Let's Learn to Recycle Plastics

Team 7

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TOPIC OF INSTRUCTIONAL DESIGN PROJECT

The title of our topic is, "Let's Learn to Recycle Plastics". We chose this topic because we are passionate about our environment. We have concerns about Earth's depleting resources and wish that we help younger generations learn to live environmentally friendly lifestyles. Our specific area of focus is to influence children to understand the importance of recycling–especially plastics. Plastics are overwhelming the environment such as the oceans, landfills are expanding, and microplastics are affecting our air quality index.

LITERATURE REVIEW ON TOPIC

Introduction

Our topic is, "Let's Learn to Recycle Plastics".The challenge we want to address with our instructional materials is finding a way to influence younger generations to live environmentally-friendly lifestyles. Therefore, we conducted a literature review to help us understand implementations of recycling programs that allow children to absorb recycling behaviors in different countries. The key terms we used were: "kids", "recycling" , "learning", "children", "recycling", "plastics", "recycling", "bottles", and "children".

Research

Castellano et al. *IEEE International Conference on Systems, Man and Cybernetics (SMC)* (2019) states, "[Currently in Italy], game-based learning is one of the most widespread approaches in learning and training processes…During the play the students have the chance to gain experience in a protect (real or simulated) environment that allows them to fail and correct their behavior to succeed in a task" (p. 3805). For this project, we will have learners experience game-based learning

opportunities to learn to recycle plastics. They will be exposed to these opportunities on the online Nearpod learning platform.

Makridis' *Land Economics* (2021) research found "recycling [in California] has to increase by 50 % to improve air quality from an "unhealthy" rating to a "moderate" rating" (p.258).

Schill et al. *Journal of Business Research* (2020) discussed French childrens' recycling behavior. Their findings found that children who have a personal concern for the environment and knowledge about recycling and the environment recycled in the public and private settings. In addition, children were more likely to recycle if it was integrated into their past behaviors, had physical accessibility to recycle bins, and also needed spatial organization with recycle bins inside and outside their homes to promote recycling. The most important influence of recycling was determined if their families encouraged recycling at home. Some parents grant their children autonomy to choose to recycle at home, especially, if they have designated recycling bins. However, there are some parents that do not care about recycling, causing some children to not see the importance of it. The French government wants to develop influential strategies to encourage environmentally-friendly behaviors with families.

In the article written by So et al. (2018), the researchers followed eight primary school teachers from Hong Kong. In order to promote environmentally friendly practices and learning in schools, the research examined the integration and effectiveness of Plastic Resource Education (PRE).

Analysis

Needs Analysis

Background of Problem/Problem Statement

After reviewing the literature and surveys, we identified the student did not know the problem was that there is a lack of accessibility of recycle bins in students' classrooms. Based on the surveys, students mentioned that they mainly recycle plastics at home, hospitals, and at some restaurants. However, their schools do not promote recycling plastic bottles in the classroom and throughout campus. In some surveys, plastic bottles being recycled was determined by the efforts of the students' teachers.

Rationale for the Need for Instruction

There is a need for more education in primary grades (kindergarten to third grade) to learn the importance of recycling and how to go about recycling plastics at school.
Schools need to support environmental education and promote recycling habits by supplying recycling bins in classrooms and on campus. Recycling should not only be discussed surrounding annual Earth Day activities, but it should be an ongoing habitual practice to encourage lifelong environmentally friendly habits. If children of primary grades become emotionally invested and have a deeper understanding of the importance of recycling, they will choose to make an effort to be eco-friendly such as bringing a reusable water bottle, use reusable bags, use eco-friendly straws, ditch one-time use plastics, and purchase 'green' products.

Available Resources

Ideally, school sites will need to put aside budgeting for waste baskets. When they put in their orders through their vendors, they will need to include recycle bins for classrooms and for the campus. Additionally, the City Waste Management Companies will need to provide recycling dumpsters and pick ups. Finally, we understand that teachers are limited with their instructional time in the classroom. Similarly, the problem was addressed in the case study from So et al.'s (2018) research. Students were provided with e-learning materials during recess and lunch.

Goal Statement

Primary grade student learners will recycle plastics at school and public areas using appropriate recycling bins. They will have access to recycle bins at school and be more motivated to recycle plastic bottles and use reusable plastic items in the school setting. Skills learned will be transferred to daily habits in public settings and will encourage learners to have environmentally-friendly lifestyles.

Learner Analysis

The general characteristics of the target population were students that were enrolled in primary elementary grades in Southern California Entry behaviors are that students need to know how to distinguish a plastic bottle and other types of plastics. Based on the data, more than half students younger than 8 years old did not know what recycling is, how to recycle, or where they could find recycle bins. Additionally, this population of students did not understand the concept of plastic. Based on the surveys, younger students have neutral attitudes towards recycling because they don't really understand the concept and why it is necessary. All of the students were surprised to learn that plastics take hundreds to thousands of years to decompose. Many of the elementary students knew that their families recycled, but shared that they did not recycle in public settings. Through our literature review, young students are motivated to recycle if given reward schemes such as certificates and prizes. They are also highly motivated to practice recycling habits through game based approaches at school. It is reasonable to expect them to learn environmental education and to recycle plastic bottles at school if schools promote recycling habits by providing recycling bins in each of their classrooms and throughout campus. Campuses can also hang posters to promote environmentally friendly habits such as : recycling, not wasting water, turning off lights, and bringing reusable water bottles and plastic containers

from home. Students enjoy a game based approach to learning about recycling. Their learning is enforced with the accessibility of recycle bins at school. If younger students had the opportunity to be rewarded with certificates, prizes, e-learn, and to play exciting educational recycling games, they would have a positive attitude towards their school. Based on our survey information, all students did not state they recycled at school. An important group characteristic of young elementary school aged students was the lack of understanding what recycling is and why it's important. In contrast, most high school students were aware of what recycling is and could provide reasons why they should recycle plastics. Middle school students understood the concept of recycling, but failed to know the importance of recycling plastics. This could be remedied if they had continuous environmental education and accessibility to recycle bins.

