

Technical Paper

Creating a smart chatbot to motivate young adults to dispose of their plastic more responsibly

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Welcome to the Technical Paper, an extension of the Academic Paper. This paper will assist in telling the tale of how the prototype was created, as well as its inner workings, testing rounds and iterations.

This prototype will be created using two distinct applications. Python, a programming language, is used to build the text-based chatbot, which will be accessed via an app window. The chatbot will use a json file as a data storage and transformation format, as well as the Natural Language Processing (NLP) module to help it interpret and respond to user input. Figma, a collaborative interface design tool, will be used to create the application. The application is designed for and displayed on an iPhone 13 with the screens linked together, making the application interactive. The chatbot and application, however, are not linked, but are shown next to one other so that the impacts can be viewed.

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DATA COLLECTING

Data must be collected before the chatbot can function. This is where the handcrafted json file comes into play. The json file is divided into several categories: patterns, tags, and responses.

Tags: The topic of the chat is described through tags. The json file has numerous tags, for instance, a tag for "greetings", "thank you's" and "goodbye's". Each tag has its own set of patterns and replies.

Patterns: Patterns are data entered by the user. Patterns are strings that contain words and sentences and can be used as tags. For example, the lines "how are you", "is anyone there" and "hello" all fit under the tag "greetings". If the user input data resembles one of the many patterns, such as "hello, how are you?" the machine will recognise the words and recognise that it belongs to the "greetings" tag. This is necessary so that a corresponding response can be provided.

Responses: Responses are strings used by the chatbot to respond to user input data. Following the tag's identification based on the pattern, a randomised "greeting" response will be displayed. Each tag contains many responses. In this example, the responses "hello, thanks for visiting," "hey there, what can I do for you," and "great to meet you" are filled in as accurate responses to return to the user.

```
"tag": "greeting",
"patterns": [
    "Hi",
    "Hey",
    "How are you",
    "Is anyone there?",
    "Hello",
    "Good day"
],
"responses": [
    "Hey :)",
    "Hello, thanks for visiting",
    "Hi there, what can I do for you?",
    "Hi there, how can I help?"
]
```

This example illustrates how the json file is constructed in general; but, in order for it to operate, the chatbot must be able to train with the data. The json file is currently not trainable.

DATA CLEANING

Strings, as seen in the example above, are difficult for a machine to read, however integers (numbers) are significantly easier and more recognised to assist teach the chatbot. The transformation from a string to a vector containing integers is required for the NLP module to function. This procedure is divided into several steps.

1. Tokenisation

To begin, the tokenisation method must be implemented. Tokenisation is the process of dividing a string into meaningful parts. All strings in the json file must be collected and organised into an array, which serves as a container. To illustrate, two strings are collected from the "greetings" tag and two strings from the "goodbye" tag.

“Hi”

“How are you?”

“Bye!”

“See you later”

These strings will be tokenised and combined into an array as follows:

[“Hi”, “How”, “are”, “you”, “?”, “Bye”, “!”, “See”, “you”, “later”]

2. Lowering and removing of

The second step is straightforward. It first converts capital letters to lowercase letters, which is required so that "Hi" and "hi" are not considered two separate words. It also removes punctuation marks because they provide no context. As a result, the example becomes:

[“hi”, “how”, “are”, “you”, “bye”, “see”, “you”, “later”]

3. Stemming

The third stage is referred to as stemming. Stemming eliminates suffixes from words and standardises them to their base stem, removing the need for the machine to learn all of the different versions of a word. The words "organise," "organises," and "organising" are examples. By applying stemming, it cuts off the ends of the words, hence making the words all turn into "organ". Stemming, on the other hand, does not always work smoothly. The words "universe" and "university" do not appear to have the same definition; however, when stemmed, they both form "univers". Nonetheless, stemming will be used in this prototype because it simplifies the chatbot's training procedure.

[“is”, “anyone”, “there”] → [“is”, “anyon”, “there”]

4. Bag of words

Now that the array has been well cleaned, it is time to employ the bag of words. Bag of words considers the array as a collection of words and then calculates if there is a match with a pattern for each one individually. It ignores semantics, syntax (word order), morphology and pragmatics (e.g., irony).

To begin, each word in the array iterates through all of the patterns. If a word is detected in a specific pattern in the json file, it will be assigned a 1 instead of a 0. For example, "how" will be recognised in the pattern "how are you," earning it a 1. The word "bye" will not be recognised in the same pattern, resulting in a 0 score. As a result, the pattern "how are you?" would then look like [1, 0]. These zeros and ones are referred to as X data, or training data. Furthermore, each tag receives its own number, so the "greetings" tag, for example, receives a 1, while the "goodbye" tag receives a 2. This is known as the Y vector, and it is required for training. The chatbot can be trained by combining X and Y. The following page gives an illustration.

an example array

["hi", "how", "are", "you", "bye", "see", "later"]

Y data	some greeting patterns	X data
1	"Hi" "How are you"	[1, 0, 0, 0, 0, 0, 0]
		[0, 1, 1, 1, 0, 0, 0]

some goodbye patterns

2	"Bye" "See you later"	[0, 0, 0, 0, 1, 0, 0]
		[0, 0, 0, 1, 0, 1, 1]

```
# open json file and read it
with open('intents4.json', "r") as f:
    intents = json.load(f)

###print(intents)

# after reading the file, I need to collect all of the words
# first, make an empty list to put them into
all_words = []

# to hold the tags
tags = []

# to hold the patterns and tags later on
xy = []

# loop through the json file, json file has 1 big intents, then it has tags, patterns and responses
for intent in intents['intents']:

    # figure out the tags and put them in the empty array
    tag = intent['tag']
    tags.append(tag)

    # the patterns are also in an array, so a new loop has to be made
    for pattern in intent['patterns']:

        # patterns are things the user can say, now the first step begins: tokenization
        w = tokenize(pattern)

        # extend because w is an array, and I dont want arrays of arrays
        all_words.extend(w)

        # put into tokenized pattern and corresponding label
        xy.append((w, tag))
```

```

# function for bagg of words
# put tokenized_sentence in there to know that tokenisation must be applied first
def bag_of_words(tokenized_sentence, all_words):

    # how bag of words will look like
    # sentence = ["hello", "how", "are", "you"]
    # words = ["hi", "hello", "I", "you", "bye", "thank", "cool"]
    # bag = [ 0,      1,      0,      1,      0,      0,      0 ]

    # applying the stemming
    tokenized_sentence = [stem(w) for w in tokenized_sentence]

    # create a bag, and initialize it with zero for each word
    bag = np.zeros(len(all_words), dtype=np.float32)
    # numerate all words, give index and current word
    for idx, w in enumerate(all_words):
        # check, if this word is in the tokenized sentence,
        if w in tokenized_sentence:
            # then it will get a 1
            bag[idx] = 1.0

    return bag

# testing the bag of words, the whole process made above
sentence = ["hello", "how", "are", "you"]
words = ["hi", "hello", "I", "you", "bye", "thank", "cool"]
bag = bag_of_words(sentence, words)
print(bag)
# when printing bag you can see the array [ 0,      1,      0,      1,      0,      0,      0 ] from above

```

```

# exclude punctuations words
ignore_words = ['?', '!', '.', ',']
# and do the stemming process taken from other file, so lowercase words and chopped off words
all_words = [stem(w) for w in all_words if w not in ignore_words]

# now lets sort these words, and remove duplicate elements
# the sorted function will return a list in alphabetical order
all_words = sorted(set(all_words))
# also do with tags, not that necessary but still
tags = sorted(set(tags))

#print(all_words)

# now the words are tokenized and stemmed. The next step is bag of words

# list with X train data, which will contain the bag of words
X_train = []
# and Y, the tags, or associated number for each tags
y_train = []

# loop through the xy array, made above
for (pattern_sentence, tag) in xy:
    # calling the function bag of words, getting the tokenized sentence and all_words
    bag = bag_of_words(pattern_sentence, all_words)
    X_train.append(bag)

    # and for Y, for example, if tag is "delivery", it will give it label 0 and for other 1 and so on
    label = tags.index(tag)
    y_train.append(label) # class labele, CrossEntropyLoss later on

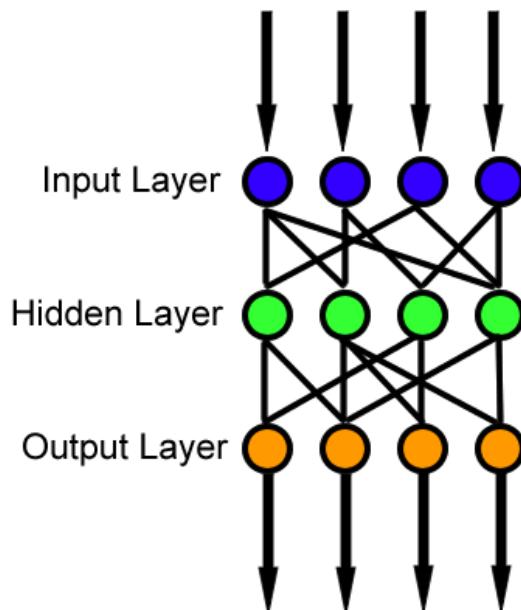
# convert to a numpy array
X_train = np.array(X_train)
y_train = np.array(y_train)

```

DATA TRAINING

Feed Forward Neural Net

Now that the X data looks like [0, 1, 1, 1, 0, 0, 0], it may start training to comprehend the user and respond to it. The machine will be learning using the Feed Forward Neural Net (FNN). "The process of receiving an input to produce some kind of output to make some kind of prediction is known as Feed Forward" (Java T Point, z.d.). The X data in this network will pass from the input layer to a hidden layer and then to an output layer. The data will flow through the layers in a straight line, always in one direction and never backwards (Sharma, 2022). A huge number of neurons will modify the X data while inside the hidden layer. Each neuron has a weight that describes the strength of a connection (Sharma, 2022). A probability will have emerged after the hidden layer communicated with the output layer. To illustrate, putting "how are you" [1, 0, 0, 1, 0] through the FNN yields a result of 0.91. Y is 0.91. This means that the algorithm is 91% confident that "how are you?" belongs in the "greetings" category.



(Wikipedia, 2022)

```

# this will be a feed-forward neural net with two hidden layers
# see as in the photo, input layers, number of classes as output
# then after, applying the softmax to get probabilities for each classes
class NeuralNet(nn.Module):
    def __init__(self, input_size, hidden_size, num_classes):
        super(NeuralNet, self).__init__()

        # creating three linear layers
        # input and classes are fixed, but amount of hidden size can be made up
        self.l1 = nn.Linear(input_size, hidden_size)
        self.l2 = nn.Linear(hidden_size, hidden_size)
        self.l3 = nn.Linear(hidden_size, num_classes)

        # activation function for in between
        self.relu = nn.ReLU()

    # implement the forward pass
    def forward(self, x):
        out = self.l1(x)
        # apply activation function
        out = self.relu(out)

        # then repeat two more times
        out = self.l2(out)
        out = self.relu(out)
        out = self.l3(out)

class ChatDataset(Dataset):
    def __init__(self):
        self.n_samples = len(X_train)
        # store the data
        self.x_data = X_train
        self.y_data = y_train

    # implement get item function
    #dataset[idx]
    def __getitem__(self, index):
        return self.x_data[index], self.y_data[index]

    # define length method
    def __len__(self):
        return self.n_samples

# Hyperparameters
batch_size = 8
# conclusion
dataset = ChatDataset()
# create a data loader
train_loader = DataLoader(dataset=dataset, batch_size=batch_size, shuffle=True, num_workers=0)

# by creating this dataSet and dataLoader it can automatically iterate and therefore get better training

# import and create the model with help from already model.py

hidden_size = 8
# number of different classes there are
output_size = len(tags)
# number of length of each pack of words that were created
input_size = len(X_train[0])

# check if i have access to specific device
device = torch.device('cuda' if torch.cuda.is_available() else 'cpu')

#model activation
model = NeuralNet(input_size, hidden_size, output_size).to(device)

```

Epochs

The network can go through the dataset again to improve the result even more. This can be called with epochs. One epoch means that each sample in the training dataset has gone through the FNN once (Brownlee, 2022). It will consequently cycle through it again if the epochs number is increased. This project will go through 1000 epochs.

Loss

Loss is defined as the errors, or log loss, that can occur when training the dataset. If the log loss is high, it means that the training data is difficult to train and that some training could not be performed correctly (Stack Overflow, 2016). However, the log loss reduces with each epoch; hence, the lower the loss, the better trained the dataset.

```
# how intensely I want to train the data
learning_rate = 0.001
num_epochs = 1000

# loss and optimizer
criterion = nn.CrossEntropyLoss()
optimizer = torch.optim.Adam(model.parameters(), lr=learning_rate)

# training loop
for epoch in range(num_epochs):
    # use training loaders
    for (words, labels) in train_loader:
        # push to device
        words = words.to(device)
        labels = labels.to(device)

        # forward pass
        outputs = model(words)

        # calculate the loss
        loss = criterion(outputs, labels)

        # backward pass and optimizer steps
        # empty the gradients first
        optimizer.zero_grad()
        # calculate the back propagation
        loss.backward()
        optimizer.step()

    # this all is now the training loop

    # every 100th step, print the current epoch and which number of all epochs it is, and show the loss
    if (epoch+1) % 100 == 0:
        print(f'Epoch {epoch+1}/{num_epochs}, loss={loss.item():.4f}')

# show the final results of loss, which will lower with each epoch for better results
# the lower the results, the better trained, the less difficult it was to train etc
print(f'final loss, loss={loss.item():.4f}')

[0. 1. 0. 1. 0. 0. 0.]
Epoch 100/1000, loss=1.2730
Epoch 200/1000, loss=0.0768
Epoch 300/1000, loss=0.0230
Epoch 400/1000, loss=0.0044
Epoch 500/1000, loss=0.0051
Epoch 600/1000, loss=0.0029
Epoch 700/1000, loss=0.0020
Epoch 800/1000, loss=0.0022
Epoch 900/1000, loss=0.0005
Epoch 1000/1000, loss=0.0003
final loss, loss=0.0003
training complete. file saved to data.pth
```

The training is completed after traversing the FNN using epochs and loss, and the training data file is saved. This means the data file can now be delivered to the chatbot for processing. The chatbot itself only requires a few lines of code to be activated. When activated and combined with the trained dataset, it can now successfully respond to the user input data.

```
# saving the data, create a dictionary for the data
data = {

    # save different things
    "model_state": model.state_dict(),
    "input_size": input_size,
    "output_size": output_size,
    "hidden_size": hidden_size,
    "all_words": all_words,
    "tags": tags,

}

# define a file name and serialize it
FILE = "data.pth"
# save the file
torch.save(data, FILE)
# to confirm
print(f'training complete. file saved to {FILE}')

# check if i have access to specific device
device = torch.device('cuda' if torch.cuda.is_available() else 'cpu')

# open the file with intents
with open('intents4.json', 'r') as f:
    intents = json.load(f)

# open the file with saved data
FILE = "data.pth"

# since data was saved in train.py, now just load the data
data = torch.load(FILE)

# get the same information, get the information to create the model
input_size = data["input_size"]
hidden_size = data["hidden_size"]
output_size = data["output_size"]
all_words = data["all_words"]
tags = data["tags"]
model_state = data["model_state"]

#model activation
model = NeuralNet(input_size, hidden_size, output_size).to(device)

# load the state dict of the creation
# now it knows the learned parameters
model.load_state_dict(model_state)

# set to evaluation mode
model.eval()
```

Some of the code was handmade and some was made with the help of Loeber (2020), NeuralNine (2020), Tech with Tim (2019), and Skolo Online (2021).

ITERATION 1

The goal of the first iteration is to gather initial input on the idea's workings, appeal, and enthusiasm for a chatbot.

