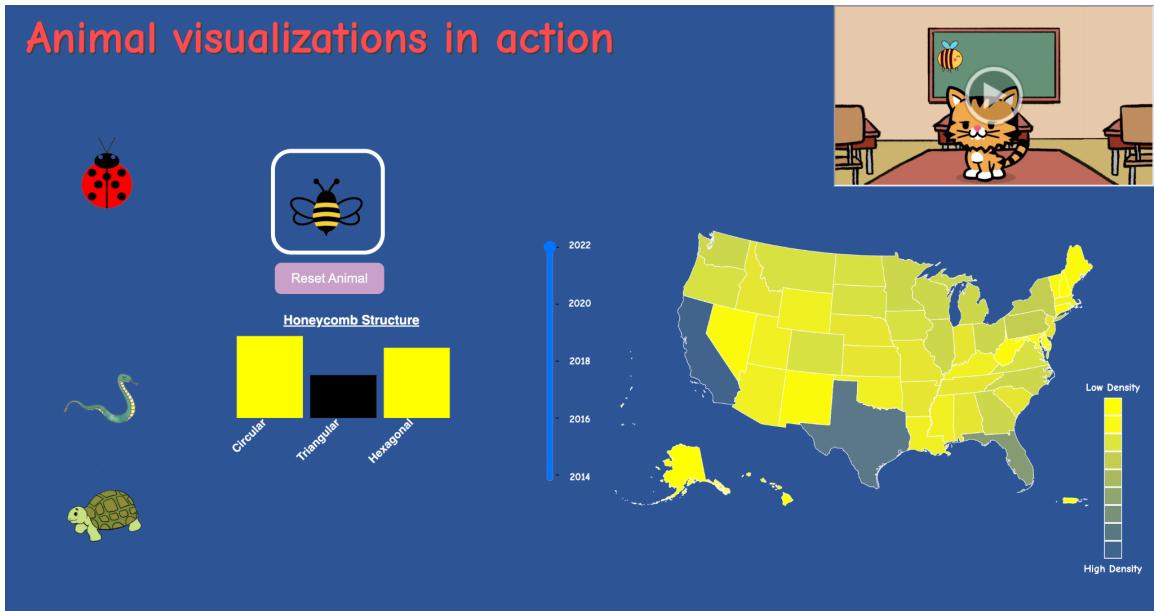
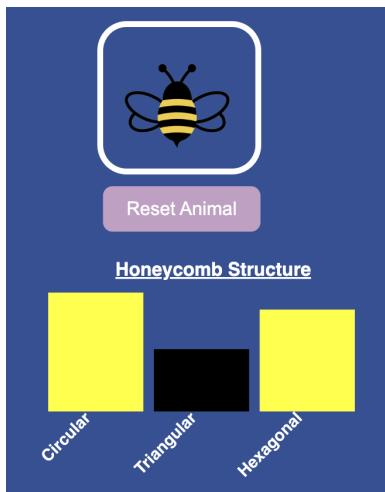
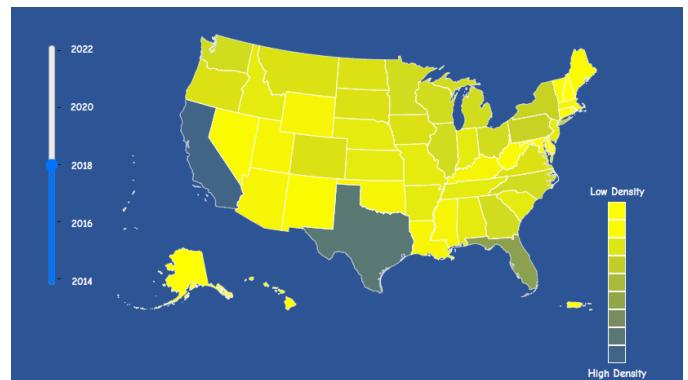


Figure 20: Bar Chart

The image presents a bar chart illustrating the different types of bees and the corresponding honey they produce, alongside a heatmap depicting the density of bees from 2004 to 2022, broken down by county. Additionally, a video segment is included, which provides data literacy content focusing on the bar chart, using a bee as a visual aid.



The bar chart shows the different types of bees and the corresponding honey they produce. Each bar represents a specific type of bee, while the length of the bar indicates the quantity or variety of honey they generate.