Instructional (Learning) Analysis/Task Analysis

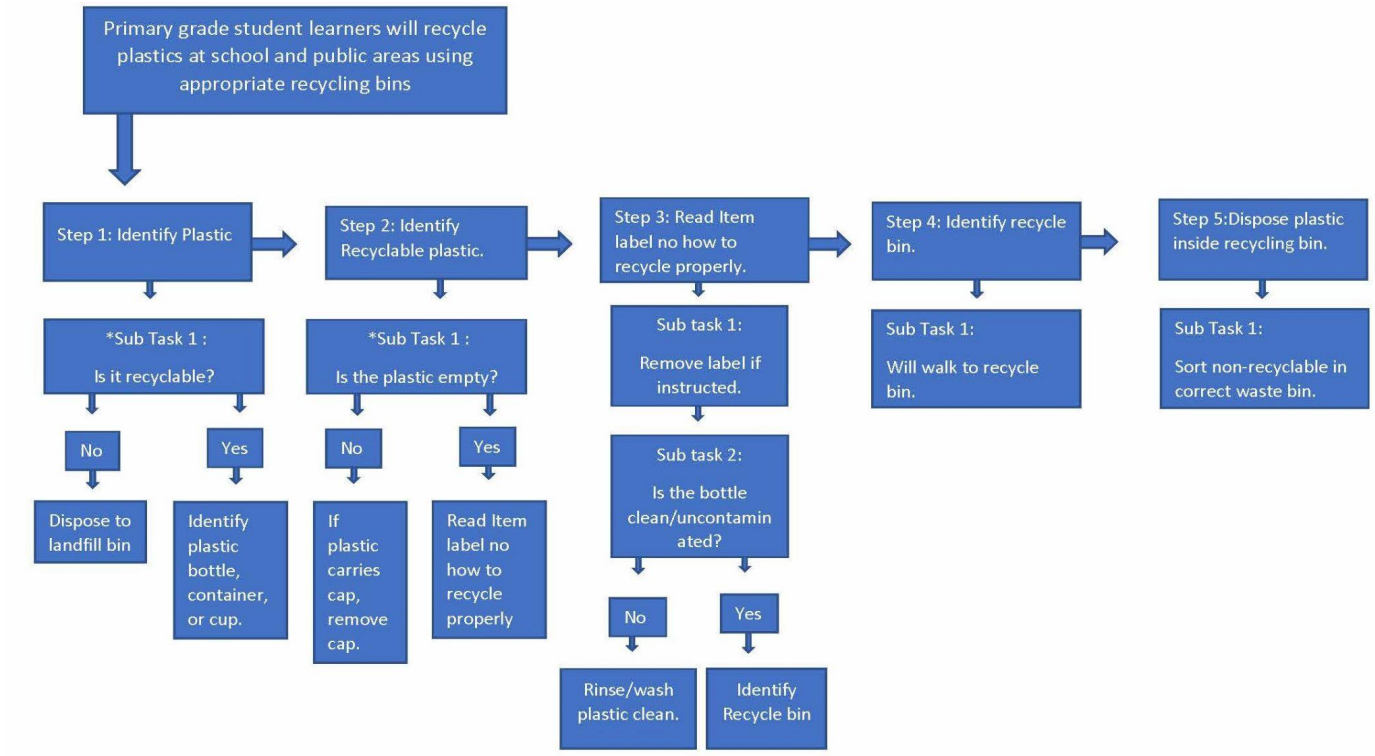
- Task: Primary students will recycle plastic bottles using recycling bins at school.
    - Pre-Tasks:
        - Students will need to identify a recycle bin at school.
        - Students will need to locate a plastic that is recyclable (ex: plastic bottles, plastic cups, plastic containers)
        - Students will need to make sure their plastic bottle is clean–not contaminated with food or is dirty. (Rinsing and washing may be required).
    - Post-Task:
        - If needed, sorting through recyclables from other recyclables.
        - If needed, combining smaller recycle bins or collections of recyclables to a larger recycle bin/dumpster.

- Recycling habits practiced and reinforced in different public and private settings.

- Frequency: When disposing of items at school, which may be multiple times per school day.
- Difficulty: Starting at age 5 to adult. Difficult for people with severe learning disabilities when distinguishing waste bins, community/safety sign (recycle logo), clean plastics, and non-plastics items.
- Importance: to help primary grade students understand the need of recycling. Waste disposal and overproduction affects our environment and wilderness.
- Conditions needed for the task
    - Pre-knowledge
        - Blue recycling bins symbolize recycling bins.
        - A recycling logo means recycle bin.
        - Disposing waste and other non-recyclable plastics such as plastic wrappers, plastic bags, paper towels, and plastic utensils in a trash can.
        - Students will need to make sure their plastic is clean–not contaminated with food or dirty (rinsing and washing may be required).
    - Skills
        - Identifying recyclable items.
        - Read how to properly recycle plastic based on instructions of label.
        - Ability to dispose of recyclable items in the correct recyclable bin at school.
        - Lifting a recycle bin and pouring contents to a larger bin/dumpster, if needed.
        - Pouring skills.

- Standards of performance
    - Skills: Understanding the concept of recycling through environmental education.
        - Motor skills and muscle strength to toss recyclable in the correct bin or lift a dumpster lid.
        - Ability to clean contaminated/dirty plastic (ex: rinsing or wiping).
        - Ability to remove wrappers or seals of plastic
        - Ability to pour remaining liquid out of a bottle or cup
- Tools needed for the task
    - Recycle bin in classroom or campus.
    - Recyclable plastic
    - Scissors, if needed.
    - Sink and/or drain, if needed.
- Outcomes/Outputs/Results: Reinforcing recycling behaviors.
- Human/System Interfaces:
    - Human: Instruction from teachers, support from campuses with providing opportunities to recycle, and Reward-Schemes.
    - System: E-gamification; E-learning with videos.

Flow Chart of Goals and Subgoals



Summary

As Castellano et al. (2019) and So et al. (2018) discussed, childrens' recycling behaviors of plastics are influenced by a stimulus driven by gains and reward schemes. It was often found that the stimulus of game based approaches allows children to correct their behaviors to succeed in a task. For example, in Castellano et al.'s (2019) study, children played a recycling sorting game, in which children were in competition with the computer. "The idea to use the competition, Pepper [(the computer)] vs user is based on the gamification approach that uses the competition to motivate and enhance the learning process" (p. 3807).