Code

The chatbot for this project can now be launched now that the training data has been collected. To activate the chatbot, a new Python file called "chat.py" was created. The json file and training dataset will be retrieved in chat.py. The bag of words procedure, as well as the FNN model with its input, hidden, and output layers, will be returned. All of this will be gathered in chat.py. The bot will be named "Laura" when it is implemented. Laura will use bag of words and FNN when active, and then return an answer if the probability of a match identified in training is high enough. If the likelihood is sufficiently low and the pattern is not recognised, the user will receive a "I don't understand" response. The process of creating a regular chatbot is now complete.

```
# give bot a name
bot_name = "Laura"

# define a function that gets a message as parameter and then returns the response
def get_response(msg):

    # first tokenize the sentence and then calculate a bag of words, just like the training data
    # tokenize the message
    sentence = tokenize(msg)
    # create bag of words
    X = bag_of_words(sentence, all_words)
    # reshape it, give it 1 roll cause there is only one sample, 0 as the number of columns
    X = X.reshape(1, X.shape[0])
    # convert to torch, numpy because bag of words returns in a numpy array
    X = torch.from_numpy(X)

    # to get the predictions
    output = model(X)
    _, predicted = torch.max(output, dim=1)
    # the class label, the number
    tag = tags[predicted.item()]

    # apply softmax
    probs = torch.softmax(output, dim=1)
    prob = probs[0][predicted.item()]

    # the probability is large enough
    # first it was 0.75
    if prob.item() > 0.75:

        # find the corresponding intent, loop through all intents and check if tag matches
        for intent in intents["intents"]:
            if tag == intent["tag"]:

                # choose a random response from the bot to say
                return random.choice(intent['responses'])

    # if not large enough
    return "I do not understand. Could you perhaps rephrase it with some more words? :)"
```

During this testing phase, the chatbot's and user's discussion is primarily focused on assisting with the recycling of plastic products. The chatbots ask what they want to recycle, if they need assistance recycling it in the appropriate bin, why they opted to recycle, why they do not recycle, and if they have any further questions. As a result, the json file looks like this.

```
"intents": [
  {
    "tag": "one",
    "patterns": [
      "I have some plastic to recycle",
      "I would like to recycle some plastic",
      "I have something to recycle",
      "I want to recycle something"
    ],
    "responses": [
      "Great! What would you like to recycle?",
      "I can certainly help you, what do you have to recycle?",
      "This is great, what do you have to recycle?"
    ]
  },
  {
    "tag": "twoPP",
    "patterns": [
      "I have a water bottle",
      "I have plastic cutlery",
      "I have an empty plastic food package"
    ],
    "responses": [
      "I see you have PP plastic, that plastic can go in the plastic bin at home",
      "PP plastic goes in the plastic bin at home, well done. Did you recycle it?"
    ]
  },
  {
    "tag": "question",
    "patterns": [
      "I have a question",
      "Could I ask you something",
      "I do not understand something about plastic",
      "Can I ask a question about plastic types and recycling"
    ],
    "responses": [
      "Of course, what would you like to know?",
      "I gladly would like to help",
      "My pleasure, what it is?"
    ]
  },
  {
    "tag": "four",
    "patterns": [
      "Yes I have recycled the product",
      "Yes I have recycled it",
      "Yes"
    ],
    "responses": [
      "Great. What made you change to go recycling?",
      "If I could ask one last question, what made you recycle?"
    ]
  },
  {
    "tag": "five",
    "patterns": [
      "I did it for the environment",
      "I started recycling due to health dangers",
      "I wanted to learn more about recycling",
      "The home screen motivated me to recycle"
    ],
    "responses": [
      "Thank you for your answer! I am glad",
      "That is great to hear, goodbye for now"
    ]
  }
]
```

A counting variable was created to help the chatbot recall user attributes. Count = 0. If the user mentions a specific word that corresponds to one of their barriers, such as "I do not recycle because I do not understand it," the system will recognise it. The tag "knowledge," which contains the phrase "understand," will then be alerted. When a certain count is triggered, it increases by one. Knowledge count = 1. This allows the chatbot to remember user attributes. Several tags have been established to understand more about the person. For instance, "knowledge," "convenience," "social," "inspiration," and so forth. Each of these tags has an own count meter. The count meter with the highest number determines how the user's home screen will look.

```
# find the corresponding intent, loop through all intents and check if tag matches
for intent in intents["intents"]:
    if tag == intent["tag"]:

        # choose a random response from the bot to say
        return random.choice(intent['responses'])

        # if the user says something specific, the chatbot will remember it
        #####
        if tag == "knowledge":
            count = count + 1
            print("knowledge has reached: ", count, ". The leaderboard gamification packet is now active")
```

The chatbot is currently only available in Visual Studio Code.

Design

For the initial test, the application designs are produced low-fi. The designs for this test were created with the purpose of conveying the general concept of the prototype to the user. It provided an outline of the kind of screens that will be there and what might occur on those screens.

Intro screen: When you initially launch the application, you will see an intro screen. This screen will assist in explaining the application's purpose.

Home screen: A gamification method is shown on the home screen. The home screen will change according on the user's personality and personal barriers. If the user reacts strongly to any TPB elements, such as having no "knowledge" or feeling a lot of "social" pressure to recycle, the screen will display a gamification method that correlates to the TPB element with the highest count. For instance, if "knowledge" has the highest count number, the "narrative" gamification method will be displayed on the home screen. The gamification method will be "teams" if social has the greatest count number. At the

moment, just one gamification method is available on the home screen. The home screen is built in this manner to encourage the user to assist them with their weakness.

Attitude -> points gamification method

Subjective norms -> leaderboard gamification method

Perceived control -> badges gamification method

Social pressure -> teams gamification method

Moral norms -> rewards gamification method

Knowledge -> narrative gamification method

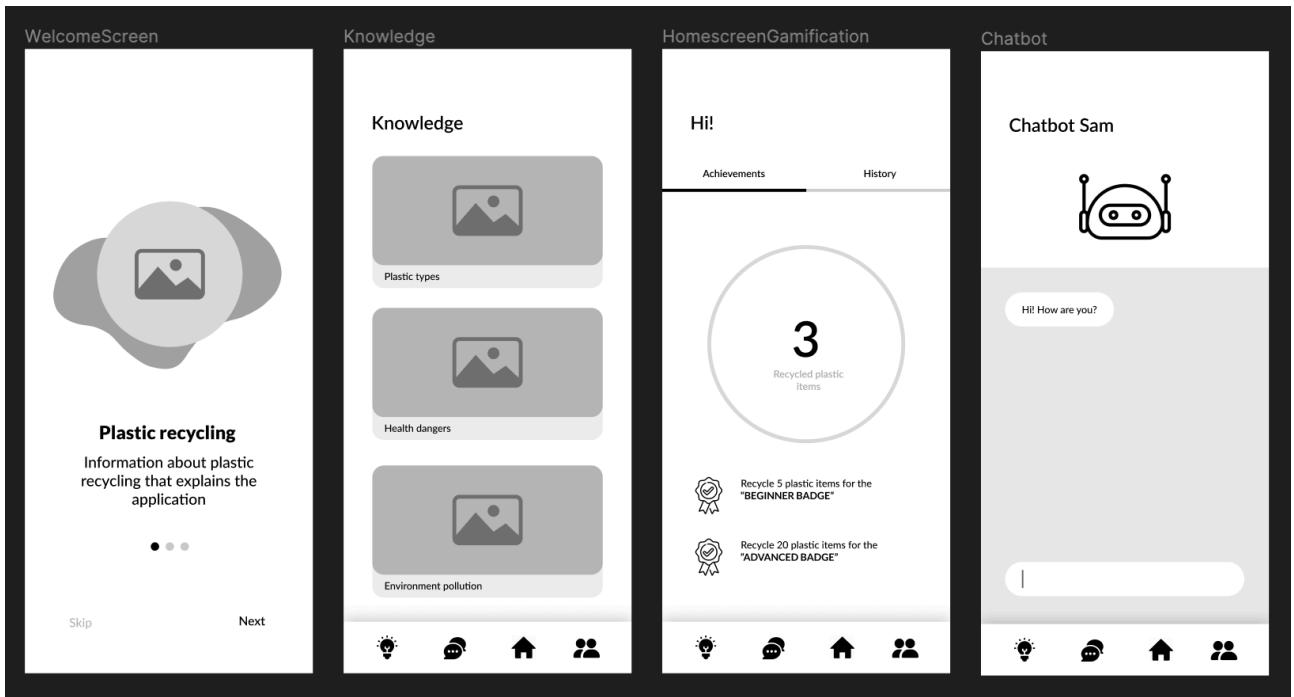
Furthermore, the home screen also informs the user of what they have already recycled.

Chatbot screen: The chatbot screen is where you can interact with the chatbot. The chatbot will assist the user with recycling plastic, answering inquiries, and updating the home screen.

Knowledge screen: In the menu, there is a link to a knowledge screen. This screen will display a variety of categories, ranging from plastic types to health and environmental concerns. When you click on a category, a new page containing information about it will load. The knowledge screen was created to remove the uncertainty barrier.

Social screen: A social screen can be accessed via the menu. This screens content is still unknown; however, social features will be implemented. The social screen was created to exploit the social pressure barrier.

The screens are on the following page.



Usability test

Test 1 will evaluate the overall concept of the prototype, the workings of the chatbot, whether or not the chatbot is appreciated by users, if the TPB elements generate greater motivation, and the overall like-ability.

Planning

Before testing, the user will be notified of the prototype's aim and content. The user will be able to test the Figma design that is presented on the phone. The user will type in the python file to communicate with the chatbot. Questions will be asked when the user has explored the program and the chatbot.

Required resources and time

- Figma prototype on phone
- Working python file with chatbot
- Note for taking notes
- No time limits
- A tester

Potential assignments for the tester

- Potential assignments for the tester
- Add a theme

- Go through a lesson

Observations

- Does the user understand how the prototype works?
- Is the prototype's goal clear?
- Is the user aware of what to do? What to press?
- Is the user getting trapped at times?
- What is the user's behaviour when using the app? What about facial expressions?
Positive or negative?
- In general, how does the user react to the app?

Questions to choose from

Chatbot:

- What are your thoughts on the conversation's flow?
- Does it make you want to properly dispose of plastic more?
- What is the reason you don't always throw your plastic away correctly?
- Do you believe you can connect with a chatbot?
- Do you like that a chatbot is assisting you?
- Does it make the process of dumping plastic easier?
- Do you mind if the chatbot probes you on your reasoning?

Application:

- Does the application's objective appear to be clear?
- What do you think of the personalised home screen?
- What are your thoughts about the screens?
- What would make you want to recycle?
- What are your thoughts on gamification?
- What effect does societal pressure have on you?
- What are your thoughts on the application?

General:

- Is there anything that confuses or irritates you?
- Do you believe further feedback is required?
- What are your thoughts on the prototype?

Results

This test was done with the help of three students. 23 Female, 23 Male and 24 Female.

Chatbot:

- Conversation was not really flowing
- Personal question was thrown in there at random, but they had no problem answering it
- Chatbot could give more help with throwing away plastic, "I did not understand which bin they meant"
- Fun to talk with a chatbot, but would not do it every time when throwing something away
- Could be more straightforward, typing out each product takes a lot of time
- They like the concept
- Connection with chatbot they do not see yet

Application:

- Difficult to discuss because there wasn't much design there, more content needs to be present
- The idea of personalised home screen was well received
- Application is simple to understand
- More focus on chatbot, as that is the main feature
- They like the idea of achievements, competitions, and levels, in terms of gamification
- They didn't realise one could click on the knowledge categories

What to improve

The results of the tests suggest that the prototype concept was well received. However, because it was low-fi and only had a few displays, the application was weak and difficult to evaluate. The chatbot itself was thought to be amusing but rigid; it lacked emotional connection and moved too rapidly through the recycling process. These features will be prioritised in the next generation.

Chatbot:

- Improve the chatbot's flow by conducting additional research on how to do it
- Incorporate more personalisation and demonstrate the data-driven aspect
- Make more of a link between the chatbot and the user
- Improve the throwing away process
- Make the chatbot out of Python

Application:

- Add real text to the screens (knowledge, home screen, social, intro)
- Create an application design
- Create several gamification variations for the main screen
- Provide a visual demonstration of how the chatbot would function in the application
- Improve the clarity of the knowledge screen

ITERATION 2

The flow between the user, chatbot, and application is the emphasis of the second iteration. This test will determine whether or not its goal has been met after filling out content in the application and improving the flow of the chatbot.

Code

With this iteration, the chatbot has altered in two ways. First, some new code. The idea of merely having the chatbot exist in the Python terminal was insufficient. An outside window screen was created, with the help of Loeber (2021). To make this work, a new Python module called "app.py" was made. A window is active in this python file, and within this window are several elements such as the button, the screen, the scrollbar, and more, each of which may be configured with its own colours, widths, and heights. After attaching the chatbot code to this new file and activating it, the window could work properly.

```
# defining of some colours
BG_GRAY = "#ABB2B9"
BG_COLOR = "#17202A"
TEXT_COLOR = "#EAECEE"

# and fonts
FONT = "Helvetica 14"
FONT_BOLD = "Helvetica 13 bold"

# create application
class ChatApplication:

    def __init__(self):

        # just the top level widget
        self.window = Tk()
        # create the layout
        self._setup_main_window()

    # for running the application
    def run(self):
        # must call this in tk inter to start the application
        self.window.mainloop()

    # the helper function, that sets up main window
    def _setup_main_window(self):
        self.window.title("Chat")
        # do not want window to be resizeable
        self.window.resizable(width=False, height=False)
        # helps with giving widgets different attributes, bg is background
        self.window.configure(width=470, height=550, bg=BG_COLOR)

        # define layout
        # head label, from tk inter, fg is foreground colour
        head_label = Label(self.window, bg=BG_COLOR, fg=TEXT_COLOR,
                           text="Welcome", font=FONT_BOLD, pady=10)
```

```

# tiny divider, 450 gives some spacing
line = Label(self.window, width=450, bg=BG_GRAY)
line.place(relwidth=1, rely=0.07, relheight=0.012)

# text widget, display text, also with tk inter
# every text will display 20 characters in 1 line, two lines for it, and padding around
# self is being used cause it needs to be used for later also
self.text_widget = Text(self.window, width=20, height=2, bg=BG_COLOR, fg=TEXT_COLOR,
font=FONT, padx=5, pady=5)

# 0.745 means it will take a huge chunk from the application, 75%, and whole width is used
self.text_widget.place(relheight=0.745, relwidth=1, rely=0.08)

# make a cursor, from tk library
self.text_widget.configure(cursor="arrow", state=DISABLED)

# scroll bar, also tk
scrollbar = Scrollbar(self.text_widget)
# take whole height of widget, 0.974 means it is at the right
scrollbar.place(relheight=1, relx=0.974)
# when scrollbar is used, it will change y position of the text widget
scrollbar.configure(command=self.text_widget.yview)

# bottom label
bottom_label = Label(self.window, bg=BG_GRAY, height=80)
bottom_label.place(relwidth=1, rely=0.825)

# message entry box, also tk, instead of self use bottom_label as parent widget
self.msg_entry = Entry(bottom_label, bg="#2C3E50", fg=TEXT_COLOR, font=FONT)
self.msg_entry.place(relwidth=0.74, relheight=0.06, rely=0.008, relx=0.011)
# whenever application starts, this is already in focus, so typing can begin
self.msg_entry.focus()
# whenever enter is hit, send text
self.msg_entry.bind("<Return>", self._on_enter_pressed)

# define on enter pressed from above
def _on_enter_pressed(self, event):
    # will get input text as a string
    msg = self.msg_entry.get()

    # call insert message
    self._insert_message(msg, "You")

def _insert_message(self, msg, sender):
    # for if enter is pressed without text in it
    if not msg:
        return

    # delete text from entry box, when send
    self.msg_entry.delete(0, END)
    # message that want to display, \n means empty line below text message
    msg1 = f"{sender}: {msg}\n\n"
    # put it in the correct widget, self.text widget
    self.text_widget.configure(state=NORMAL)
    self.text_widget.insert(END, msg1)
    # after inserting message, make field again disabled
    self.text_widget.configure(state=DISABLED)

    # make it so the chatbot respond
    # copy paste from above and adjust to chatbot, bot_name, get_response from other py files
    msg2 = f"{bot_name}: {get_response(msg)}\n\n"
    self.text_widget.configure(state=NORMAL)
    self.text_widget.insert(END, msg2)
    self.text_widget.configure(state=DISABLED)

    # it will always scroll to the end, so last message can always be seen
    self.text_widget.see(END)

# creating of app / screen, and letting it run
if __name__ == "__main__":
    app = ChatApplication()
    app.run()