The heatmap illustrates the density of bee populations across various states over a specific period, as selected through a time filter. Each color gradient represents the concentration of bees, with deeper colors indicating higher bee density.

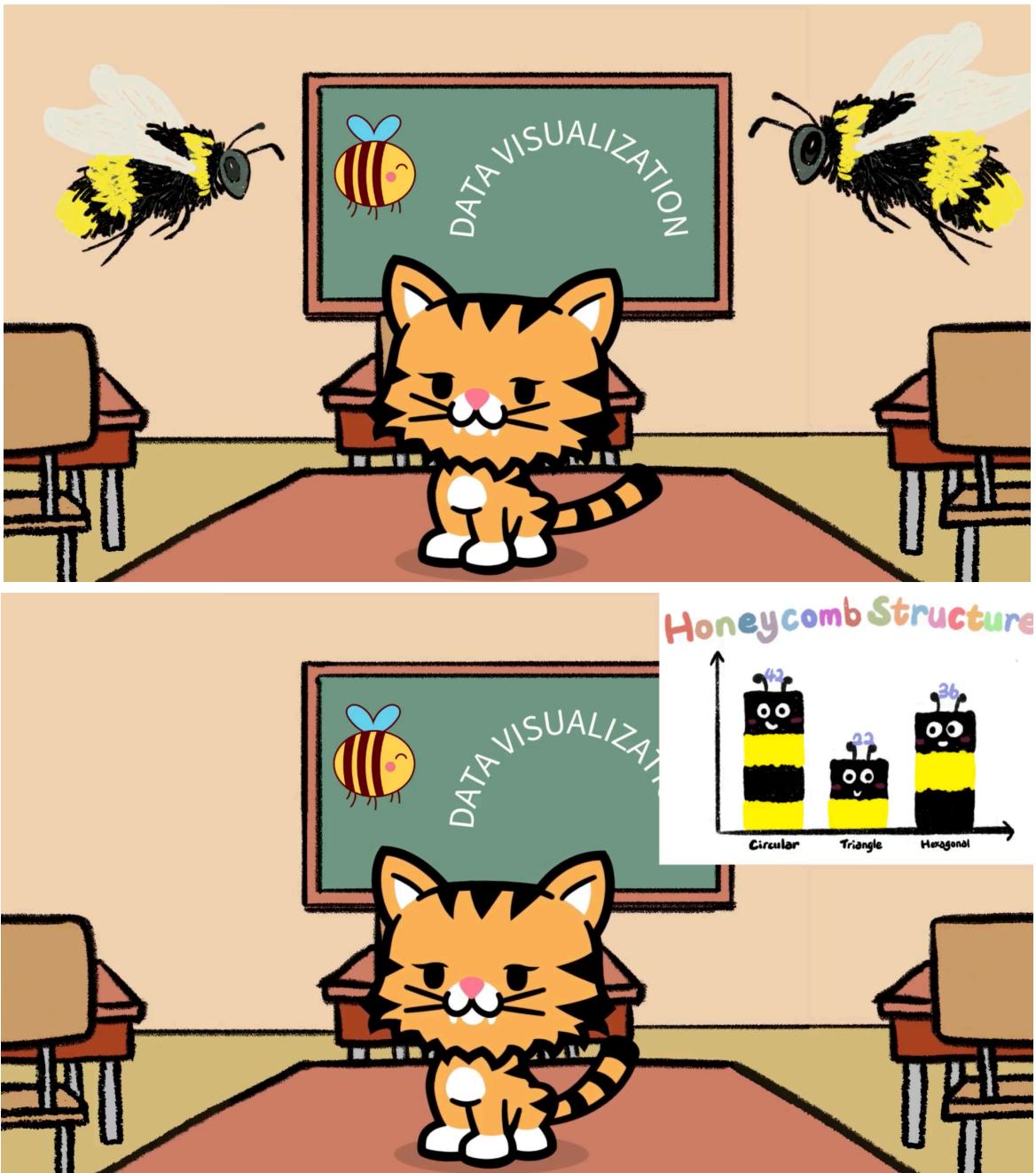


Figure 21: Video Screenshots for Bar Chart

The screenshot from the video shows Gemma explaining the data visualization using bees. She uses this explanation to introduce the concept of a bar chart, illustrating how each bar represents a different type of honey that bees make.