In So et al. (2018)'s research, not only were children at an elementary school in Hong Kong were 'learning through play' about recycling with e-games during recess, but also were motivated to bring their reusable water bottles and plastic utensils from home to school daily knowing that they would be rewarded with certificates and prizes. The authors mentioned that

the percentage of students who brought their own plastics from home increased significantly once a reward scheme was offered.

Ricoy et al. (2022)'s research takes a gamification approach to teach Spanish students in the third grade of primary school by incorporating the 4R's. The 4R's are defined as "reduce, reuse, recycle, recover". The Spanish research team created a program that taught students about the importance of recycling and the importance of it for our environment. They did this by creating projects and games that involved the use of a tablet, the support of their teachers, and parents. The tool that was the most successful and making sure that the children were involved and stimulated to learn about the 4Rs were the games and projects that were used on the tablet, not only did the students have access to a tablet in the classroom, but the majority of them had one at home, this allowed the involvement to increase by double. Many parents and teachers also reported that students not only enjoyed the games on the table but also enjoyed the projects they were assigned to create using the tablet, which involved them using the camera and drawing on the device.

In summary, primary students will have a better chance to comprehend the importance of recycling and develop life long behaviors if provided with environmental education opportunities to practice recycling in the school setting. The instruction will happen in school or assigned as homework, whenever learners are given access to technology. This instruction will be reinforced with the placements of recycle bins in the classroom and campus. Currently, most students are only recycling at home. Being that students will spend a huge percentage throughout their days on a school campus, students should be provided with chances to recycle in a setting where they spend most of their day. If they are able to practice these behaviors with enticing e-learning/gamification, a stimulus that promotes environmentally friendly practices with recycle

bins; students will practice recycling is a behavior that people should do in all settings, not just at home.

Survey Questions

Survey Questions

Grade:	Elementary	Middle	High

1. **Where do you throw away your empty bottles?**
2. **Do you know what the**  **sign means?**
3. **What does "Recycle" mean?**
4. **Besides bottles, where do you see plastic? Or, what items are made from plastic?**
5. **Do you recycle plastics? If no, why not? If yes, why?**
6. **Does your family recycle plastics?**
7. **What do you think happens when people do not recycle plastics?**

8. **Do you know what these are?**

9. **Where have you seen a recycle bin?**

10. **How many years do you think it takes for a plastic to stay on earth before it breaks down?**
    a. Did you know that a plastic bag takes 20 years to decompose?

b. Did you know that a plastic cup takes 450 years to decompose?
c. Did you know that a plastic straw takes 200 years to decompose?
d. Did you know that some plastics ***never*** decompose?

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Let's Learn to Recycle Plastics

Design Document Worksheet

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Revision

Since the last analysis report, several changes have been made. We realized that the design phases required us to clear things up within our analysis. We supported the analysis' summary with a new article, *Raising Ecological Awareness and Digital Literacy in Primary School Children through Gamification*. The article found that after Spanish elementary school students received game-based learning on recycling and instruction on the importance of it for our environment, the students were observed practicing waste management habits such as reducing energy usage and recycling. Our goal statement was strengthened by ensuring it was a measurable goal. Goal went from, "learners will understand" to "learners will recycle…" to determine the outcome. The original flowchart was incorrect. The font size was too small, should not have been linear, or based on the goal analysis and its subgoals. The flowchart is now updated. It mirrors our learner's goal objective and includes steps and subtasks to achieving the goal. We clarified that our team will use a game-based learning approach as the instructional material, we clarified the target audience based on survey responses, and also provided the survey at the end of the analysis report.

Sequence and Clustering of Objectives

CLUSTER	OBJECTIVES	TIME
Main Objective	Primary grade student learners will recycle plastics at school and public settings using appropriate recycling bins.	-
1	After being provided with online game instruction,	Up to 5

	learners will distinguish plastics vs non-plastics.	minutes
2	Learners will identify recyclable plastics (ex: bottles, containers, or cups).	Up to 5 minutes
3	Learners will read the recyclable plastic's label and determine how to properly recycle the item.	5-7 minutes
4	Learners will distinguish if recyclables are contaminated or not contaminated.	Up to 5 minutes
5	Learners will identify recycle bins and dispose of recyclable plastics.	Up to 5 mins

Pre Instructional Activities, Assessment, and Follow Through

Motivation

According to the article written by Lee et al. (2005), kids dislike school because it is boring. Teachers are incorporating technology to make learning more exciting to students, specifically through gamification. The authors state, "having children play games to learn is simply asking them to do what comes naturally". Gamification allows for the motivation to develop positive behaviors through repetition until perfection which helps increase attention and motivation as well changing unhealthy behaviors by active learning. It also helps increase socialization and hand/eye coordination (Marin, 2015). Through the use of Nearpod (a game based teaching software), our learners will increase their positive attitudes and behaviors towards

recycling on a daily basis. It will allow repetitious activities that will stimulate mastery of objectives and also stimulate the learner with audio/visual feedback through technology. According to Ricoy et al. (2022) , the stimulus that kept students engaged and motivated during the program was a tablet. Students used the tablet to expand recycling knowledge by being allowed to use the tablet's features by creating images and videos about recycling, as well as playing games based on the 4Rs of Recycling.

Using Nearpod, our learners will be able to access the activities through their school-issued tablet or Chromebook. Having access to the content on their device in the classroom and at home will give learners the freedom to obtain knowledge on recycling. Our Nearpod activities will feature quizzes, sorting, and multiplayer competitive game. The multiplayer competition game feature is named '"Time to Climb" . In this feature, learners will be able compete with their classmates in climbing a mountain as they demonstrate progress.

Objectives

The focus of the instructional material is to develop recycling habits with primary grade students. After surveying our target population, we noticed that they did not know the concept of recycling nor were they recycling at school because they did not have recycling bins. If given opportunities using our Nearpod instructional gamification material throughout the school week (about 5 minutes a day) on how to learn how to recycle plastics, learners will develop the skills to appropriately recycle plastics.The objectives learner will master are:

a) Learners will distinguish plastics vs non-plastics.
b) Learners will identify recyclable plastics (ex: bottles, containers, or cups).
c) Learners will read the recyclable plastic's label and determine how to properly recycle the item.

d) Learners will distinguish if recyclables are contaminated or not contaminated.

e) Learners will identify recycle bins and dispose of recyclable plastics.