```

The chatbot's second update is that it now has a new json file. The chatbot's flow was too swift and ineffective, as discovered in iteration 1. A new flow was created using the Behaviour Change Agent Framework from the Academic Paper (x). The chatbot is currently interacting with the five-step procedure. The first step is called pre-contemplation, this step focusses on welcoming the user and talking about the general problem or their problem behaviour. The second step is the contemplation, where due to step one the user may start contemplating on how to change. The chatbot will therefore focus on self-reevaluation questions to gather information about the user. Preparation is the third step, in this step the chatbot helps the user believe in one's ability to change and make commitments, by giving it one last push by providing knowledge or helpful links. The fourth step is action, the chatbot provides questions that elicit the actions that the user is planning to do. The last step is maintenance, where the chatbot may include stimulus controls to prevent the user from relapsing in old behaviour. To summarise, the chatbot will ask them about their barriers, such as why they discard their plastic poorly and why they want to improve themselves, while also encouraging the user and going through the discarding process to hear what they want to discard and inform them where they can do so.

```
{
  "tag": "location",
  "patterns": [
    "I live in the city",
    "My home town is called Amsterdam",
    "I live in a big house near the capital",
    "Amsterdam is where I live",
    "I sleep in a place called Amsterdam",
    "Amsterdam",
    "The city I live in is called Amsterdam",
    "I live in the province of Noord-Holland",
    "I sleep in a big city",
    "I live on this streetname",
    "My postal code is 1234AB",
    "I live next to a super market",
    "I spend my time in a city called Amsterdam",
    "I live in the capital city"
  ],
  "responses": [
    "Amsterdam! That is a nice city. I will lock down its recycling methods. Moreover, what motivates you to st
    "Oh I love Amsterdam! They have great recycling methods. Talking about recycling, what motivates you to wan
    "Amsterdam! I always wanted to live there. They have some interesting recycling methods. Moreover, what mot
  ]
}
```

```

{
  "tag": "attitude",
  "patterns":
  [
    "I think it is important to recycle",
    "I want to put the product in the correct place",
    "I want to put the trash in the correct bin",
    "I like the environment, so I want to help it",
    "I like my health, so I will recycle for it",
    "I care about the environment",
    "I think it is important for this planet to recycle",
    "Recycling is important to me",
    "I want to make a change for the better",
    "I am upset at how dirty my surroundings are",
    "I am emotional about the recycling states"
  ],
  "responses":
  [
    "I totally understand what you mean. What kind of emotions come forth when you are recycling, and why?",
    "I really appreciate you are being honest with me. How do you feel while you are recycling, and why?",
    "That is an excellent reason! How would you feel after having recycled something, and why?",
    "I can see where you are coming from. How would you feel after recycling something, and why?",
    "I understand where you are coming from! How does recycling make you feel, and why?"
  ]
},
{
  "tag": "socialpressure-two",
  "patterns":
  [
    "So that friends won't talk about it anymore",
    "learning from others",
    "motivated from others",
    "it makes me feel connected",
    "connected",
    "close to my friends",
    "close to my family",
    "I am happy for my friends",
    "Just doing it for my friends and family",
    "Like I am doing it for my friends and family"
  ],
  "responses":
  [
    "That is a very logical response. You are doing great! Let the recycling process begin! What kind of plastic
    "I would feel exactly the same. I am proud of you for doing this! Now comes the real question, what is it tha
    "Thank you for sharing your feelings, I believe in you! Let the real recycling process now start, what kind o
    "I appreciate you telling your feelings about it. I think you are making a change for the better! However, it
    "Thank you for trusting me with your emotions. You are doing a good deed! Let's now start the recycling proce
  ]
}

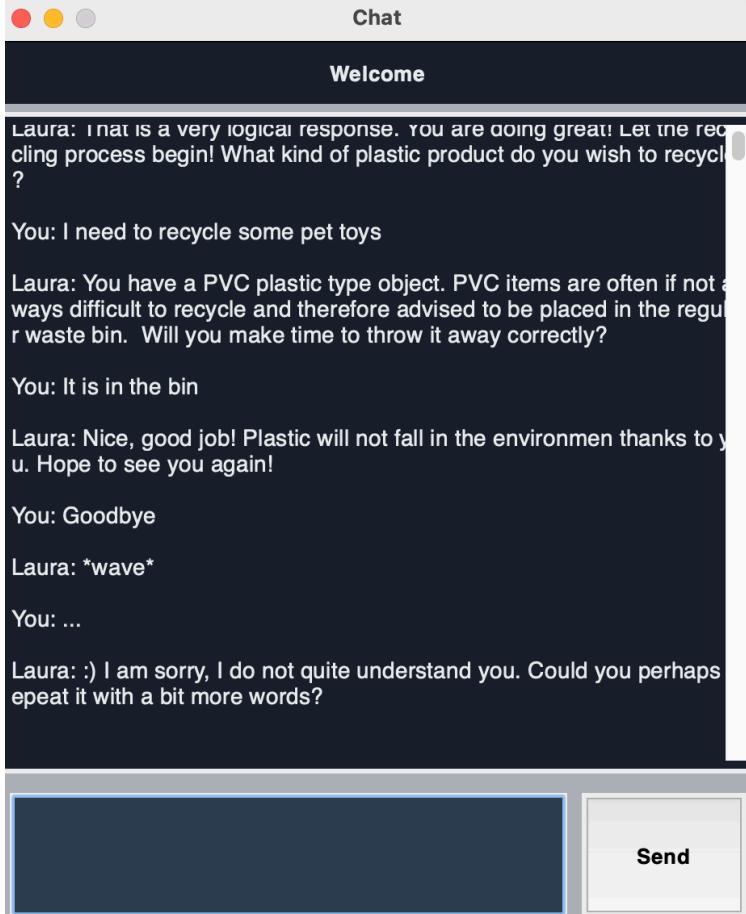
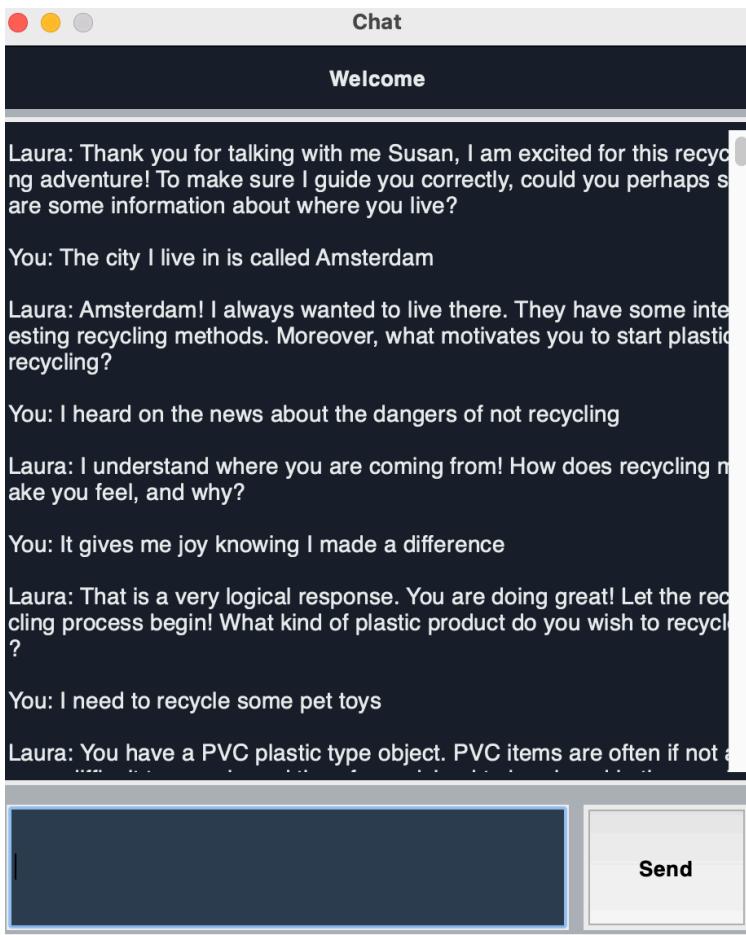
```

```

{
  "tag": "preparation2",
  "patterns": [
    "I have a milk jug",
    "I want to recycle a household cleaner",
    "I would like to recycle a water bottle",
    "I have to recycle a cereal box",
    "I need to recycle some liners",
    "I want to recycle some yogurt containers",
    "I need to recycle some milk cartons",
    "I have detergent bottles to recycle",
    "I want to recycle a cereal box",
    "I want to recycle some toys"
  ],
  "responses": [
    "You have a HDPE plastic type object. HDPE items can easily be recycled by your plastic curbside recycling."
  ],
  {
    "tag": "action",
    "patterns": [
      "Yes I have thrown it away",
      "Yes I recycled it",
      "Yes",
      "Yes it is thrown away",
      "I did it",
      "Yes I did",
      "It is in the bin",
      "It is successfully thrown away",
      "It is away",
      "I did what you asked",
      "I have thrown it away",
      "I did what you asked",
      "Yes I was successful",
      "Yes it is done",
      "Yes I will throw it away",
      "Yes I will prepare it",
      "I will be doing that",
      "Yes I will"
    ],
    "responses": [
      "You did great! This will certainly help keep the planet a bit greener. I hope to see you next time!",
      "Lovely! You did amazing, you certainly helped your environment. I hope to see you soon!",
      "Amazing, you prevented plastic from coming into your environment! See you next time!",
      "Great work! You help keep plastic off the streets. It was great working with you, hope to see you soon!",
      "Nice, good job! Plastic will not fall in the environment thanks to you. Hope to see you again!"
    ]
  }
}

```

The responses end with a question so that the user might react with something from the following pattern on the list. The inquiries range from how to dispose of the plastic object to knowing more about the individual. As a result, the chatbot may assist the user while simultaneously learning about them. When they discover that the user's motivation is primarily based on subjective norms, the count from subjective norms is triggered, and the gamification method is activated on the home screen.



Design

The design has also advanced. There are no new screens; however, each existing screen has undergone a design makeover and content filling. In addition, several screens now have multiple variations.

Design: The application's design is straightforward. This decision was made so that it would work for everyone.

Intro screen: The three-part intro screen has been replaced on the home screen by a "empty state" screen. An empty state screen is one on which the user must do something before the content may be displayed. When the user initially launches the program, the home screen informs them that they must first talk with the chatbot before a gamification method can be displayed and therefore fill the screen.

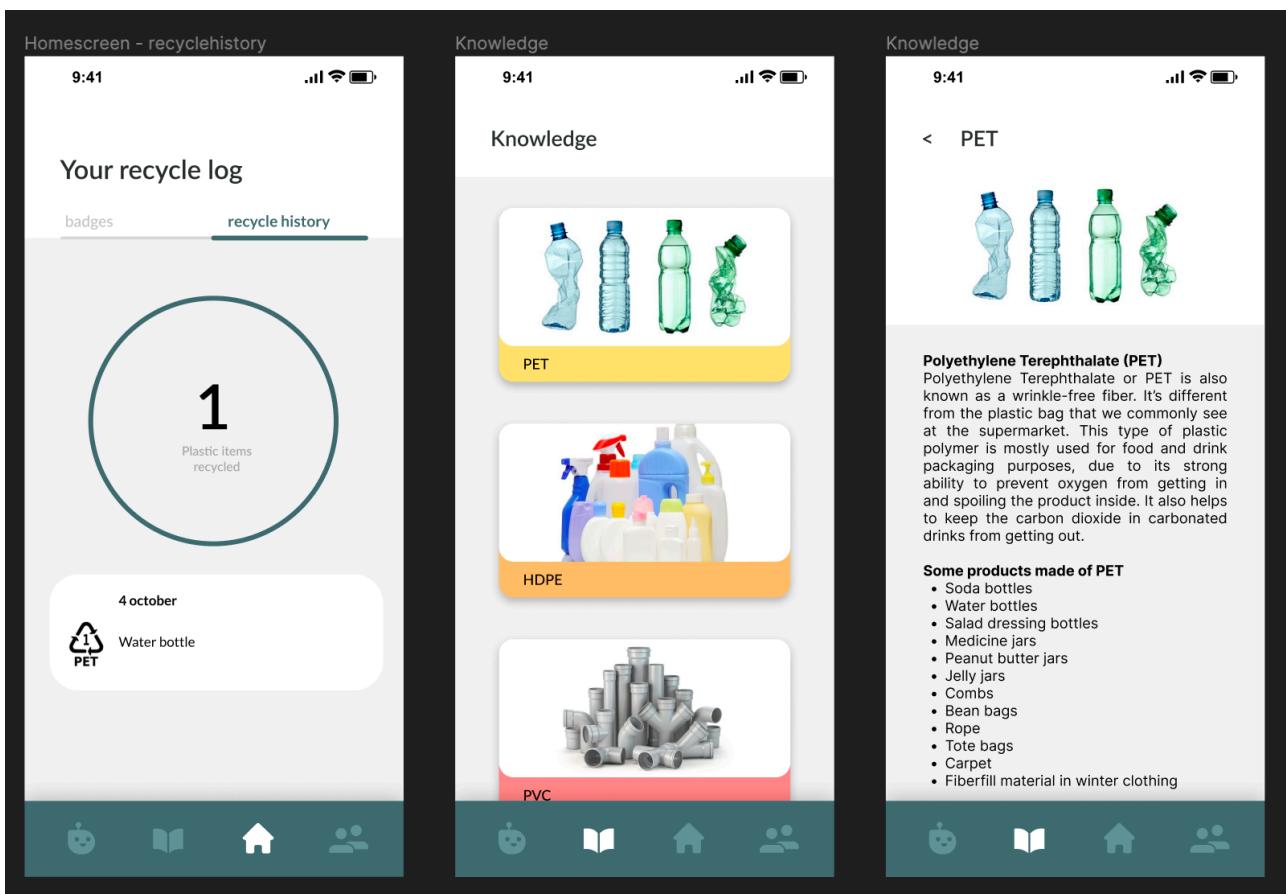
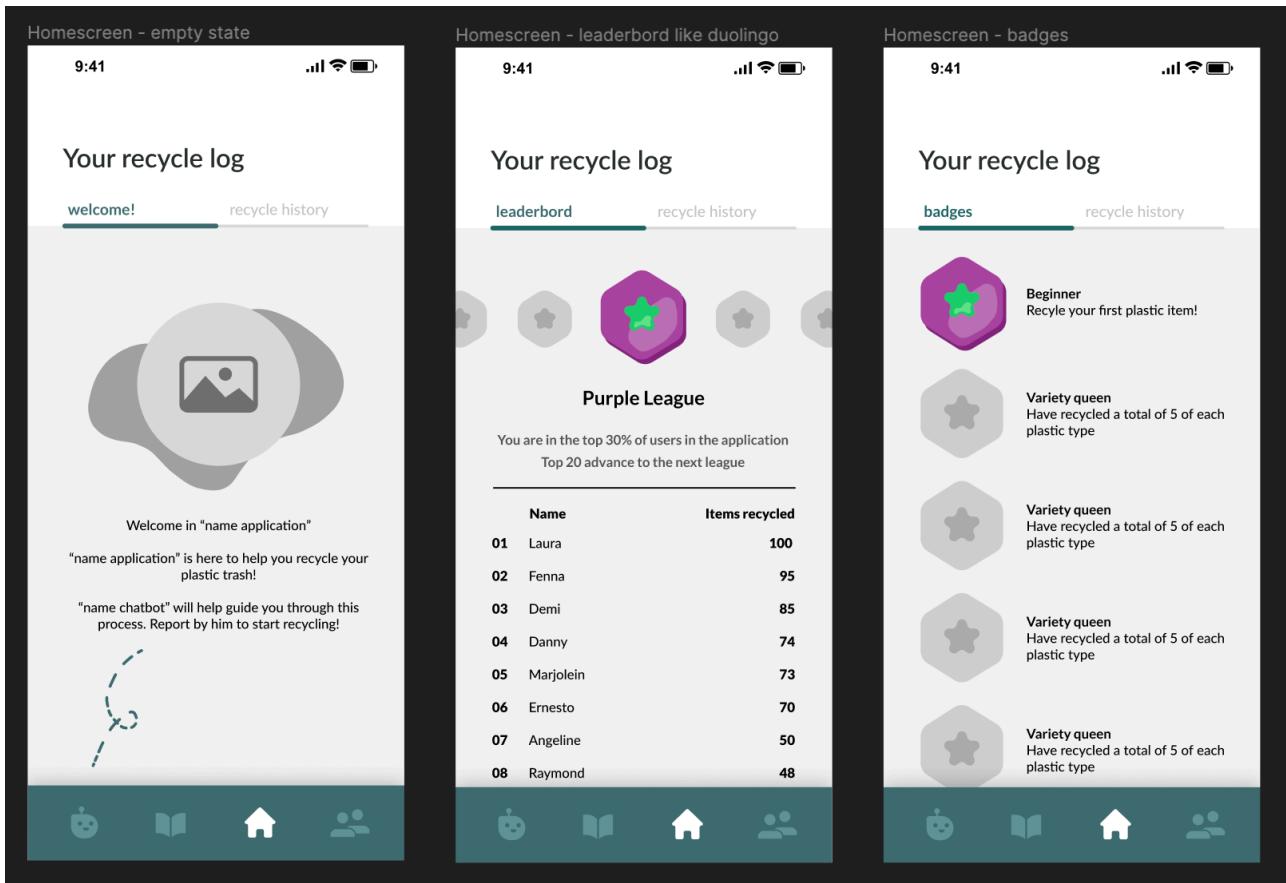
Home screen: The home screen has remained relatively unchanged, however it has received many versions of gamification methods. From badges to leaderboards, there will be something for everyone.