### 7.2.3 The Snake functionality

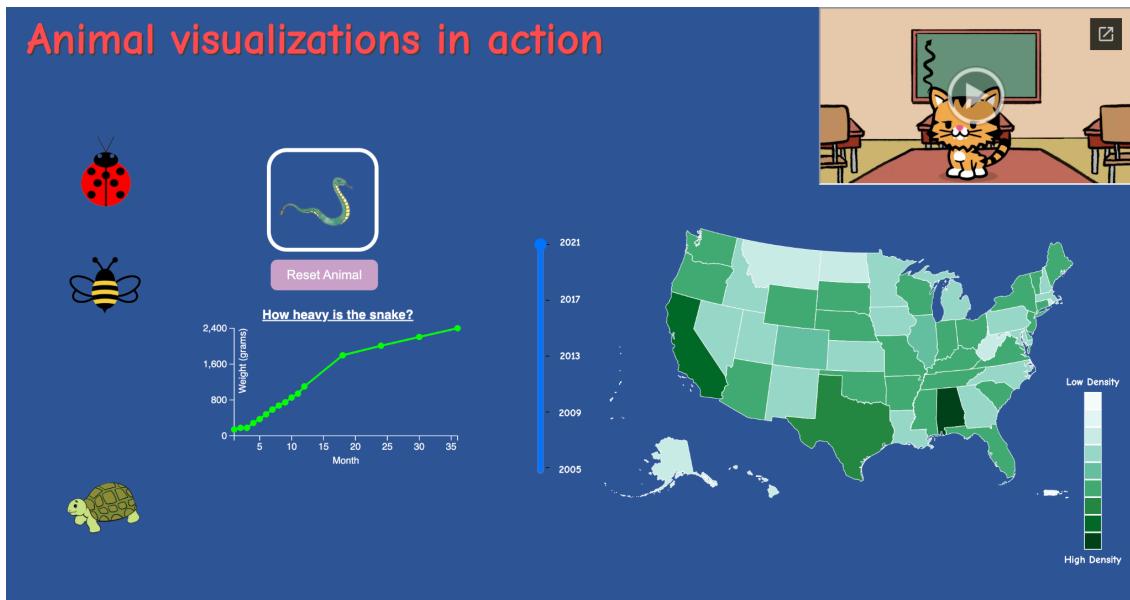


Figure 21: Line Chart

The image presents a line chart illustrating the growth trend of a snake over time and, alongside a heatmap depicting the density of snakes from 2004 to 2022, broken down by county. Additionally, a video segment is included, which provides data literacy content focusing on the line chart, using a snake as a visual aid.



The line chart shows the growth trend of a snake over time, plotting its weight (vertical axis) against the number of months (horizontal axis). This visualization demonstrates how the snake's weight changes month by month, providing insight into its growth pattern.

The heatmap illustrates the density of python populations across various states from 2000 to 2009, as selected through a time filter. Each color gradient represents the concentration of snakes, with deeper colors indicating higher snake density.



Figure 22: Video Screenshot for Line Chart

The screenshot from the video shows Gemma explaining the data visualization using snakes. She uses this explanation to introduce the concept of a line chart, illustrating how each line represents a specific trend.