We expect that if schools provide recycling bins, learners will be able to practice appropriate recycling habits in school settings and transfer skills to other places. Learners will develop lifelong recycling habits, have positive attitudes towards recycling, and educate others. Schill et al. (2020), states that the most important influence of recycling with children was if their families encouraged recycling at home. After our instruction, learners will be able to teach their family members about recycling and hope they will be allowed opportunities to recycle at home.

Assessment

Pretest

Learners will be presented images of waste bins and recycle bins. They will then be asked if they see anything wrong or what can be changed. In order to analyze prior knowledge to the program, answers will be recorded. Questioning such as:

- Can you identify anything wrong in this image?
- What should not be placed in this bin?
- Can anything be changed?
- Why do you think it is important to identify waste/recycle bins?

Posttest

Learners will demonstrate that they have learned how to recycle plastics appropriately through observation. They will be given a survey and their answers will be reviewed. Students will also be given items (Trash) and teachers will then observe if learners are:

a) Disposing of recyclable plastics in the recycle bin

b) Check if the recyclable plastic is contaminated/clean/empty.

c) And if required, labels will be disposed of in the waste bin.

d) Non-recyclable plastics will be disposed of in waste bins (ex: plastic wrappers, plastic labels, plastic bag, plastic fork).

Follow-Through Activities

Memory Aids

Students will learn the process of recycling plastics through audio and visual support. Learners are able to identify what the recycle logo looks like. Learners will need to comprehend what the label states on how to recycle plastic by locating and reading the label. Learners will need to identify a recycle bin by its logo or the color of the recycle bin. Learners will have visual support of posters to encourage recycling and of appropriate recyclable vs non-recyclable plastics around campus and in the classroom.

Secondly they will have access to a 4 R's media: Reduce, Reuse, Recycle, Recover (Repair).

See Youtube link : https://www.youtube.com/watch?v=8nfiiCY_omg

Transfer

Learners will discuss other ways to reduce and reuse plastic waste to live environmentally friendly lifestyles and to apply the real-world with their classroom . Learners will not only learn to recycle plastics, but how to reuse plastics to reduce plastic waste. It is important to have learners understand this concept in order to further their understanding and stress the importance of recycling for the environment, so that they can apply it to their everyday habits. Learners will generalize this skill by beginning to look at plastics in a different light and think of different ways that items can be reused in everyday life. For instance: a plastic water jug can be cut out and made into a bird feeder; a set of 6 water bottles can be reused to make a

bowling game for young students; Learners can use bottle caps to create an art project wind chime. Plastic bags from the grocery store can be reused when shopping or reused as waste bin liners. The possibilities to upcycle plastic items are endless! This will promote reusing plastic bags, reusable water bottles, and reusing utensils/containers. Recoy et al. (2022) found "half the teachers involved in the study (2/4; 50%) stated that the children had internalized procedures on protecting the environment. The teachers were surprised by how much the children now saved in electricity and water, or adhered to guidelines (to reduce consumption of energy, waste and paper)."

Content Presentation and Student Participation

Objective 1

After being provided with online game instruction, learners will distinguish plastics vs non-plastics.

Content

Learners access a Nearpod game-based assignment where they will have a choice between two items at a time. One item will be an item made of plastic and the other item will be an item not made of plastic. Learners will select or click the plastic items.

Examples

Trail 1: plastic hanger v. wire hanger

Trial 2: aluminum can v. water bottle

Trial 3: 4 oz plastic portion cup vs. 4 oz paper portion cup

Media Selection

The content will be presented through the use of an online interactive platform, Nearpod. Learners will be able to access Nearpod through the use of their district issued

Chromebooks or tablets in the classroom or at home.

Objective 1: Student Participation

Practice Items

Through the use of Nearpod, learners will be given a choice of an item made of plastic v. a non-plastic item. Learners will click on the item made of plastic.

Feedback

If the learner clicks on the item made of plastic, then the learner will receive immediate visual and hear auditory feedback that the answer was correct. If the learner clicks on the item not made of plastic, then the learner will receive immediate visual and hear auditory feedback that the answer was incorrect. Nearpod will ask the learner to "try again" and the learner will self-correct their response.

Media Selection

Learners will access the "Quiz" feature on Nearpod. They will receive immediate feedback with their selection, allowing the learner to interact and actively participate in their game based learning opportunity.

Practice Items

Through the use of Nearpod, learners will be given a choice of an item made of plastic v. a non-plastic item. Learners will click on the item made of plastic.

Feedback

If the learner clicks on the item made of plastic, then the learner will receive immediate visual and hear auditory feedback that the answer was correct. If the learner clicks on the item not made of plastic, then the learner will receive immediate visual and hear auditory feedback that the answer was incorrect. Nearpod will ask the learner to "try again" and

the learner will self-correct their response.

Objective 2

Learners will identify recyclable plastics (ex: bottles, containers, or cups).

Content

Learners access a Nearpod game-based assignment where they will have different kinds of items made of plastic. Learners will select or click the recyclable plastic items.

Examples

Trial 1: plastic film/cling wrapper vs. plastic soda bottle

Trial 2: plastic condiment bottle vs. plastic bag

Trial 3: bubble wrap vs. plastic food container

Media Selection

The content will be presented through the use of an online interactive platform, Nearpod. Learners will be able to access Nearpod through the use of their district issued Chromebooks or tablets in the classroom or at home.

Objective 2: Student Participation

Practice Items

Through the use of Nearpod, learners will be given a choice of plastic that may be recycled and non-recyclable. Learners will click on the plastic that may be recycled.

Feedback

If the learner clicks on the plastic that may be recycled, then the learner will receive immediate visual and hear auditory feedback that the answer was correct. If the learner clicks on the plastic that cannot be recycled, then the learner will receive immediate visual and hear auditory feedback that the answer was incorrect. Nearpod will ask the

learner to "try again" and the learner will self-correct their response.

Media Selection

Learners will access the "Quiz" feature on Nearpod. They will receive immediate feedback with their selection, allowing the learner to interact and actively participate in their game based learning opportunity.