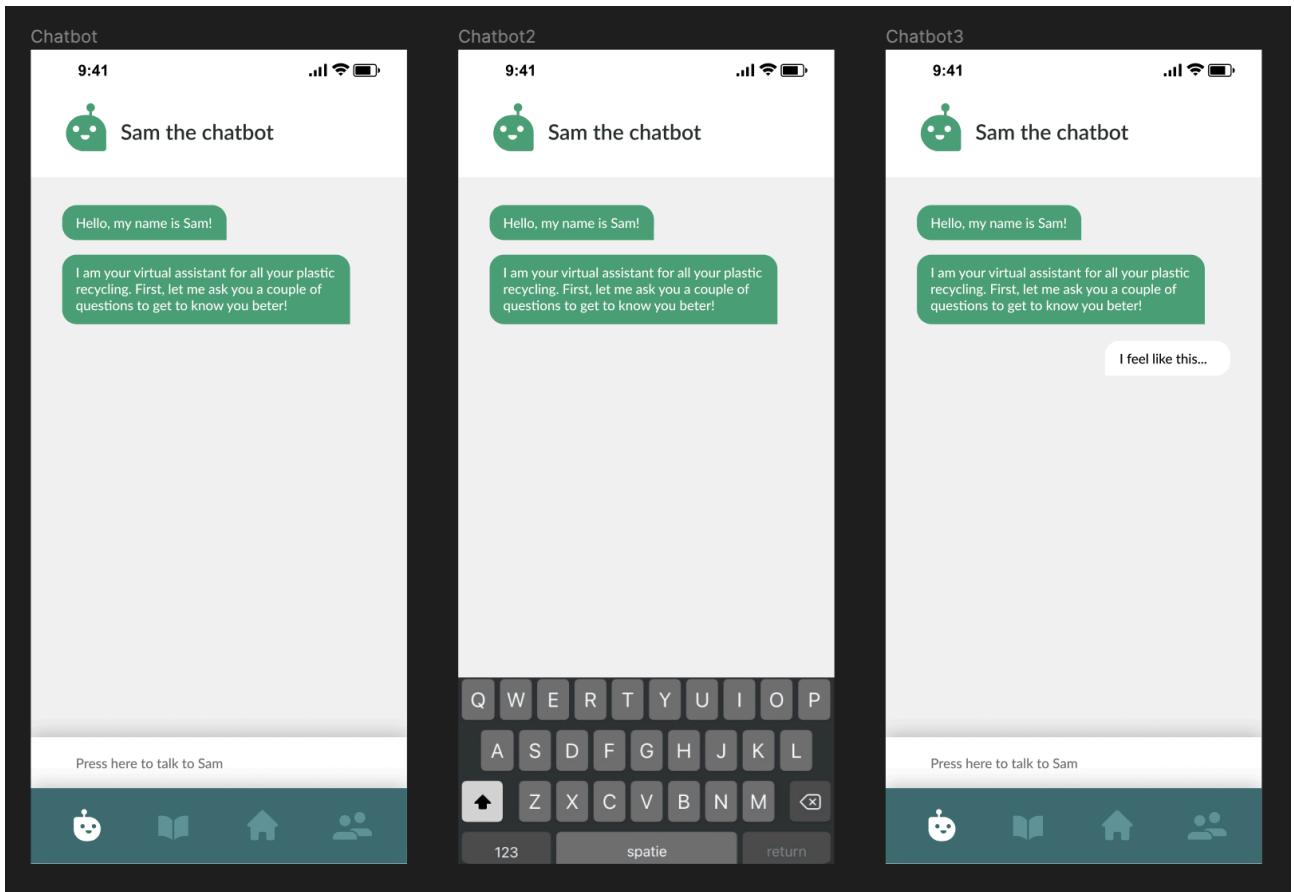
Chatbot screen: The chatbot screen has also been improved. The user can now simulate interacting with the chatbot. The chatbot's form and text have been given a distinct colour so that the user can quickly identify it. The screen has the same sensation as talking to a friend, such as on WhatsApp. The chatbot messages are on the left, while the user is on the right. The dialogue will feel more trustworthy as a result.

Knowledge screen: The categories "health" and "environment" have been deleted from the knowledge screen because research has shown that many people are already aware of the world's plastic repercussions. As a result, the knowledge screen now focuses mostly on recycling information. Each plastic kind has its own screen information about what it is (Bahraini, 2022), what items it can be used for (Mertes, 2020), how to recycle it (Plastic Facts, z.d.), and what it can be repurposed into (Mertes, 2020).

Social screen: The social screen has remained the same.

The screens are on the following screen.





Usability test

Test 2 will evaluate the general concept of the prototype, the chatbot's functionality, whether the chatbot is loved by users, whether the TPB elements provide greater motivation, and the overall like-ability.

Planning

Before testing, the user will be notified of the prototype's aim and content. The user will be able to test the Figma design that is presented on the phone. The user will text in the window application to communicate with the chatbot. Questions will be asked when the user has explored the program and the chatbot.

Required resources and time

- Phone prototype of Figma
- Python file that works with the chatbot window application
- Make a note to take notes
- There are no time constraints
- A test subject

Potential assignments for the tester

- How to find Information on a plastic type
- How to create a gamification method

Observations

- Does the user understand how the prototype works?
- Is the prototype's goal clear?
- Does the user understand what to do? What to press?
- Does the user appear to be stuck at times?
- What is the user's behaviour when using the app? What about facial expressions? - Is it negative or positive?
- How does the user perceive the app in general?

Questions to choose from

Chatbot:

- What are your thoughts on the conversation's flow?
- Does it encourage you to throw plastic away correctly?
- Do you appreciate the 5-step progression of the chatbot?
- Does it facilitate the throwing away process?
- Would you go through this again, the chatbot conversation?
- Do you mind if the chatbot inquires about your personal life?
- Do you enjoy witnessing the gamification that the chatbot has provided?
- Did you agree with the chatbot's selections?

Application:

- Does the application's objective appear to be clear?
- How do you feel about the personalised home screen?
- What are your thoughts about the screens?
- What are your thoughts on the content?
- Is the knowledge screen comprehensive enough?
- How do you feel about the application?
- What are your thoughts on the chatbot screen?
- Do you comprehend the screen with the empty state? Do you know what you need to do?

General:

- Is there anything that confuses or irritates you?

- Do you believe further feedback is required?
- What are your thoughts on the prototype?

Results

This test was done with the help of four students. 23 Female, 23 Male, 24 Female, 21 Male and 21 Female

Chatbot:

- Sometimes wrong responses came out due to patterns resembling each other
- Flow was well received this time
- Would like to know when a change in home screen has been done, let the chatbot tell them instead of just doing it
- Throwing away plastic advice was nice
- A little bit long of a chat for a basic task as throwing away plastic, "doing it every time might become tiring"
- Because one of the testers was confused whether a plastic item was plastic, she did not use it for the chatbot
- Window thing was better than in python file
- They did not mind giving away personal answers

Application:

- The recycling log history did not pique much interest
- "What if I want two gamification aspects?" and "And what happens when one gamification takes precedence over another?" Gamification aspect not clear enough
- The menu was simple to understand
- The content was understandable and appreciated
- The design is also positive, albeit a little drab and dark
- Various sorts of gamification are quite entertaining. Curious to know what they would get
- The empty state was understood, but a little further explanation could be helpful
- A map feature could be handy, for when plastic needs to be thrown away outside
- More screens are needed to give a better look and feel

What to improve

The results of the tests demonstrate that a significant improvement was made over the previous test. The prototype was well received and simple to grasp by all. The design went a little flat, yet some fascinating issues and insights about the gamification method and Technical Paper

location assistance were discovered. The flow of the chatbot was improved this time, but it was still a little long and wonky, and the chatbot did not reveal what it had learned about the user or what adjustments had been made. These outcomes will be improved in the following iteration.

Chatbot:

- Improve json to avoid errors
- Reduce the length of the chat, perhaps only long conversations in the beginning, or create a skip option
- Improve window design to fit with the application
- Display to the user when a discovery about them has been made and what changes will result

Application:

- Remove the recycle log history and maybe the social screen, as they generate little interest and do not fit under the purview of gamification
- Add a map screen to assist users in determining where to dispose of their plastic waste that must be discarded outside
- Determine the user's location
- Give a more detailed explanation of how the application works and what has to be done
- Enhance the design
- Create more screens

ITERATION 3

Iteration 3's goal is to improve the code and design, making the prototype feel more real. There will be more functionality, and the chatbot will have less flaws. The goal of this prototype is to determine whether the TPB parts are functioning properly, whether they would use the application and chatbot again, and how they feel overall.

Code

This iteration's code has improved on several fronts. With the addition of some additional code, the chatbot has become more data-driven. To further optimise the plastic disposal procedure, the chatbot will now remember the products the user has selected to discard and present them as a proposal at the start. Each plastic product will have its own count variable in code, such as "plastic bottle = 0". When a user throws away a plastic bottle, the

count increases by one. When the count reaches a particular threshold, it may be eligible for the button. The button will be "plastic bottle" in this scenario. When the user enters the discarding procedure, this button will appear on the screen. By clicking it, the user can just inform the chatbot that they want to discard a plastic bottle, and the chatbot will count it, avoiding the need for the user to talk and thereby speeding up the procedure. The chatbot will continuously count every plastic product that the user has decided to trash, learning data from the user and improving the user experience with that data. The chatbot will continuously count every plastic product that the user has decided to discard, learning data from the user and using that data to therefore improve the user experience.

```
word = "plastic bottle"
if word in msg:
    global pear_count
    plastic_bottle_count = plastic_bottle_count + 1
    print("count:", plastic_bottle_count)

if plastic_bottle_count > 3:

    # do make it so that it only mentions it once.
    plastic_bottle_count = plastic_bottle_count + 1

    # do \n\n\, that will fix it
    msg3 = f"{bot_name}: \"Press 1 for plastic bottle disposal\" \n\n"
    #msg3 = f'{bot_name}: {get_response(msg)}\n\n'
    self.text_widget.configure(state=NORMAL)
    self.text_widget.insert(END, msg3)
    self.text_widget.configure(state=DISABLED)

    # also make it so that "You:", starts on the next line
```

You: plastic bottle

Laura: You have a PET plastic type object. PET items can easily be recycled by your plastic curbside recycling. In your region, Amsterdam, there are multiple plastic containers around, see the map view to find them. Please remember to remove any liquids from your product. Will you make time to throw it away correctly?

You: plastic bottle

Laura: You have a PET plastic type object. PET items can easily be recycled by your plastic curbside recycling. In your region, Amsterdam, there are multiple plastic containers around, see the map view to find them. Please remember to remove any liquids from your product. Will you make time to throw it away correctly?

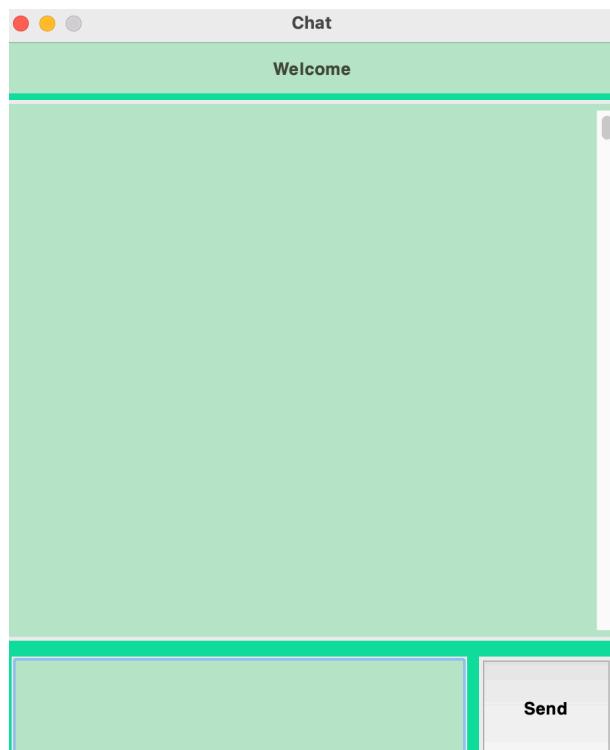
Laura: Press 1 (button) for fast plastic bottle disposal



The json file has also been improved. Long sentences were shortened or replaced with single-word sentences. As the line "I want to throw away a plastic bottle" could become entangled with other tags and patterns, it has now been reduced to "plastic bottle," which the chatbot understands. The five-step questioning method has also been shortened and spread among numerous plastic disposal processes.

```
{  
    "tag": "preparation1",  
    "patterns":  
    [  
        "Peanut butter",  
        "Soda bottle",  
        "Water bottle",  
        "Salad dressing",  
        "Container",  
        "Beverage bottles",  
        "Food bottles",  
        "Jar",  
        "Jars",  
        "Polyester clothing",  
        "Rope",  
        "plastic bottle"  
    ],  
    "responses":  
    [  
        [  
            "You have a PET plastic type object. PET items can easily be recycled by your plastic curbside r  
        ]  
    ]  
},
```

Lastly, the chatbot's colours are more coordinated with the application.