#### 7.2.4 The Turtle functionality

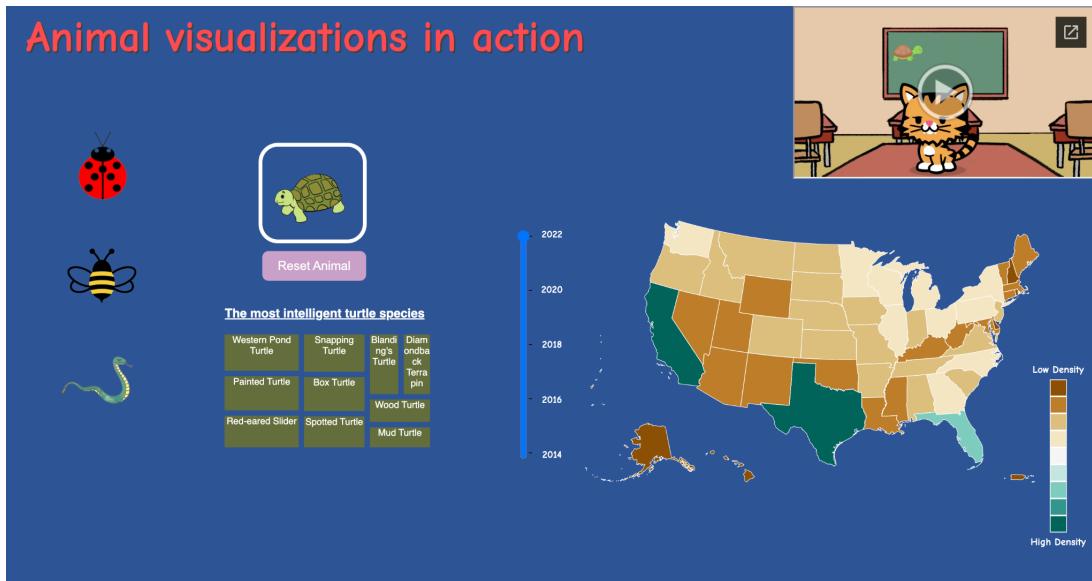
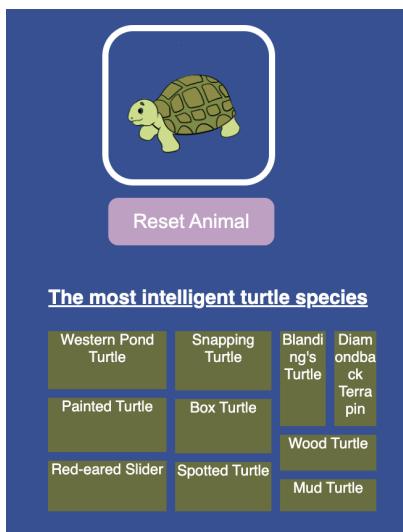
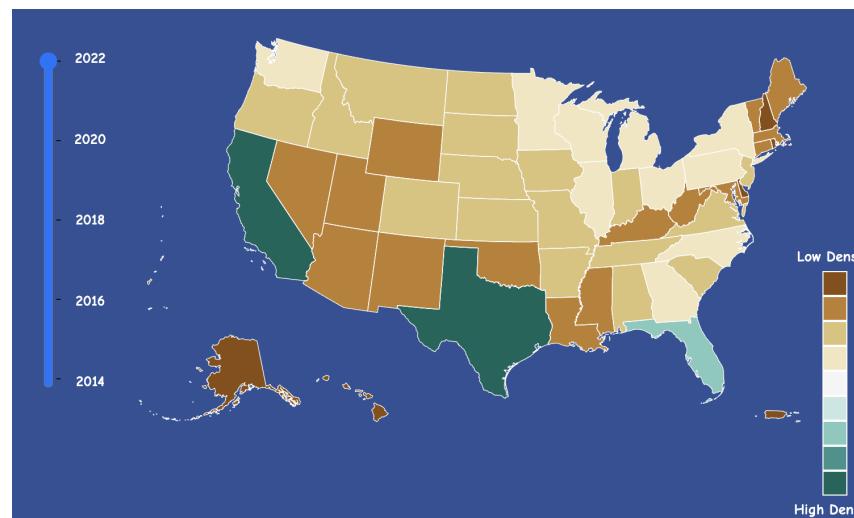


Figure 23: Treemap

The image presents a treemap illustrating the intelligence of the turtle species, alongside a heatmap depicting the density of turtles from 2004 to 2022, broken down by county. Additionally, a video segment is included, which provides data literacy content focusing on the treemap, using a turtle as a visual aid.



The treemap visualizes the intelligence rankings of various turtle species. In this representation, each square corresponds to a specific turtle species, with larger squares indicating higher intelligence rankings.



The heatmap illustrates the density of tortoise populations across various states from 2014 to 2022, as selected through a time filter. Each color gradient represents the concentration of turtles, with deeper colors indicating higher turtle density.



Figure 24: Video Screenshot for Treemap

The screenshot from the video shows Gemma explaining the data visualization using turtles. She uses this explanation to introduce the concept of a treemap, illustrating how each square represents the intelligence of each turtle species.

## 8. EVALUATION

### 8.1 Understanding Data Through Visualization

By leveraging visualizations on our website, we gained invaluable insights into the data associated with different animals. The interactive nature of our visualizations enabled us to delve into and discern data patterns and trends with greater efficiency. Furthermore, through our video content, individuals who are unfamiliar with data visualization skills could access basic but valuable knowledge. We envision this website as a crucial initial resource, offering a foundational understanding of data visualization and inspiring further exploration and study in this field.