Objective 3

Learners will read the recyclable plastic's label and determine how to properly recycle the item.

Content

Learners will be presented with a Nearpod "Quiz"activity of plastic bottles and containers. Learners will read the label and decide how to properly dispose/recycle plastics through reading comprehension. The learners will be given up to 3 choice responses in order to understand the objective of learning how to appropriately recycle plastic containers. This objective is crucial in order to fully understand how to properly dispose of recyclable vs non recyclable items.

Examples

Trial 1: Label says, "Bottle is not recyclable".

Trial 2: Label says to unscrew cap and remove safety seal.

Trial 3: Label says to discard seal, and empty before recycling.

Trial 4: No instructions on label.

Objective 3: Student Participation

Practice Items

Learners will access Nearpod "Quiz" activity and determine proper ways to clean/dispose

or recycle plastic containers through reading comprehension.

Feedback

Learners will be given feedback/reinforcement immediately after attempting to choose the correct answer for specific plastic containers for appropriate disposal. The correct answer for specific plastic containers for appropriate disposal.

Objective 4

Learners will distinguish if recyclables are contaminated or not contaminated.

Content

Learners will access the Nearpod activity in which learners will select the clean plastic containers vs not contaminated plastic containers.

Examples

Trial 1: plastic contaminated ketchup bottle vs a clean ketchup bottle

Trial 2: plastic contaminated coffee creamer container vs a clean coffee creamer container

Trial 3: plastic water jug vs a water jug with napkins inside.

Objective 4: Student Participation

Practice Items

Through access to Nearpod activity, learners will practice selecting the correct response regarding clean vs contaminated plastic containers. Learners will immediately understand the difference between clean vs contaminated plastic containers.

Feedback

Learners will be given immediate reinforcement/feedback when they sort through the clean vs contaminated plastic containers.

Objective 5

Learners will identify recycle bins and dispose of recyclable plastics.

Content

Students will be presented with a nearpod matching game, which will showcase images of objects that are non-recyclable and recyclable, these items will be matched with the proper waste/recycle bin.

Examples

Trial 1: Match to correct bin:

1. Banana peel, Plastic Wrap, Clean Ketchup bottle.
2. Recycle bin, Waste bin (1), Waste bin (2)

Trial 2: Match to correct bin:

1. Napkin, Clean Water Bottle, Clean Mayo Bottle
2. Recycle bin (1), Recycle Bin (2), Waste bin

Objective 5: Student Participation

Practice Items

By participating in the Nearpod matching game, learners will be able to place given items into correct bins.

Feedback

Learners will be given immediate reinforcement/feedback when matching the images to the correct waste bin.

Summary

The team hopes to incorporate primary students with new behaviors on recycling. In order to do so we will assess what they know about the concept of recycling, teach them how to recycle

correctly, and hopefully by the end observe new behavior that shows the teachings of the program. A pre-assessment will be given at the beginning in order to see what they already know about recycling. This will include images of trash bins with recyclable plastic placed in the wrong bin, identifying the recycle symbol, and the importance of recycling and why do it. After the learners complete the pre-assessment they will then be given a series of games through Nearpod to meet each objective. According to Acosta et al. (2021), students prefer gamification and virtual learning instead of traditional methods of learning. Incorporating technology into the educational environment makes it easier for students to acquire knowledge, as they are having fun. In order to ensure learners master the objectives, we must make the activities on Nearpod engaging and reinforce positive behaviors so learners find success and are able to transfer those skills to real-life. As we are developing gamifications activities on Nearpod, our team will further look into: the free features that Nearpod offers; will provide instruction and/or reasoning to the correct and incorrect selections of appropriate recycling practices; and have created a list of plastics and waste bins per objective that will be used in each activity. Once the objectives have been completed a post assessment will be conducted to observe if the goal has been met by assigning a questionnaire and a small activity where the learners will be given items and asked to implement the behaviors that are expected by the program goal. The design project is to teach learners how to recycle plastics, by focusing on shaping positive behaviors through auditory and visual aids in technology. Motivation will be given through the gamification process.

Time for Development

Timeline for Development

Date	**Tasks**	**Preparation for the Tasks**
10/10	Create Storyboard	Create a list of trials per objective.
10/15	Create a Nearpod account, start creating activities.	Input information into Nearpod activities.
10/16	Finishing touches on Nearpod (game) development	Any images or last minute additions.
10/16	Run Nearpod activities to ensure they run correctly	Ensure they aren't any glitches in the Nearpod system
10/21	Beta test Nearpod activities.	Find volunteers to test activity.
10/22	Make modifications if needed.	Analyze beta test interaction and results, make changes if needed.

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Pre-Assessment

1.What can you tell me about this symbol?

Acceptable Answers (Key words): Recycle. Reuse. Reduce, to help the planet, to keep the streets/oceans clean.

2.Can you identify anything wrong in this image?



Acceptable answers: too much trash, messy, trash and recycles are in one bin

3. What should not be placed in this bin?(*Free responses will be recorded).*

Acceptable answers are:

-trash is inside the recycle bin

-recyclables inside a trash bin

-contaminated plastic containers.

-food is in a recycling bin.

-trash and recyclables are mixed in the same bin.

-labels on plastics are in recycle bins.

-non-recyclables are in recycle bins

4. Can anything be changed? *(Free responses will be recorded).*

Acceptable answers are:

- plastics need to be washed/cleaned.

-recyclables and waste need to go in their designated bins.

-plastic bags need to be in the waste bin.

-no food inside recycle bins.

-no recycles in a waste bin.

5. Why do you think it is important to identify waste/recycle bins?*Free responses will be recorded*

Acceptable answers are:

-to help the environment

-to reduce waste

-to keep our oceans clean of plastic waste

-to keep our campus clean of waste

-to know which plastic containers can be recycled/disposed

Post-Assessment (Observable)

Observation	Yes	No
Disposing of recyclable plastics in the recycle bin		
Check if the recyclable plastic is contaminated/clean/empty		
And if required, labels will be disposed of in the waste bin		
Non-recyclable plastics will be disposed of in waste bins (ex: plastic wrappers, plastic labels, plastic bag, plastic fork)		

1. Which symbolizes the recycle sign?

a) 

b) 

c) 

2. How do we recycle recyclable plastics correctly?

    a) Empty plastic, wash clean, throw away into the recycle bin.

b) Empty plastic, throw away into the recycle bin. .

c) Throw it away into the trash.