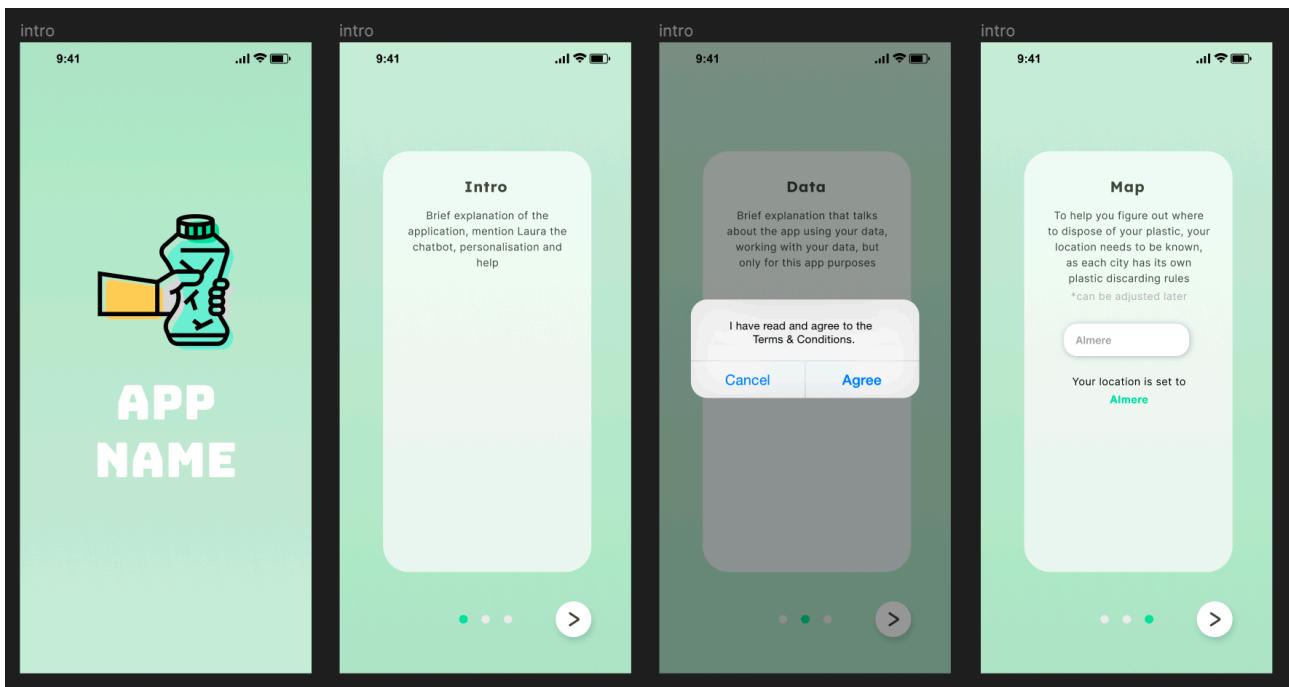


Design

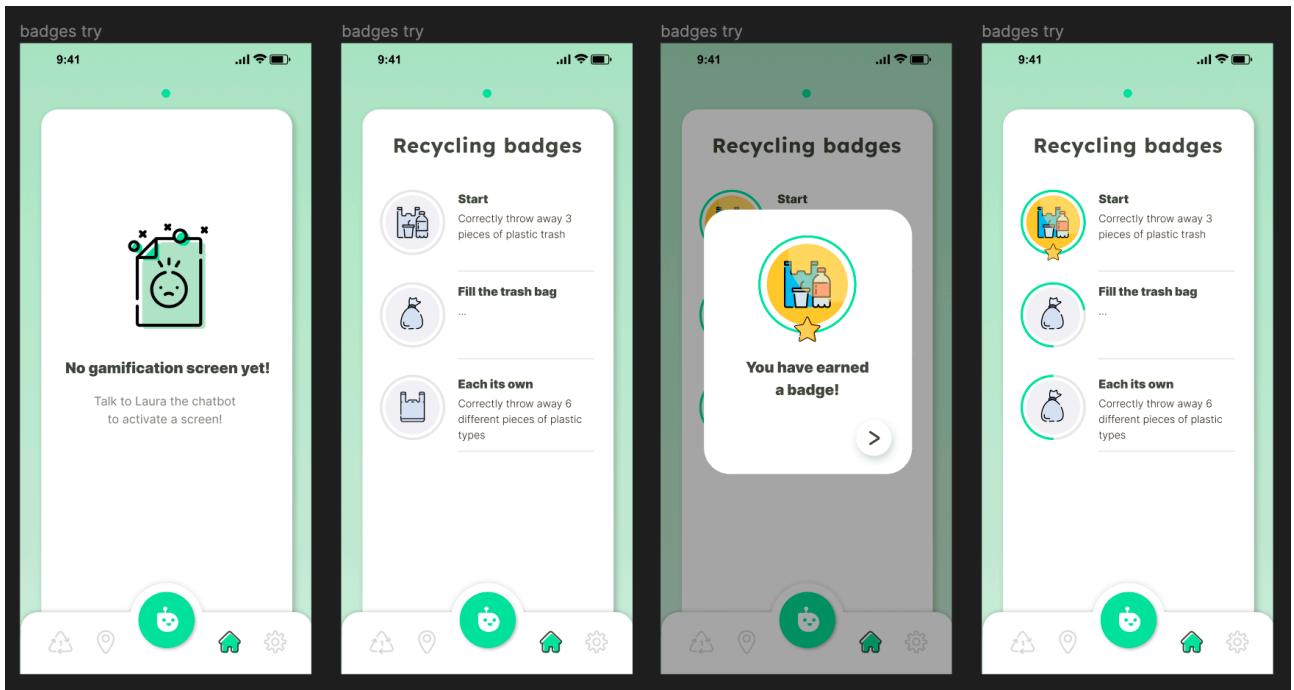
The design has improved significantly, with additional screens, more content, and a more enjoyable look.

Design: The design of the application has become more lighthearted and entertaining. The colour scheme is green to represent recycling, and the chatbot is emphasised to indicate where the application's main focus is. The visuals and buttons are simple, straightforward, and repetitive, making the interfaces simple to grasp. The visuals are made with the help of flaticon (Flaticon, z.d.).

Intro: The intro screens have been updated to explain to the user about the data that will be collected from them and whether they consent, as well as their location, so that the chatbot can tell how and where particular plastic types must be disposed. The logo and application name were also added to the intro screens.

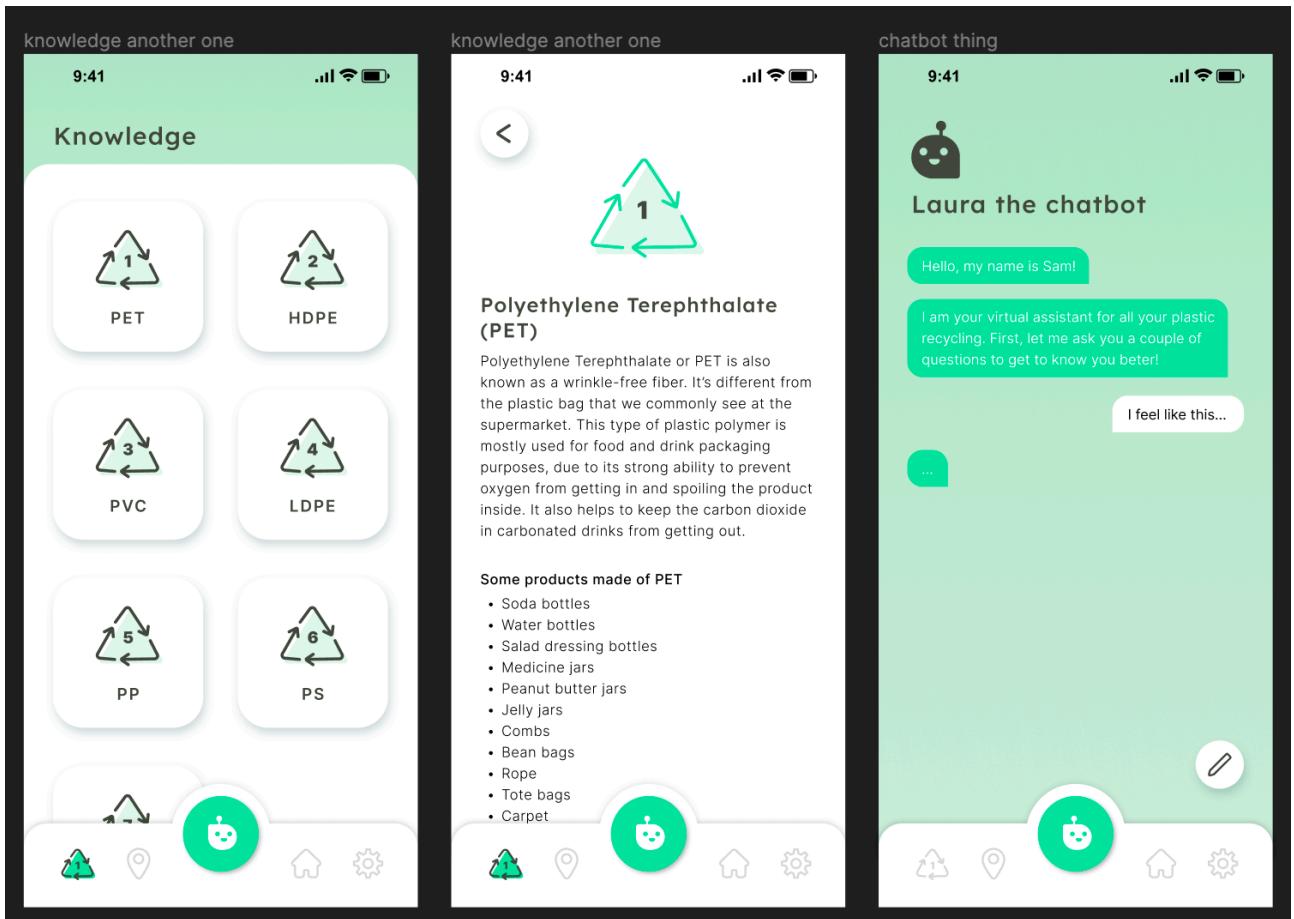


Home: The home screen design has been considerably enhanced, making room for three gamification methods, with the other two accessible via swiping. The badges gamification method has been developed, with a simple design and vibrant colours to attract the user's attention. The user can track the progress of their badges using the green line and receive a pop-up when a badge is collected. Following that, the badge will shine to remind the user of their accomplishment.



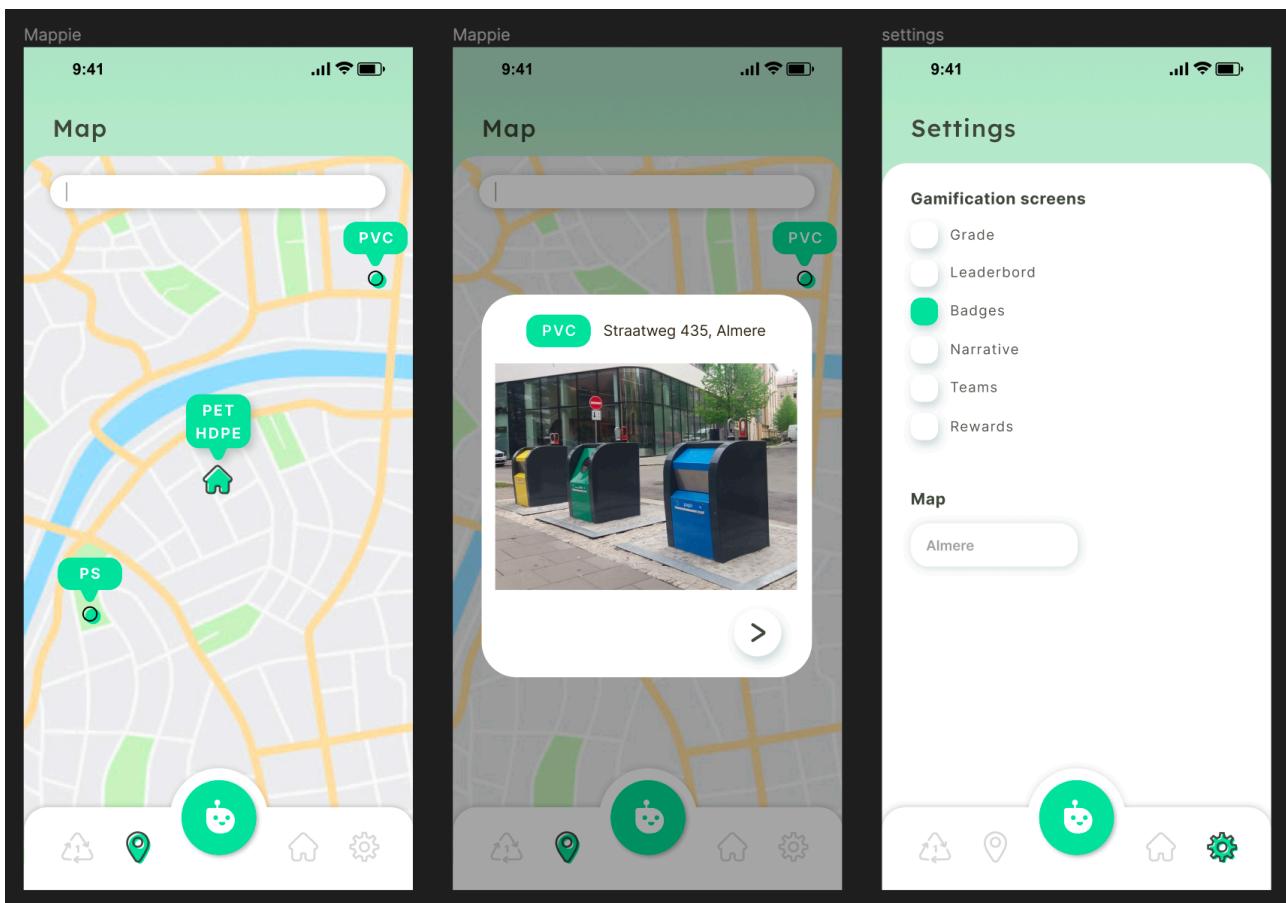
Chatbot: Except then the aesthetic, the chatbot screen hasn't changed much.

Knowledge: Except for the design, there haven't been many modifications to the knowledge screen.



Settings: A settings screen was added to provide the user with extra control if necessary. If users do not agree with the chatbot or are interested in a change, they can edit which gamification methods are active in the settings screen. The user could also change their location in case they moved.

Map: A map screen was introduced to help users understand where they should put away which type of plastic. The house icon depicts plastic types that can be thrown away at home. Plastic types that must be disposed of in a specific bin outside can also be identified on the map by their name and a green arrow. When you click on a specific, for instance, "PVC" location, a pop-up window will appear with the address and an image of the location. A map screen allows the user to see where they need to go in addition to the chatbot's words.



Usability test

The third test will look at the entire concept of the prototype, the workings of the gamification methods, the functionality and appeal of the chatbot, and its overall like-ability.

Planning

Before testing, the user will be notified of the prototype's aim and content. The user will be able to test the Figma design that is presented on the phone. The user will text in the window application to communicate with the chatbot. Questions will be asked when the user has explored the program and the chatbot.

Required resources and time

- Phone prototype of Figma
- Python file that works with the chatbot window application
- Make a note to take notes
- There are no time constraints
- A test subject

Potential assignments for the tester

- Activate a gamification method
- Find out where you may dispose of "PVC" plastic
- Change a gamification method
- Use the chatbot to successfully dispose of some plastic

Observations

- Does the user understand how the prototype works?
- Is the prototype's goal clear?
- Does the user understand what to do? What to press?
- Does the user appear to be stuck at times?
- What is the user's behaviour when using the app? What about facial expressions? - Is it negative or positive?
- How does the user perceive the app in general?

Questions to choose from

Chatbot:

- What are your opinions on the flow of the conversation?
- What do you think of the pace of the chatbot?
- Does it make the disposal procedure easier?
- Would you go through this process again for each item?

- What are your thoughts on the specific buttons that may be included at the beginning?
To speed up the process?
- Do you mind if the chatbot inquires about your personal life?
- Did you agree with the choices made by the chatbot?
- Is there anything you would modify or improve?