## 8.2 Addressing our Questions

**Question 1:** What approaches can we use to make data visualization concepts accessible to elementary school children through animal-themed content?

To make data visualization accessible to children using animal-themed content, we employed the following approaches:

**Visual representation:** Used relatable animal-themed imagery to represent various types of data visualization. For example, a ladybug for a pie chart, a bee for a bar chart, a turtle for a treemap, and a snake for a line chart. This visual analogy helps children to associate animal characteristics with data visualization concepts.

**Interactive Activities:** Created interactive areas, like the "Drag Animal Here" box, where children can drag and drop animal images to explore corresponding data visualizations. This approach encourages hands-on engagement and learning through play.

**Simplified Explanations:** Used simple language and clear visuals in educational videos and tutorials to explain the data visualization concepts behind each animal representation. This approach makes complex ideas more accessible to children.

**Question 2:** How can we leverage storytelling in data visualization to engage elementary school children and help them understand basic data concepts?

To leverage storytelling in data visualization for children, we utilized the following:

**Animal Stories:** Crafted stories around animals that explain their relationship to the data visualization type they represent. For example, we made up a story about how the ladybug's shell resembles a pie chart, encouraging children to explore different data segments.

**Contextual Learning:** Incorporated stories that connect the data to real-life situations or fun facts about animals. By presenting data in a context that children can relate to, we made learning more meaningful and memorable.



**Narrative-Driven Videos:** Created videos that use storytelling to guide children through the process of learning about data visualization. These videos illustrated how different animal-themed data visualizations are used in various scenarios, adding a narrative element to the learning experience.

**Question 3:** How can we ensure that the animal-themed content remains educational while being engaging and fun for elementary school children?

To keep the animal-themed content educational, engaging, and fun for elementary school children, we considered these strategies:

**Balancing Education and Entertainment:** Ensured that the content includes both educational and entertainment elements. Interactive activities, playful design, and engaging storytelling can maintain children's interest while they learn about data visualization.

**Structured Learning:** Organized the website into sections that guide children through a structured learning process. This helps maintain focus and ensure that educational content is delivered effectively.

**Encouraging Exploration:** Provided opportunities for children to explore and interact with the content. This included interactive elements like the "Drag Animal Here" box, where they can learn by experimenting with different animal-themed visualizations.

**Diverse Content Formats:** Used a combination of videos, interactive visualizations, and text-based explanations to cater to different learning styles. This diversity ensures that children stay engaged and absorb the educational content effectively.

**Question 4:** Which types of data visualizations are most effective for teaching data literacy to children?

Here are the most effective data visualizations from our brainstorming session, which can also be represented by animal themes for teaching data literacy to children:



**Pie Charts:** Represented by ladybugs, where each segment of the shell resembles a pie chart. Ideal for teaching children about proportions and percentages because they are also simple and visually intuitive.

**Bar Charts:** Symbolized by bees, with their striped abdomens mirroring bar charts. These are great for showing comparisons among categories because they are straightforward and easy to understand.

**Treemaps:** Depicted by turtles, whose shell patterns resemble treemaps. This visualization type helps children understand hierarchical data and how parts relate to a whole.

**Line Charts:** Illustrated by snakes, with their long, winding bodies representing line charts. These charts are effective for demonstrating trends and changes over time and also be useful for teaching concepts like growth or decline.

### **8.3 Effectiveness and Future Work**

Overall, this visualization project proved to be effective in conveying complex data in an accessible and engaging manner for children. The interactive features, such as the drag-and-drop function and dynamic map responses, enhance user interaction and comprehension of the data presented. The educational videos provide a seamless bridge hands-on experience with informative videos of data literacy.

Moving forward, we plan to incorporate an evaluation function or conduct focus groups with children and educators to better assess the effectiveness of this platform.



## 9. APPENDIX

### 9.1 Video Scripts

#### LadyBug

Hey there, young explorers! It's Gemma, and I will teach you something super cool—data visualization! But wait, don't worry, it's not as scary as it sounds. We'll learn about it using something we all love — ladybugs!

Ladybugs are like nature's little superheroes. They come in all sorts of colors, from bright red to sunny yellow, cheerful orange, and even more! They are like little works of art fluttering around our gardens!