3. Where should we throw out recyclable plastics?

a) In the trash

b) In recycle bin

c) On the street

4. What can you do to help the environment?

a) Clean up after yourself

b) Throw away recyclable plastic in recycle bin

c) Do nothing

5. Circle what doesn't belong in this picture.

TITLE Story Board 1 (Objective 1)

NAME What are plastics?

SUBJECT Lets Recycle Plastics

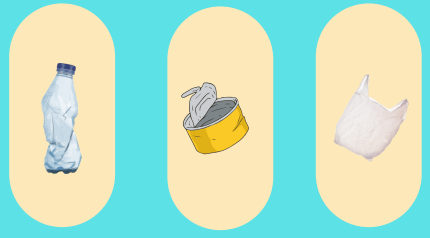
NEARPOD GAME ONE

Lets Reduce, Reuse, and Recover.

STUDENTS WILL SEE TITLE TO OBJECTIVE ONE

LETS BEGIN

Which two are plastic?



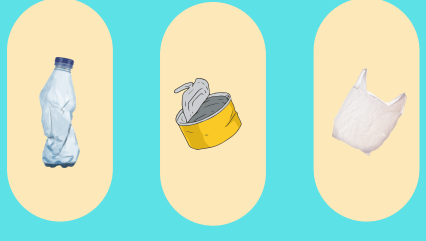
STUDENTS WILL PRESENTED OPTIONS TO IDENTIFY PLASTICS

CONFLICT

Almost there try again!

STUDENTS WILL RECEIVE IMMEDIATE FEEDBACK.

Try Again!
Which of two are plastic?



ANOTHER ATTEMPT WILL BE GIVEN TO SELF CORRECT.

RISING ACTION

Thats correct! Great Job!

STUDENTS WILL HAVE OPPORTUNITY TO SELF CORRECT.

WOW! Your Doing Great!!

LEVEL UP

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 2 (Objective 2)

NAME What plastic can you recycle? SUBJECT Lets Recycle Plastics

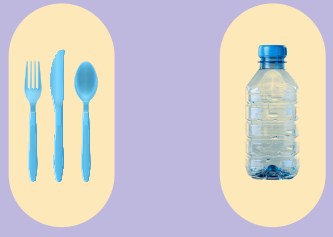
NEARPOD GAME TWO

Remember in order to recycle we must Identify the Correct plastics

STUDENTS WILL SEE TITLE TO OBJECTIVE TWO: REMEMBER IN ORDER TO RECYCLE WE MUST IDENTIFY THE CORRECT PLASTICS

CONFLICT

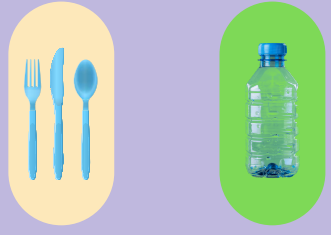
Which plastic is recyclable?



STUDENTS WILL PRESENTED WITH 2 ITEMS MADE OF PLASTIC, ONE IS RECYCLABLE THE OTHER IS NOT.

RISING ACTION

YAAY! you identified the correct plastic!



STUDENTS WILL RECEIVE IMMEDIATE FEEDBACK ON THIER SELECTION.

Amazing!!!

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 3 (Objective 3)

NAME Label Comprehension SUBJECT Lets Recycle Plastics

NEARPOD GAME THREE

Remember you need to read label!

STUDENTS WILL SEE TITLE TO OBJECTIVE THREE: REMEMBER YOU NEED TO READ LABEL!

CONFLICT

What is this label asking you to do? Select two.

THROW PLASTIC LABEL AWAY

THROW AWAY

RECYCLE PLASTIC BOTTLE

EMPTY & DISCARD CAP

STUDENTS BE ASKED TO READ PLASTICS RECYCLE LABEL

RISING ACTION

Almost. Try Again!

BOTTLE NOT RECYCLABLE UNLESS LABEL REMOVED

THROW AWAY

RECYCLE PLASTIC BOTTLE

EMPTY & DISCARD CAP

STUDENTS WILL ANSWER COMPREHENSION QUESTION. THEY WILL BE GIVEN IMMEDIATE FEED BACK ATTEMPTS TO SELF CORRECT.

RESOLUTION

Try Again!

What is this label asking you to do? Select two.

THROW PLASTIC LABEL AWAY

THROW AWAY

RECYCLE PLASTIC BOTTLE

EMPTY & DISCARD CAP

ANOTHER ATTEMPT WILL BE GIVEN TO SELF CORRECT.

Yes! That is Correct!

BOTTLE NOT RECYCLABLE UNLESS LABEL REMOVED

THROW AWAY

RECYCLE PLASTIC BOTTLE

EMPTY & DISCARD CAP

STUDENTS WILL HAVE OPPORTUNITY TO SELF CORRECT.

Amazing!!!

LEVEL UP

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 4 (Objective 4)

NAME Lets Recycle correctly!

SUBJECT Lets Recycle Plastics

NEARPOD GAME FOUR

In order to recycle, your plastic must be clean.

STUDENTS WILL SEE TITLE TO OBJECTIVE FOUR: IN ORDER TO RECYCLE, YOUR PLASTIC MUST BE CLEAN.

CONFLICT

Which is ready to recycle?

STUDENTS WILL PRESENTED WITH 2 OPTIONS A CLEAN PLASTIC AND A CONTAMINATED PLASTIC.

RISING ACTION

Correct! a clean bottle is a recyclable bottle.

STUDENTS WILL RECEIVE IMMEDIATE FEEDBACK ON THIER SELECTION.

Great Job!

LEVEL UP

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 5 (Objective 5)

NAME Match Items to correct bin.

SUBJECT Lets Recycle Plastics

NEARPOD GAME FIVE

Lets practice what you learned! Remember this sign means Recycle!

STUDENTS WILL SEE TITLE TO OBJECTIVE FIVE: REMEMBER THIS SIGN MEANS RECYCLE!

CONFLICT

Match items to correct bin.