Application:

- What do you think of the application's new look?
- Do you comprehend what you must do in the application?
- Is the map screen helpful?
- Does the menu want to make you click the chatbot screen?
- Would you recommend this app to a friend?
- What are your thoughts on personalised home screens?
- Do you mind disclosing your location?
- Do you trust the application with your data?
- Is the empty state screen understandable?
- Is there anything you would modify or improve?

General:

- Is there anything that confuses or irritates you?
- Do you believe further feedback is required?
- What are your thoughts on the prototype?

Results

This test was done with the help of four students. 23 Female, 23 Male, 24 Female and 21 Female.

Chatbot:

- Although there have been fewer incorrect responses since the previous version, some remain
- The procedure of discarding plastic still felt excessively protracted, and answering personal inquiries took time
- The chatbot's flow has been improved
- Positive responses when the chatbot informed the user of the gamification method used
- Chatbot appears to be more of a system than a friend
- Almost everyone was able to successfully dispose of their plastic and appreciated the advice

- 70/30 split on whether they would use it again
- They loved the notion of the specific plastic item button since it would help them save time
- One of the testers was confused whether certain things were plastic or not, and wondered if the chatbot might assist

Application:

- The application's new design was favourably received
- One observer noticed a lot of green in the design
- The map interface was simple to use and appealing
- The application's visuals and illustrations were liked
- Everyone understood the empty screen and promptly hit the chatbot menu button
- Other gamification methods, such as leaderboards, sparked interest. "Then you'd have to add a profile, right?"
- There was a lot of interest in the other gamification screens, because thus far only badges have been developed
- The intro screens were clear, however they lacked some content
- "These badges urge me to discard plastic," a critical concern was identified. Yes, but doesn't that also make me want to buy plastic? Isn't that incorrect?"
- Menu icons were understood
- The application's simplicity was praised

What to improve

The test findings show that the prototype has come a long way, although some improvements can still be made. The chatbot could be made even faster with assisting the user in disposing of their plastic. The more the chatbot learns about the user, the more quickly it can assist with the process. Personal inquiries posed throughout the discarding process must be moved elsewhere. Because of the significant improvement in design, the application was warmly accepted by all. Further development of the application will mostly focus on adding more screens and content, as well as maybe adding new features such as a profile. Finally, an intriguing question must be investigated: "Is it harmful to encourage plastic use?"

Chatbot:

- Look for ways to optimise the chatbot process even more, such as a trash can function?
A skip button?
- Remove the five-step procedure questions from the discarding process entirely and place them elsewhere. Perhaps the chatbot can send a notification that it wishes to converse and then ask a question. This could also turn the chatbot into a friend rather than a machine
- Make it more data-driven; the more the chatbot learns about the user, the more quickly the process can be completed
- Make the chatbot more of a friend
- Assist in determining whether certain goods are plastic or not, if an item is uncertain, have backup code and responses
- How to know all is fare? Investigate whether the chatbot should be aware of the presence of plastic products in the home. This manner, they can determine whether or not certain plastic products were recycled

Application:

- Investigate the problem of "encouraging plastic use" further; is this a bad thing? And could gamification methods help to lessen it? Encourage the user to adopt more environmentally friendly habits, as a badge?
- Add perhaps extra functionality to the settings screen
- Fill in all of the other gamification screens with content
- Figure out how to add some sort of profile, as they are required for the gamification methods leaderboard and teams. Perhaps not a full profile, but simply a name or something else minor
- In the chatbot screen, make the chatbot feel more like a friend
- In the map screen, pay closer attention to the city and/or region. Plastic bottles, for example, should be returned to the supermarket as a deposit

Iteration 4 can be found in the Academic Paper

LINKS

To play with the prototype in Figma:

<https://www.figma.com/proto/wkhQ5pmB53R3BVS1XPd66O/Graduation-3?page-id=0%3A1&node-id=216%3A585&viewport=-3198%2C-1452%2C0.11&scaling=scale-down&starting-point-node-id=216%3A585&show Proto-sidebar=1>

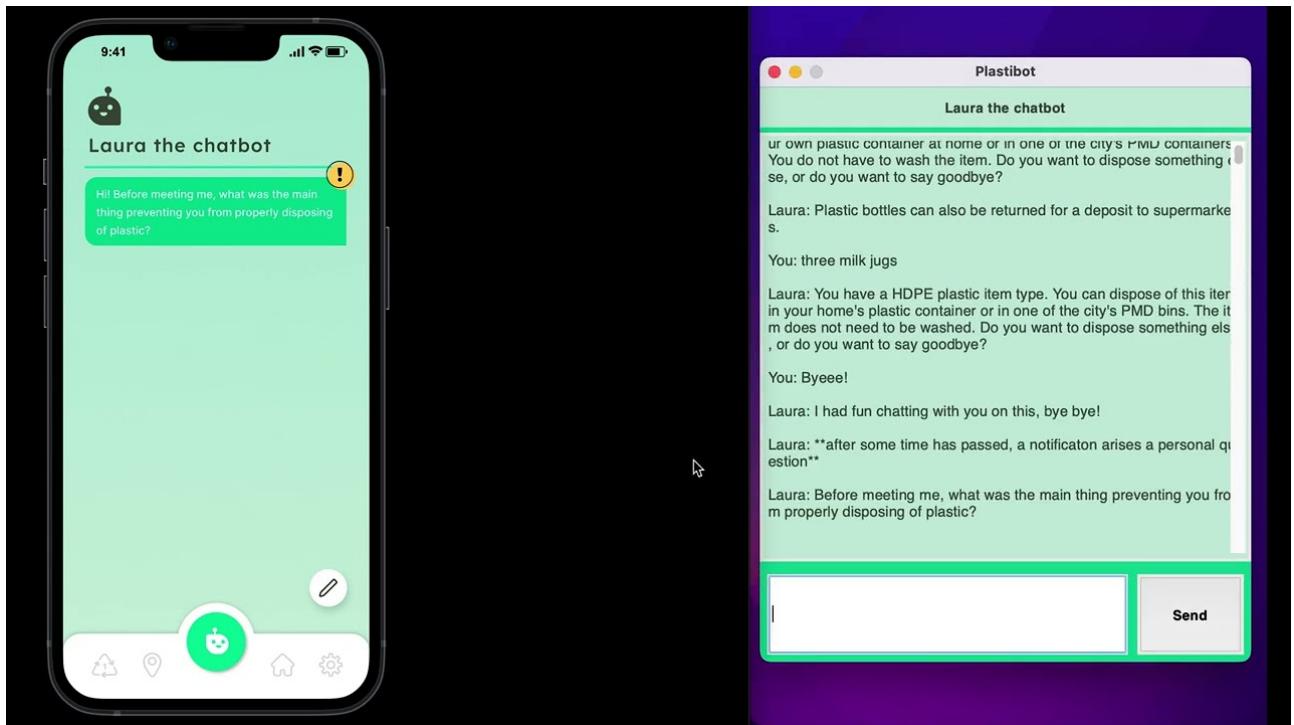
The code can be found here:

The chatbot can be played with when everything has been downloaded, accessed in Visual code, and this is entered in the terminal: model.py *enter* nltk_utils.py *enter* train.py *enter* chat.py *enter* app.py *enter*.

<https://github.com/vreebua/GraduationDDDChatbot>

Video link of prototype:

H <https://www.youtube.com/watch?v=QDTIuTN14yU>



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APPENDIX

Json file

```
{  
    "intents": [  
        {  
            "tag": "PETitemsPlastic",  
            "patterns": [  
                "Bottle",  
                "Bottles",  
                "Container",  
                "Containers",  
                "Salad dressing",  
                "Dressings",  
                "Peanut butter",  
                "Comb",  
                "Combs",  
                "Mouthwash",  
                "Salad domes",  
                "Salad dressing",  
                "Tray",  
                "Trays",  
                "Tin can",  
                "Can",  
                "Cans"  
            ],  
            "responses": [  
                "You have a PET plastic item type. You can throw this item in your plastic container at home, or you can throw it away in one of the PMD containers found in the city. You do not have to wash the items. Do you wish to discard another item, or would you like to say goodbye?",  
                "This is a PET plastic item type. You can dispose of this item in your own plastic container at home or in one of the city's PMD bins. You do not have to wash the item. Do you want to dispose something else, or do you want to say goodbye?",  
                "This would be a PET plastic item type. You can dispose of this item in your home's plastic container or in one of the city's PMD bins. The item does not need to be washed. Do you want to discard something else or say goodbye?",  
                "This item is made of PET plastic. You can dispose of this item in your own plastic container at home or in one of the PMD containers located across the city. You are not required to clean the product. Would you like to say goodbye or would you like to dispose another item?",  
                "You are carrying a PET plastic item type. This item can be disposed of in either your home's plastic trash container or a PMD container that can be found across the city. The item does not require washing. Do you want to discard anything else, or should we say goodbye?"  
            ]  
        },  
        {  
            "tag": "PETitemsRest",  
            "patterns": [  
                "Jar",  
                "Jars",  
                "Tennis ball",  
                "Tennis balls"  
            ],  
            "responses": [  
                "You have a PET plastic item type. You can throw this item in the residual waste container at home. Do you wish to discard another item, or would you like to say goodbye?",  
                "This is a PET plastic item type. You can dispose of this item in your home's residual waste container. Do you want to dispose something else, or do you want to say goodbye?",  
            ]  
        }  
    ]  
}
```

```

        "This would be a PET plastic item type. This item can be disposed of
at home in the residual waste container. Do you want to discard something else
or say goodbye?", [
            "This item is made of PET plastic. You can dispose of this item in
your household's residual waste container. Would you like to say goodbye or
would you like to dispose another item?", [
                "You are carrying a PET plastic item type. You can discard this item
in your home's residual garbage container. Do you want to discard anything else,
or should we say goodbye?"]
        ],
    },
    {
        "tag": "PETItemsScheiding",
        "patterns": [
            "Clothing",
            "Rope",
            "Ropes",
            "Carpet",
            "Carpets",
            "Window cleaner"
        ],
        "responses": [
            "You have a PET plastic item type. You can dispose of this item at a
separation station that can be found just outside the city. Each separation
station provides instruction and help from staff members as to which container
your item has to be thrown into. Do you wish to discard another item, or would
you like to say goodbye?", [
                "This is a PET plastic item type. This item can be disposed of at a
separation station located just outside of town. Each separation station
provides staff guidance and assistance in determining which bin your item should
be thrown into. Do you want to dispose something else, or do you want to say
goodbye?", [
                    "This would be a PET plastic item type. You can dispose of this item
at a separation station located just outside of town. Each separation station
provides staff members with instructions and assistance in determining which bin
your item should be tossed into. Do you want to discard something else or say
goodbye?", [
                        "This item is made of PET plastic. This item can be disposed of at a
separation station that is nearby the city. Each separation station offers
personnel assistance and instructions regarding which bin your item should be
thrown into. Would you like to say goodbye or would you like to dispose another
item?", [
                            "You are carrying a PET plastic item type. This item may be disposed
of at a separation station located just outside the city. Each separation
station gives staff guidance and assistance in determining which container your
item should be placed in. Do you want to discard anything else, or should we say
goodbye?"]
                    ],
                ],
            },
            {
                "tag": "HDPEitemsPlastic",
                "patterns": [
                    "Jug",
                    "Jugs",
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                    "Bag",
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                    "Shampoo bottle",
                    "Shampoo bottles",
                    "Conditioner",
                    "Conditioner bottle",
                    "Conditioner bottles",
                    "Soap",
                    "Soaps",
                    "Detergent",
                ]
            }
        ]
    }
}

```

```

        "Detergents",
        "Bleach",
        "Juice",
        "Grocery",
        "Reusable",
        "Freezer bags"
    ],
    "responses": [
        "You have a HDPE plastic item type. You can dispose of this item in your home's plastic container or in one of the city's PMD bins. The item does not need to be washed. Do you want to dispose something else, or do you want to say goodbye?", [REDACTED]
        "This is a HDPE plastic item type. You can throw this item in your plastic container at home, or you can throw it away in one of the PMD containers found in the city. You do not have to wash the items. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]
        "This would be a HDPE plastic item type. You can dispose of this item in your own plastic container at home or in one of the PMD containers located across the city. You are not required to clean the product. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
        "This item is made of HDPE plastic. This item can be disposed of in either your home's plastic trash container or a PMD container that can be found across the city. The item does not require washing. Would you like to say goodbye or would you like to dispose another item?", [REDACTED]
        "You are carrying a HDPE plastic item type. You can dispose of this item in your own plastic container at home or in one of the city's PMD containers. You do not have to wash the item. Do you want to discard something else or say goodbye?" [REDACTED]
    ]
},
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    "tag": "HDPEitemsRest",
    "patterns": [
        "Motor oil",
        "Oil",
        "Oils"
    ],
    "responses": [
        "You have a HDPE plastic item type. You can dispose of this item in your home's residual waste container. You can dispose of this item in your home's residual waste container?", [REDACTED]
        "This is a HDPE plastic item type. You can dispose of this item in your household's residual waste container. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]
        "This would be a HDPE plastic item type. This item can be disposed of at home in the residual waste container. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
        "This item is made of HDPE plastic. You can throw this item in the residual waste container at home. Would you like to say goodbye or would you like to dispose another item?", [REDACTED]
        "You are carrying a HDPE plastic item type. You can discard this item in your home's residual garbage container. Do you want to discard something else or say goodbye?" [REDACTED]
    ]
},
{
    "tag": "HDPEitemsScheiden",
    "patterns": [
        "Toys",
        "Toy",
        "Cleaner",
        "Cleaners",
        "Bucket",
        "Crate",
        "Crates"
    ],
    "responses": [
        "You have a HDPE plastic item type. You can dispose of this item in your home's residual waste container. You can dispose of this item in your home's residual waste container?", [REDACTED]
        "This is a HDPE plastic item type. You can throw this item in your household's residual waste container. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]
        "This would be a HDPE plastic item type. This item can be disposed of at home in the residual waste container. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
        "This item is made of HDPE plastic. You can throw this item in the residual waste container at home. Would you like to say goodbye or would you like to dispose another item?", [REDACTED]
        "You are carrying a HDPE plastic item type. You can discard this item in your home's residual garbage container. Do you want to discard something else or say goodbye?" [REDACTED]
    ]
}