Now, let's dive into the exciting world of data and graphs. Ever heard of a pie chart? No, not the yummy kind you eat! A pie chart is a special way of showing information using colorful slices, just like slices of a pie. Each slice represents something different, like the colors of our ladybug friends!

Here comes the fun part! I've created a special ladybug pie chart just for us. Let's take a peek: Red Ladybugs, Yellow Ladybugs, Orange Ladybugs, and other Colors.

Wow, look at all those colors! Each slice of the pie represents a different color of ladybug. But do you know what's really cool? We can learn so much by looking at this chart. Can you guess which color of ladybug is the most common? Or which one is the rarest? Isn't that amazing?

So, my dear friends, that's the magic of data and graphs! We can learn so much about the world around us by looking at charts. And hey, next time you spot a ladybug in your garden, you'll know just how colorful and special they really are!

Well, it's time for me to take a little nap. Until next time. happy exploring!

#### Bees

Hey there, young explorers! It's Gemma again, ready for another adventure? I will teach you something super cool—data visualization! But wait, don't worry, it's not as scary as it sounds. We'll explore it through one of nature's most beloved creatures—bees!

Bees are like nature's little magicians, aren't they? They fly from flower to flower, collecting pollen, and turning those simple ingredients into delicious honey!



Now, let's buzz into the exciting world of data and graphs. Ever heard of a bar chart? Well, think about the stripes on a bee's abdomen. They look just like the bars of a graph, don't they? A bar graph is a special way of showing information using bars, each one represents something unique, like how many bees belong to different families.

Here comes the fun part! I've created a special bee bar chart just for us. Let's take a peek: Why do you think these bars vary in height?

That's interesting! Each bar in the chart denotes a different species of bee. But what's really fascinating? We can learn so much by looking at this chart - like which species are the most common or the rarest. Isn't that amazing?

So, my dear friends, that's the beauty of data visualization! With charts like these, we can uncover hidden patterns and learn so much about the world around us. And hey, next time you see a busy bee in your garden, you'll know how magical they truly are!

Well, my roommate is calling me for treat time! Until next time, happy exploring!

## **Snakes**

Hey there, young explorers! It's Gemma again, ready for another adventure? I will teach you something super cool—data visualization! But wait, don't worry, it's not as scary as it sounds. We'll explore it through one of the most beautiful creatures—snakes!

Picture a world without snakes, it'd be a chaotic scene overrun by rodents, wouldn't it? That's because snakes play a crucial role in balancing the ecosystem.

Now, let's dive into the exciting world of data and graphs. Ever heard of a line chart? Well, think about the sleek and sinuous form of a snake - it's quite similar to a line chart, right? A line chart helps us understand information over time, much like tracking the weight of a snake from its early stages to maturity.

Here comes the fun part! I've created a special chart just for us. Let's take a look: What patterns do you observe? How does a snake's age correlate with its weight?

Isn't that fascinating? We can learn so much by just looking at this.



So, my dear friends, that's the beauty of data visualization! We can learn so much about the world around us by just looking at graphs. And remember, the next time you encounter a snake, appreciate its vital role in maintaining ecological balance—and keep a safe distance!

Well, it's time for me to play with my robo-mouse. Until next time, happy exploring!

## Turtles

Hey there, young explorers! It's Gemma, ready for another adventure? I will teach you something super cool—data visualization! But wait, don't worry, it's not as scary as it sounds. We will explore it through one of the ancient creatures—turtles!

Are you intrigued by dinosaurs? Did you know that turtles coexisted with them? Ever wondered how these resilient creatures have thrived through the ages? Was it because of their intelligence or something else altogether?

Now, let's dive into the exciting world of data and graphs. Ever heard of a treemap? Well, this graph looks similar to the turtle's shell. The treemap is a special way of describing information much like showing the intelligence of turtles across different categories.

Here comes the fun part! I've created a special chart just for us. Let's take a look: Notice how the size of each square reflects the intelligence of specific turtle species.

Isn't that fascinating? We can learn so much by just looking at this.

So, my dear friends, that's the beauty of data visualization! We can learn so much about the world around us by looking at graphs. And hey, next time you see a turtle, you'll appreciate its magnificence, much like a treemap.

Until our next purr-fect rendezvous, keep your curiosity alive!



## 10. REFERENCE

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