STUDENTS WILL MATCH ITEMS TO THE CORRECT BIN.

RISING ACTION

Correct! you matched items to the right bin.

STUDENTS WILL RECEIVE IMMEDIATE FEEDBACK ON THIER SELECTION.

You're a Pro!

LEVEL UP

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 1 (Objective 1)

NAME What are plastics?

SUBJECT Lets Recycle Plastics

NEARPOD GAME ONE

Lets Reduce, Reuse, and Recover.

STUDENTS WILL SEE TITLE TO OBJECTIVE ONE

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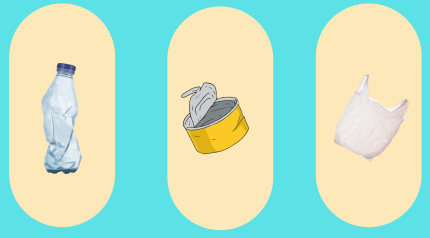


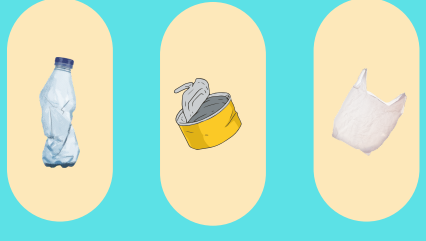
STUDENTS WILL PRESENTED OPTIONS TO IDENTIFY PLASTICS

CONFLICT

Almost there try again!

STUDENTS WILL RECEIVE IMMEDIATE FEEDBACK.

Try Again!
Which of two are plastic?



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WOW! Your Doing Great!!

LEVEL UP

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 2 (Objective 2)

NAME What plastic can you recycle? SUBJECT Lets Recycle Plastics

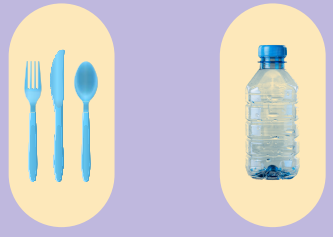
NEARPOD GAME TWO

Remember in order to recycle we must Identify the Correct plastics

STUDENTS WILL SEE TITLE TO OBJECTIVE TWO: REMEMBER IN ORDER TO RECYCLE WE MUST IDENTIFY THE CORRECT PLASTICS

CONFLICT

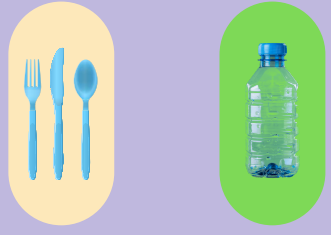
Which plastic is recyclable?



STUDENTS WILL PRESENTED WITH 2 ITEMS MADE OF PLASTIC, ONE IS RECYCLABLE THE OTHER IS NOT.

RISING ACTION

YAAY! you identified the correct plastic!



STUDENTS WILL RECEIVE IMMEDIATE FEEDBACK ON THIER SELECTION.

Amazing!!!

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 3 (Objective 3)

NAME Label Comprehension SUBJECT Lets Recycle Plastics

NEARPOD GAME THREE

Remember you need to read label!

STUDENTS WILL SEE TITLE TO OBJECTIVE THREE: REMEMBER YOU NEED TO READ LABEL!

CONFLICT

What is this label asking you to do? Select two.

THROW PLASTIC LABEL AWAY

THROW AWAY

RECYCLE PLASTIC BOTTLE

EMPTY & DISCARD CAP

STUDENTS BE ASKED TO READ PLASTICS RECYCLE LABEL

RISING ACTION

Almost. Try Again!

BOTTLE NOT RECYCLABLE UNLESS LABEL REMOVED

THROW AWAY

RECYCLE PLASTIC BOTTLE

EMPTY & DISCARD CAP

STUDENTS WILL ANSWER COMPREHENSION QUESTION. THEY WILL BE GIVEN IMMEDIATE FEED BACK ATTEMPTS TO SELF CORRECT.

RESOLUTION

Try Again!

What is this label asking you to do? Select two.

THROW PLASTIC LABEL AWAY

THROW AWAY

RECYCLE PLASTIC BOTTLE

EMPTY & DISCARD CAP

ANOTHER ATTEMPT WILL BE GIVEN TO SELF CORRECT.

Yes! That is Correct!

BOTTLE NOT RECYCLABLE UNLESS LABEL REMOVED

THROW AWAY

RECYCLE PLASTIC BOTTLE

EMPTY & DISCARD CAP

STUDENTS WILL HAVE OPPORTUNITY TO SELF CORRECT.

Amazing!!!

LEVEL UP

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 4 (Objective 4)

NAME Lets Recycle correctly!

SUBJECT Lets Recycle Plastics

NEARPOD GAME FOUR

In order to recycle, your plastic must be clean.

STUDENTS WILL SEE TITLE TO OBJECTIVE FOUR: IN ORDER TO RECYCLE, YOUR PLASTIC MUST BE CLEAN.

CONFLICT

Which is ready to recycle?

STUDENTS WILL PRESENTED WITH 2 OPTIONS A CLEAN PLASTIC AND A CONTAMINATED PLASTIC.

RISING ACTION

Correct! a clean bottle is a recyclable bottle.

STUDENTS WILL RECEIVE IMMEDIATE FEEDBACK ON THIER SELECTION.

Great Job!

LEVEL UP

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

TITLE Story Board 5 (Objective 5)

NAME Match Items to correct bin.

SUBJECT Lets Recycle Plastics

NEARPOD GAME FIVE

Lets practice what you learned! Remember this sign means Recycle!

STUDENTS WILL SEE TITLE TO OBJECTIVE FIVE: REMEMBER THIS SIGN MEANS RECYCLE!

CONFLICT

Match items to correct bin.

STUDENTS WILL MATCH ITEMS TO THE CORRECT BIN.

RISING ACTION

Correct! you matched items to the right bin.

STUDENTS WILL RECEIVE IMMEDIATE FEEDBACK ON THIER SELECTION.

You're a Pro!

LEVEL UP

ONCE STUDENTS PASS QUESTIONS ON FIRST LEVEL THEY WILL MOVE ON TO THE NEXT.