```

```
"responses": [
    "You have a HDPE plastic item type. This item can be disposed of at a separation station located just outside of town. Each separation station provides staff guidance and assistance in determining which bin your item should be thrown into. Do you want to dispose something else, or do you want to say goodbye?", [
        "This is a HDPE plastic item type. You can dispose of this item at a separation station that can be found just outside the city. Each separation station provides instruction and help from staff members as to which container your item has to be thrown into. Do you wish to discard another item, or would you like to say goodbye?", [
            "This would be a HDPE plastic item type. This item can be disposed of at a separation station that is nearby the city. Each separation station offers personnel assistance and instructions regarding which bin your item should be thrown into. Do you want to discard anything else, or should we say goodbye?", [
                "This item is made of HDPE plastic. You can dispose of this item at a separation station located just outside of town. Each separation station provides staff members with instructions and assistance in determining which bin your item should be tossed into. Would you like to say goodbye or would you like to dispose another item?", [
                    "You are carrying a HDPE plastic item type. This item may be disposed of at a separation station located just outside the city. Each separation station gives staff guidance and assistance in determining which container your item should be placed in. Do you want to discard something else or say goodbye?"
                ]
            ]
        ]
    ]
}, [
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    "patterns": [
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        "Film",
        "Cosmetic",
        "Cosmetics",
        "Blister packs"
    ],
    "responses": [
        "You have a PVC plastic item type. You can discard this item in your home's residual garbage container. Would you like to say goodbye or would you like to dispose another item?", [
            "This is a PVC plastic item type. This item can be disposed of at home in the residual waste container. Do you want to discard something else or say goodbye?", [
                "This would be a PVC plastic item type. You can throw this item in the residual waste container at home. Do you wish to discard another item, or would you like to say goodbye?", [
                    "This item is made of PVC plastic. You can dispose of this item in your home's residual waste container. Do you want to discard anything else, or should we say goodbye?", [
                        "You are carrying a PVC plastic item type. You can dispose of this item in your household's residual waste container. Do you want to dispose something else, or do you want to say goodbye?"
                    ]
                ]
            ]
        ]
    ]
}, [
{
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    "patterns": [
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        "Tote bags",
        "Plumbing pipes",
        "Plumbing",
        "Tile",
        "Tiles",
        "Shoes",
        "Gutters",
        "Window frames",
        "Frame"
    ]
}
```

```

    "Frames",
    "Ducts",
    "Sewage pipes",
    "Pipe",
    "Pipes",
    "Wire",
    "Wires",
    "Flooring",
    "Building",
    "Automotive parts",
    "Thermal",
    "Wall cladding",
    "Roof sheeting",
    "Garden hose",
    "Shoe soles",
    "Cable sheathing",
    "Electrical conduit"
  ],
  "responses": [
    "You have a PVC plastic item type. You can dispose of this item at a separation station that can be found just outside the city. Each separation station provides instruction and help from staff members as to which container your item has to be thrown into. Do you want to discard anything else, or should we say goodbye?", [
      "This is a PVC plastic item type. This item can be disposed of at a separation station located just outside of town. Each separation station provides staff guidance and assistance in determining which bin your item should be thrown into. Would you like to say goodbye or would you like to dispose another item?", [
        "This would be a PVC plastic item type. You can dispose of this item at a separation station located just outside of town. Each separation station provides staff members with instructions and assistance in determining which bin your item should be tossed into. Do you want to discard something else or say goodbye?", [
          "This item is made of PVC plastic. This item can be disposed of at a separation station that is nearby the city. Each separation station offers personnel assistance and instructions regarding which bin your item should be thrown into. Do you want to dispose something else, or do you want to say goodbye?", [
            "You are carrying a PVC plastic item type. This item may be disposed of at a separation station located just outside the city. Each separation station gives staff guidance and assistance in determining which container your item should be placed in. Do you wish to discard another item, or would you like to say goodbye?" ]
      ]
    ]
  ],
  {
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    "patterns": [
      "Wrap",
      "Wraps",
      "Cling wrap",
      "Sandwich bag",
      "Squeezable",
      "Squeezable bottle",
      "Squeeze bottles",
      "Squeeze",
      "Flexible",
      "Flexible container",
      "Lid",
      "Lids",
      "Shrink wrap",
      "Cling wrap",
      "Wraps",
      "Wrap"
    ],
  }
]

```

```

    "responses": [
        "You have a LDPE plastic item type. You can dispose of this item in your home's plastic container or in one of the city's PMD bins. The item does not need to be washed. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
        "This is a LDPE plastic item type. You can dispose of this item in your own plastic container at home or in one of the city's PMD containers. You do not have to wash the item. Would you like to say goodbye or would you like to dispose another item?", [REDACTED]
        "This would be a LDPE plastic item type. This item can be disposed of in either your home's plastic trash container or a PMD container that can be found across the city. The item does not require washing. Do you want to discard something else or say goodbye?", [REDACTED]
        "This item is made of LDPE plastic. You can throw this item in your plastic container at home, or you can throw it away in one of the PMD containers found in the city. You do not have to wash the items. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]
        "You are carrying a LDPE plastic item type. You can dispose of this item in your own plastic container at home or in one of the PMD containers located across the city. You are not required to clean the product. Do you want to dispose something else, or do you want to say goodbye?" [REDACTED]
    ],
    [REDACTED],
    {
        "tag": "LDPEitemsRest",
        "patterns": [
            "Insulation",
            "Plastic film",
            "Bin liners",
            "Liners",
            "Liner",
            "Garbage bag",
            "Garbage bags",
            "Garbage",
            "Irrigation tubing"
        ],
        "responses": [
            "You have a LDPE plastic item type. This item can be disposed of at home in the residual waste container. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
            "This is a LDPE plastic item type. You can dispose of this item in your home's residual waste container. Would you like to say goodbye or would you like to dispose another item?", [REDACTED]
            "This would be a LDPE plastic item type. You can discard this item in your home's residual garbage container. Do you want to discard something else or say goodbye?", [REDACTED]
            "This item is made of LDPE plastic. You can throw this item in the residual waste container at home. Do you want to dispose something else, or do you want to say goodbye?", [REDACTED]
            "You are carrying a LDPE plastic item type. You can dispose of this item in your household's residual waste container. Do you wish to discard another item, or would you like to say goodbye?" [REDACTED]
        ],
        [REDACTED],
        {
            "tag": "PPitemsPlastic",
            "patterns": [
                "Prescription bottle",
                "Prescription bottles",
                "Prescription",
                "Cups",
                "Cup",
                "Take-out",
                "Take out",
                "Take out container",
                "Take out containers",
                "Take out containers"
            ]
        }
    }
]
```

```

        "Microwave dish",
        "Microwave dishes",
        "Chips"
    ],
    "responses": [
        "You have a PP plastic item type. You can throw this item in your plastic container at home, or you can throw it away in one of the PMD containers found in the city. You do not have to wash the items. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
        "This is a PP plastic item type. You can dispose of this item in your own plastic container at home or in one of the PMD containers located across the city. You are not required to clean the product. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]
        "This would be a PP plastic item type. You can dispose of this item in your home's plastic container or in one of the city's PMD bins. The item does not need to be washed. Do you want to dispose something else, or do you want to say goodbye?", [REDACTED]
        "This item is made of PP plastic. This item can be disposed of in either your home's plastic trash container or a PMD container that can be found across the city. The item does not require washing. Do you want to discard something else or say goodbye?", [REDACTED]
        "You are carrying a PP plastic item type. You can dispose of this item in your own plastic container at home or in one of the city's PMD containers. You do not have to wash the item. Would you like to say goodbye or would you like to dispose another item?" [REDACTED]
    ]
},
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        "Kitchenwares",
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        "Disposable",
        "Plates",
        "Plate",
        "Straws",
        "Straw",
        "Lunch box",
        "Packaging tape"
    ],
    "responses": [
        "You have a PP plastic item type. This item can be disposed of at home in the residual waste container. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
        "This is a PP plastic item type. You can discard this item in your home's residual garbage container. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]
        "This would be a PP plastic item type. You can throw this item in the residual waste container at home. Do you want to dispose something else, or do you want to say goodbye?", [REDACTED]
        "This item is made of PP plastic. You can dispose of this item in your household's residual waste container. Do you want to discard something else or say goodbye?", [REDACTED]
        "You are carrying a PP plastic item type. You can dispose of this item in your home's residual waste container. Would you like to say goodbye or would you like to dispose another item?" [REDACTED]
    ]
},
{
    "tag": "PPitemsScheiden",
    "patterns": [

```

```

    "Margarine tubs",
    "Margarine",
    "Tubs",
    "Tub",
    "Luggage",
    "Upholstery"
  ],
  "responses": [
    "You have a PP plastic item type. You can dispose of this item at a separation station located just outside of town. Each separation station provides staff members with instructions and assistance in determining which bin your item should be tossed into. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
    "This is a PP plastic item type. You can dispose of this item at a separation station that can be found just outside the city. Each separation station provides instruction and help from staff members as to which container your item has to be thrown into. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]
    "This would be a PP plastic item type. This item may be disposed of at a separation station located just outside the city. Each separation station gives staff guidance and assistance in determining which container your item should be placed in. Do you want to dispose something else, or do you want to say goodbye?", [REDACTED]
    "This item is made of PP plastic. This item can be disposed of at a separation station located just outside of town. Each separation station provides staff guidance and assistance in determining which bin your item should be thrown into. Do you want to discard something else or say goodbye?", [REDACTED]
    "You are carrying a PP plastic item type. This item can be disposed of at a separation station that is nearby the city. Each separation station offers personnel assistance and instructions regarding which bin your item should be thrown into. Would you like to say goodbye or would you like to dispose another item?" [REDACTED]
  ]
},
{
  "tag": "PSitemsPlastic",
  "patterns": [
    "Coffee cup",
    "Coffee cups",
    "Coffee"
  ],
  "responses": [
    "You have a PS plastic item type. This item can be disposed of in either your home's plastic trash container or a PMD container that can be found across the city. The item does not require washing. Do you want to discard something else or say goodbye?", [REDACTED]
    "This is a PS plastic item type. You can dispose of this item in your own plastic container at home or in one of the PMD containers located across the city. You are not required to clean the product. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]
    "This would be a PS plastic item type. You can throw this item in your plastic container at home, or you can throw it away in one of the PMD containers found in the city. You do not have to wash the items. Do you want to discard anything else, or should we say goodbye?", [REDACTED]
    "This item is made of PS plastic. You can dispose of this item in your own plastic container at home or in one of the city's PMD containers. You do not have to wash the item. Would you like to say goodbye or would you like to dispose another item?", [REDACTED]
    "You are carrying a PS plastic item type. You can dispose of this item in your home's plastic container or in one of the city's PMD bins. The item does not need to be washed. Do you want to dispose something else, or do you want to say goodbye?" [REDACTED]
  ]
},
{
  "tag": "PSitemsRest",
}

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"patterns": [
    "Cutlery",
    "Packing foam",
    "Foam",
    "Packing peanuts",
    "Packing",
    "Insulation",
    "Imitation glassware",
    "Protective packaging"
],
{
    "responses": [
        "You have a PS plastic item type. This item can be disposed of at home in the residual waste container. Do you want to discard something else or say goodbye?", [
            "This is a PS plastic item type. You can throw this item in the residual waste container at home. Do you want to discard anything else, or should we say goodbye?", [
                "This would be a PS plastic item type. You can dispose of this item in your household's residual waste container. Do you wish to discard another item, or would you like to say goodbye?", [
                    "This item is made of PS plastic. You can discard this item in your home's residual garbage container. Do you want to dispose something else, or do you want to say goodbye?", [
                        "You are carrying a PS plastic item type. You can dispose of this item in your home's residual waste container. Would you like to say goodbye or would you like to dispose another item?"
                ]
            ]
        ]
    ]
},
{
    "tag": "PSitemsScheiden",
    "patterns": [
        "Household",
        "Appliance",
        "Appliances",
        "Car parts"
    ],
    "responses": [
        "You have a PS plastic item type. You can dispose of this item at a separation station located just outside of town. Each separation station provides staff members with instructions and assistance in determining which bin your item should be tossed into. Do you want to discard something else or say goodbye?", [
            "This is a PS plastic item type. This item can be disposed of at a separation station that is nearby the city. Each separation station offers personnel assistance and instructions regarding which bin your item should be thrown into. Do you wish to discard another item, or would you like to say goodbye?", [
                "This would be a PS plastic item type. This item may be disposed of at a separation station located just outside the city. Each separation station gives staff guidance and assistance in determining which container your item should be placed in. Do you want to discard anything else, or should we say goodbye?", [
                    "This item is made of PS plastic. You can dispose of this item at a separation station that can be found just outside the city. Each separation station provides instruction and help from staff members as to which container your item has to be thrown into. Would you like to say goodbye or would you like to dispose another item?", [
                        "You are carrying a PS plastic item type. This item can be disposed of at a separation station located just outside of town. Each separation station provides staff guidance and assistance in determining which bin your item should be thrown into. Do you want to dispose something else, or do you want to say goodbye?"
                ]
            ]
        ]
    ]
},
{
    "tag": "OTHERitemsRest",
}

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"patterns": [
    "CD case",
    "Baby",
    "Eyeglasses",
    "Eye",
    "Glasses",
    "Packaging"
],
"responses": [
    "You have a OTHER plastic item type. You can discard this item in your home's residual garbage container. Do you want to discard anything else, or should we say goodbye?", 
    "This is a OTHER plastic item type. You can throw this item in the residual waste container at home. Would you like to say goodbye or would you like to dispose another item?", 
    "This would be a OTHER plastic item type. You can dispose of this item in your household's residual waste container. Do you want to discard something else or say goodbye?", 
    "This item is made of OTHER plastic. You can dispose of this item in your home's residual waste container. Do you wish to discard another item, or would you like to say goodbye?", 
    "You are carrying a OTHER plastic item type. This item can be disposed of at home in the residual waste container. Do you want to dispose something else, or do you want to say goodbye?" 
]
},
{
"tag": "OTHERitemsScheiden",
"patterns": [
    "CD",
    "CDs",
    "DVD",
    "DVDs",
    "Medical",
    "Exterior",
    "Lighting",
    "TV",
    "Computer",
    "Computers",
    "IT equipment",
    "Safety equipment",
    "Video cases",
    "Automotive"
],
"responses": [
    "You have a OTHER plastic item type. This item can be disposed of at a separation station located just outside of town. Each separation station provides staff guidance and assistance in determining which bin your item should be thrown into. Do you want to discard anything else, or should we say goodbye?", 
    "This is a OTHER plastic item type. You can dispose of this item at a separation station that can be found just outside the city. Each separation station provides instruction and help from staff members as to which container your item has to be thrown into. Would you like to say goodbye or would you like to dispose another item?", 
    "This would be a OTHER plastic item type. This item can be disposed of at a separation station that is nearby the city. Each separation station offers personnel assistance and instructions regarding which bin your item should be thrown into. Do you want to discard something else or say goodbye?", 
    "This item is made of OTHER plastic. This item may be disposed of at a separation station located just outside the city. Each separation station gives staff guidance and assistance in determining which container your item should be placed in. Do you wish to discard another item, or would you like to say goodbye?", 
    "You are carrying a OTHER plastic item type. You can dispose of this item at a separation station located just outside of town. Each separation

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station provides staff members with instructions and assistance in determining
which bin your item should be tossed into. Do you want to dispose something
else, or do you want to say goodbye?"]
}, [
{
  "tag": "attitude",
  "patterns": [
    "Attitude",
    "Ego",
    "Imago",
    "Favour",
    "Favor",
    "Good for me",
    "Handy for me",
    "In favor",
    "Emotional state",
    "Feel good about myself",
    "To feel good",
    "Honor",
    "Because I can",
    "For myself",
    "Myself",
    "I do it for myself",
    "My emotional state",
    "It makes me feel good",
    "Good",
    "Strong",
    "Thankful",
    "Improve oneself",
    "Improving"
  ],
  "responses": [
    "I appreciate your response, and I kind of concur!",
    "Thank you for sharing that with me; I can see where you are coming
from!",
    "I appreciate you entrusting me with your response; I'll utilise it
wisely!",
    "I appreciate you giving your viewpoint because my thoughts are the
same!",
    "Thank you for sharing your thoughts. I admire your way of thinking!"
  ]
},
{
  "tag": "subjectivenorms",
  "patterns": [
    "Society",
    "Stress",
    "Pressure",
    "Opinions from others",
    "Opinions",
    "Others",
    "People",
    "People outside",
    "Being judged",
    "They judge",
    "Amount of pressure",
    "Scared of others opinions",
    "Opinion",
    "Felt pressured",
    "To stop feeling pressure",
    "For others",
    "For society",
    "To help society",
    "To stop people talking",
    "The stress from others",
  ]
}

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        "Relief",
        "Less pressure",
        "For others"
    ],
    "responses": [
        "I appreciate your response, and I kind of concur!",
        "Thank you for sharing that with me; I can see where you are coming
from!",
        "I appreciate you entrusting me with your response; I'll utilise it
wisely!",
        "I appreciate you giving your viewpoint because my thoughts are the
same!",
        "Thank you for sharing your thoughts. I admire your way of thinking!"
    ]
},
{
    "tag": "perceivedcontrol",
    "patterns": [
        "Motivated",
        "Excited",
        "Why not",
        "Seems easy",
        "Not difficult",
        "Seems difficult",
        "Seemed difficult",
        "Easy task",
        "Facil",
        "Motivate",
        "Cause",
        "Perform",
        "Behaviour",
        "Because it is easy",
        "Because I can",
        "Because I could",
        "It takes no time",
        "Easy to do",
        "No problem",
        "Thinking it be difficult",
        "Difficult",
        "Hard",
        "Easy",
        "It is easy",
        "No complaints",
        "Difficult"
    ],
    "responses": [
        "I appreciate your response, and I kind of concur!",
        "Thank you for sharing that with me; I can see where you are coming
from!",
        "I appreciate you entrusting me with your response; I'll utilise it
wisely!",
        "I appreciate you giving your viewpoint because my thoughts are the
same!",
        "Thank you for sharing your thoughts. I admire your way of thinking!"
    ]
},
{
    "tag": "knowledge",
    "patterns": [
        "Wanting to learn",
        "Knowledge",
        "Learning",
        "Learn",
        "Learnt",
        "Understand",
        "Understanding",

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        "Smart",
        "Knowing",
        "Know",
        "Knowledgeable",
        "To learn more",
        "To help more",
        "To understand it more",
        "Wanting to know",
        "Learn about problems",
        "Learn about solutions",
        "Having no knowledge",
        "Not understanding it",
        "Filling",
        "To help learn",
        "Brain",
        "Educated",
        "Educating",
        "Reading",
        "Read",
        "Knowing"
    ],
    "responses": [
        "I appreciate your response, and I kind of concur!",
        "Thank you for sharing that with me; I can see where you are coming
from!",
        "I appreciate you entrusting me with your response; I'll utilise it
wisely!",
        "I appreciate you giving your viewpoint because my thoughts are the
same!",
        "Thank you for sharing your thoughts. I admire your way of thinking!"
    ]
},
{
    "tag": "socialpressure",
    "patterns": [
        "Friends",
        "Family",
        "Pressure",
        "Need to act",
        "They said so",
        "Cause they also do it",
        "They",
        "Friend",
        "Sister",
        "Brother",
        "Mother",
        "Father",
        "Boyfriend",
        "Girlfriend",
        "Bestfriend",
        "Classmate",
        "For my friends",
        "For my family",
        "Cause they do it also",
        "Friends and family",
        "People around me",
        "Annoying"
    ],
    "responses": [
        "I appreciate your response, and I kind of concur!",
        "Thank you for sharing that with me; I can see where you are coming
from!",
        "I appreciate you entrusting me with your response; I'll utilise it
wisely!",
        "I appreciate you giving your viewpoint because my thoughts are the
same!",
    ]
}

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        "Thank you for sharing your thoughts. I admire your way of thinking!""
    ],
},
{
    "tag": "moralnorms",
    "patterns": [
        "Pride",
        "Prideful",
        "Shameful",
        "Shame",
        "Helping",
        "Help",
        "Proud",
        "To be proud",
        "Feel no shame",
        "Moral norms",
        "For the world",
        "To help the world",
        "To help stop pollution",
        "To stop feeling bad about myself",
        "For myself",
        "Scared",
        "I am proud of myself",
        "Right thing",
        "Because it is the right thing to do",
        "For the world",
        "For the future",
        "Future",
        "Children",
        "Give back",
        "Giving back"
    ],
},
{
    "responses": [
        "I appreciate your response, and I kind of concur!",
        "Thank you for sharing that with me; I can see where you are coming
from!",
        "I appreciate you entrusting me with your response; I'll utilise it
wisely!",
        "I appreciate you giving your viewpoint because my thoughts are the
same!",
        "Thank you for sharing your thoughts. I admire your way of thinking!"
    ],
},
{
    "tag": "nogoodanswer",
    "patterns": [
        "Nothing",
        "I do not know"
    ],
},
{
    "responses": [
        "I appreciate your response, and I kind of concur!",
        "Thank you for sharing that with me; I can see where you are coming
from!",
        "I appreciate you entrusting me with your response; I'll utilise it
wisely!",
        "I appreciate you giving your viewpoint because my thoughts are the
same!",
        "Thank you for sharing your thoughts. I admire your way of thinking!"
    ],
},
{
    "tag": "buttonpressPlasticBottle",
    "patterns": [
        "button"
    ],
},
{
    "responses": [

```

"You have a PET plastic item type. You can throw this item in your plastic container at home, or you can throw it away in one of the PMD containers found in the city. You do not have to wash the items. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]

"This is a PET plastic item type. You can dispose of this item in your own plastic container at home or in one of the city's PMD containers. You do not have to wash the item. Do you want to dispose something else, or do you want to say goodbye?", [REDACTED]

"This would be a PET plastic item type. You can dispose of this item in your home's plastic container or in one of the city's PMD bins. The item does not need to be washed. Do you want to discard something else or say goodbye?", [REDACTED]

"This item is made of PET plastic. You can dispose of this item in your own plastic container at home or in one of the PMD containers located across the city. You are not required to clean the product. Would you like to say goodbye or would you like to dispose another item?", [REDACTED]

"You are carrying a PET plastic item type. This item can be disposed of in either your home's plastic trash container or a PMD container that can be found across the city. The item does not require washing. Do you want to discard anything else, or should we say goodbye?"

```
], [REDACTED]
}, [REDACTED]
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```
    "tag": "buttonpress2",
    "patterns": [
        "button2"
    ], [REDACTED]
    "responses": [
```

"You have a HDPE plastic item type. You can throw this item in your plastic container at home, or you can throw it away in one of the PMD containers found in the city. You do not have to wash the items. Do you wish to discard another item, or would you like to say goodbye?", [REDACTED]

"This is a HDPE plastic item type. You can dispose of this item in your own plastic container at home or in one of the city's PMD containers. You do not have to wash the item. Do you want to dispose something else, or do you want to say goodbye?", [REDACTED]

"This would be a HDPE plastic item type. You can dispose of this item in your home's plastic container or in one of the city's PMD bins. The item does not need to be washed. Do you want to discard something else or say goodbye?", [REDACTED]

"This item is made of HDPE plastic. You can dispose of this item in your own plastic container at home or in one of the PMD containers located across the city. You are not required to clean the product. Would you like to say goodbye or would you like to dispose another item?", [REDACTED]

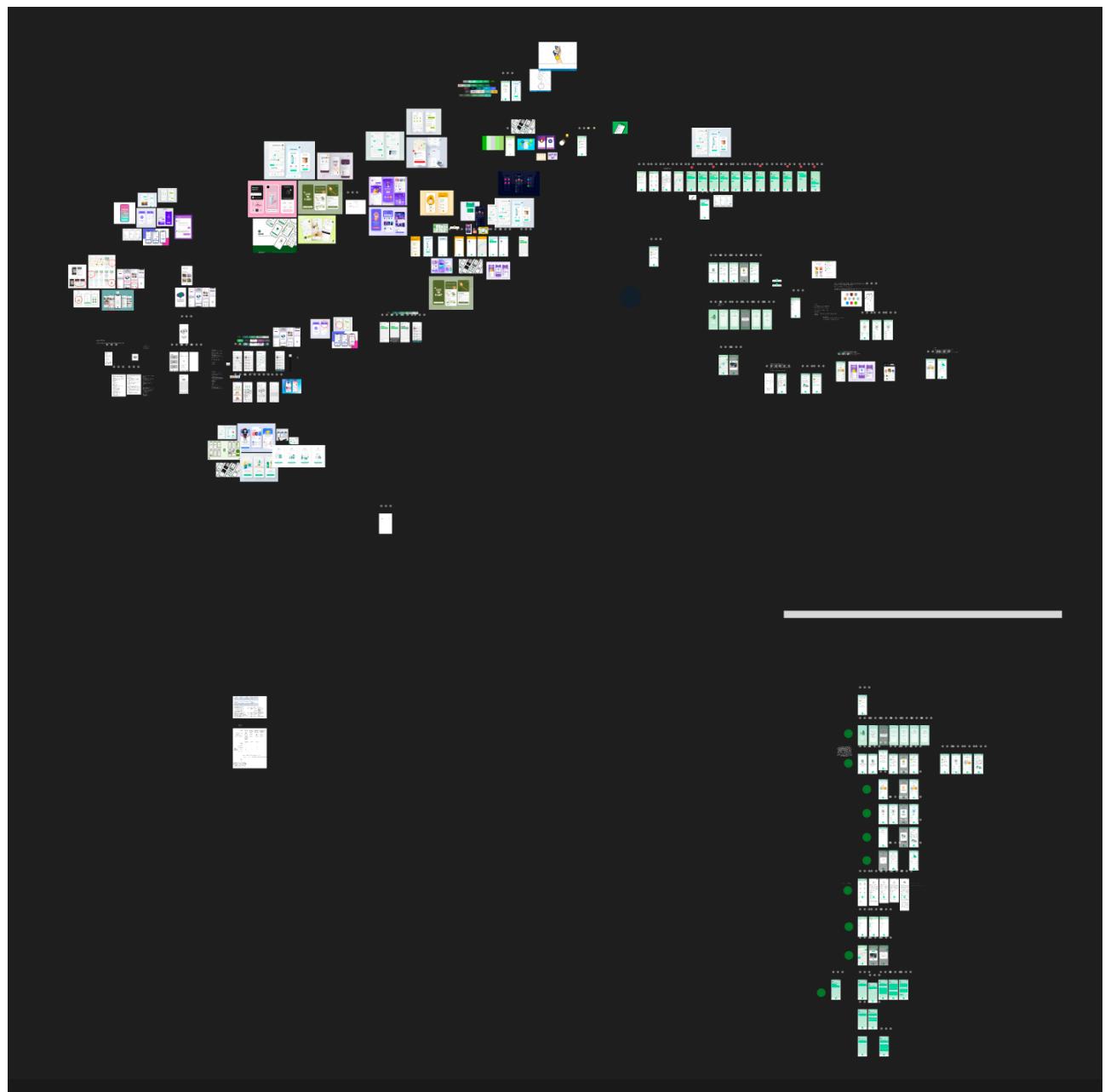
"You are carrying a HDPE plastic item type. This item can be disposed of in either your home's plastic trash container or a PMD container that can be found across the city. The item does not require washing. Do you want to discard anything else, or should we say goodbye?"

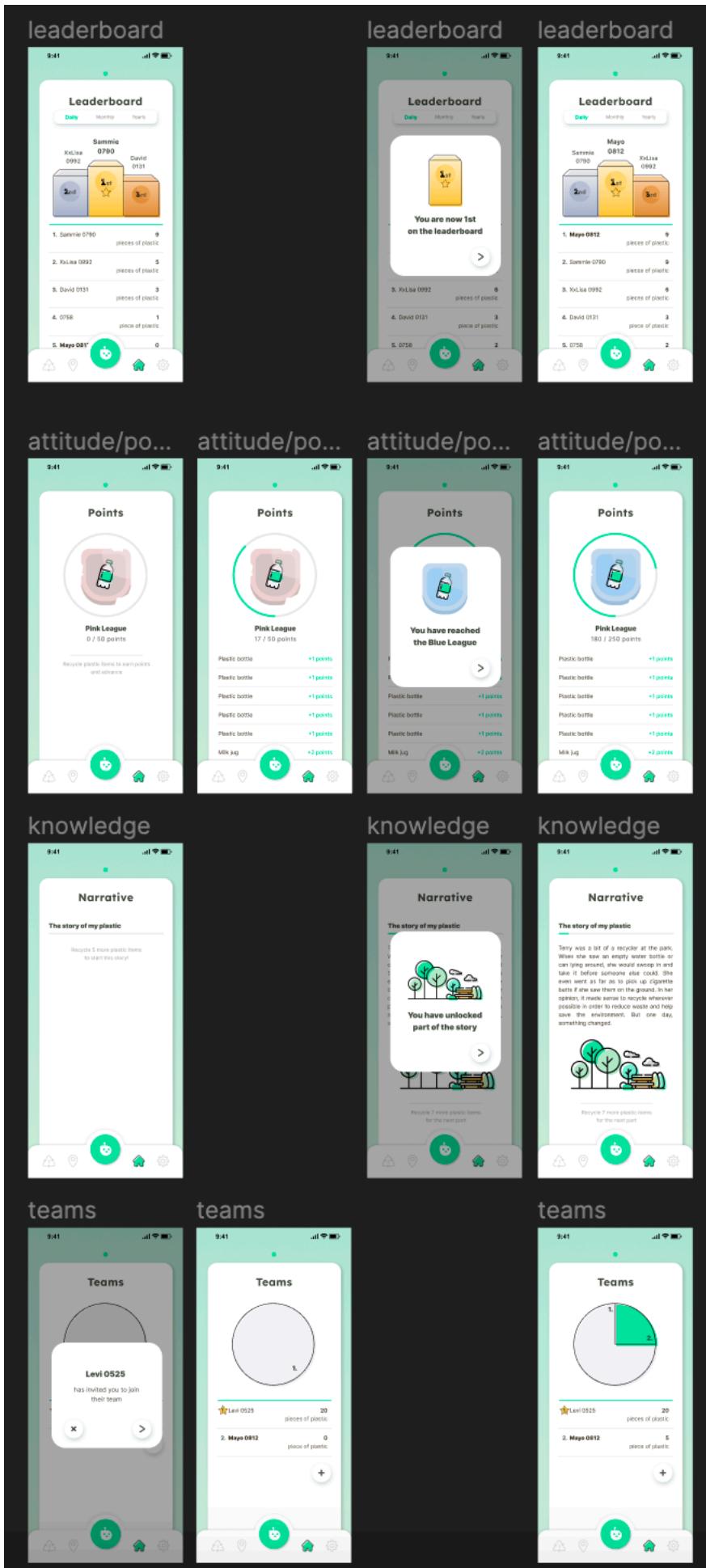
```
], [REDACTED]
}, [REDACTED]
```

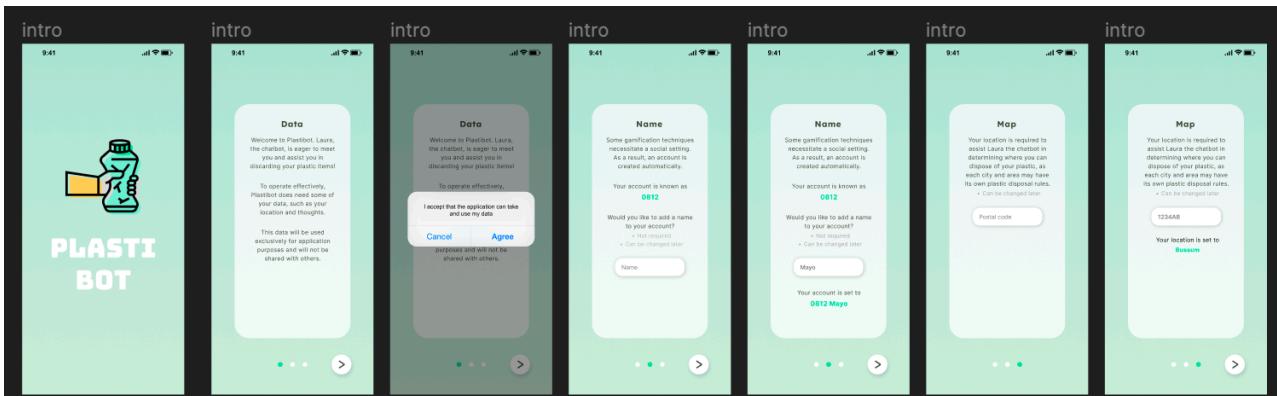
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    "tag": "Goodbye",
    "patterns": [
        "That was all",
        "Bye",
        "Goodbye",
        "See you soon",
        "Adios",
        "Dag",
        "Doei",
        "I am leaving",
        "Leave",
        "Byeee",
        "See you later",
        "Stop",
        "Hasta"
    ], [REDACTED]
    "responses": [
```

```
"See you again soon!",  
"Great talking to you, see you soon!",  
"Enjoy your day and I hope to talk to you later!",  
"I had fun chatting with you on this, bye bye!",  
"See you next time!"  
]  
}  
}
```

Some Figma screens







badges try