Let's Learn to Recycle Plastics

Development Document Worksheet

Team 7

Ducle Galindo, Carolyn Gobrick, Miranda Olivas

ETEC5440 Fall 2022

October 25, 2022

Professor: Dr. Mauricio Cadavid

Technical Aspects

The technical aspects of this development focused mainly around the utilization of the website, Nearpod.com, which is an interactive classroom tool that teachers use to engage students with interactive activities that are tied to lessons. For the purpose of this project, we used instructional slides and gamification activities to engage learners in how to learn to recycle plastics and promote lifelong recycling practices. Within Nearpod, we first provided instruction on how to appropriately recycle plastics with the use of the "Slides" feature. Learners received instruction on each of the instructional material's objectives: plastic identification; which plastics are recyclable; how to read recycling label instructions; identifying which plastics are contaminated and uncontaminated; and lastly, identifying the appropriate bin to recycle or throw away a plastic. Learners are able to achieve reinforced learning through the gamification activities per objective and receive immediate feedback. In addition to Nearpod, we also used Illustrator to create graphics that grasped the attention of the learners. This is done by creating slides that are engaging to younger viewers through the use of bright colors and images that stimulate interest.

Our team had no previous experience on creating lessons and activities on the Nearpod website. Together, we explored features, watched tutorials, and interacted with practice games. We taught ourselves how to create games using the features provided such as inputting images, editing and creating new layouts, and taught ourselves on how to play using "student mode" to understand what the learner will encounter. One of our team members had professional experience on using Illustrator, and was able to create graphics that benefited the creation of the game.

Navigation

The structure of our project was determined by the hierarchy of skills needed to appropriately recycle plastics. This was accomplished by following the objectives of the instructional material. Before the start of the instruction, learners will first receive a lesson about recycling and why it is necessary to create recycling behaviors. In the instructional material, the learners will receive added instruction between each level objective and will ideally demonstrate mastery of learned skills through the upcoming sections of the game activity.

Instructional Design Theory

The instructional design theory we used is Merrill's Principles of Instruction. We selected this theory because learners are presented with objectives in the hierarchy of importance. Our learners are gradually being introduced to more complex recycling concepts as the lessons and games progresses. Learners will use the existing knowledge from the previous objective as a way to select the correct responses in each game and will also challenge them to demonstrate appropriate recycling skills. We designed the instructional material to include plastic objects that are familiar to learners, keeping in mind to be culturally responsive/unbiased to our learners . We used real pictures of these items, so learners could make connections to recycling in the real world environment. Our learners will apply new knowledge that is consistent with the lessons and game activities. They will receive immediate feedback of correct/ incorrect answers and be able to self-correct, if needed. Learners will also be provided with motivational slides that encourage them to advance to the next objective. The goal from completion of the instructional material is for learners to discuss and model how to appropriately recycle plastics through observation in our post-assessment. The visual design of our instructional material incorporates characteristic elements of ABCCRUS. In particular, we were mindful of chunking, repetition, and simplicity in order to increase attention, efficiency, interest, and instructional effectiveness.

Let's Learn to Recycle Plastics

Formative Evaluation

Team 7

Ducle Galindo, Carolyn Gobrick, Miranda Olivas

ETEC5440 Fall 2022

November 15, 2022

Professor: Dr. Mauricio Cadavid

Purpose

The purpose of a formative evaluation is to "validate or ensure that the goals of the instruction are being achieved and to improve instruction, if necessary" (Weston, p.30). In the Evaluation Phase of the ADDIE model, it is important to identify certain aspects of the design that need to be refined so the instructional material can be effective . During the implementation of our instructional material, our team conducted observations on how our learners accessed instruction, noted the learner's comments and behaviors, then interviewed them subsequently in one-on-one and a small group with questions to obtain overall informative feedback.

The purpose of our formative evaluation was to identify if our instructional material created through Nearpod, "Let's Learn to Recycle Plastics", was effective by reinforcing the lessons on how to appropriately recycle plastics. We evaluated if not only our instructional material was engaging and appropriate for our target audience (primary grade learners), but also if our learners did well with the gamification activities. Additionally, conducting interviews in both a one-on-one and a small group setting, we were able to collect data that helped the team understand what modifications needed to be made to the instructional material.

Characteristics of Participants

Shared characteristics of all learner participants is that they are in the second grade and are high level readers. We estimated we would need a forty-five minute time frame to conduct our implementation and evaluation of our lesson. Considering that participants would be pulled out of class, teachers selected learners that would be the least educationally harmed. Our team distributed six letters to participate in our instructional material between two second grade classrooms. Teachers from participating classrooms selected six students total that they felt would obtain parent permission and would be great participants.

All six letters were returned, however on the day of the implementation of our instructional design, one learner was absent and the other had to stay behind due to bad behavior in the classroom. As a result we had three male learners and one female learner. All participants were given the pre-assessment A week prior to the implementation, the learners were shown a small preview of the Nearpod instructional design and were told that they were going to assist our team with a college project. The learners were enthusiastic in knowing that they were going to learn about recycling through gamification.

Materials and Instruments Used in the Evaluation

Due to time constraints, our team was met with two challenges–participants not having developed quick writing and typing skills and the need to release participants back to their classrooms on time. Our team decided the quickest way to evaluate learners one-on-one and in a small group was to ask questions aurally and record the learners' open-ended responses on paper.

In the one-on-one evaluation, learners were called back to a private part of the classroom and were interviewed by the observer. The observer had five questions to ask each learner. The first question asked was, "What did you think about the games?" The learner was provided with a laminated rating scale with five cartoon faces. Each face had a corresponding color, emotion, and numerical star rating. According to Piskurich (2015), one "tried-and-true method" of evaluation is a smile rating scale to assess the learners reaction to the instructional material (p.313).The face ratings were labeled "I hated them", "I do not care", "They were ok", "They were good", and "I like them a lot", respectively. The observer read the rating scale to the learner and the learner chose their answer. For the next three questions, the observer recorded the learners' open-ended responses on a paper. These questions were "What did you learn after this lesson?", "What do you think about recycling now?", and "Do we need to recycle at school?".

For the fifth question,"What lesson did you enjoy the most?", the observer displayed the images of each game using the classroom's projector. The learners were handed back the paper that the observer wrote their responses on. The learners were required to use a writing utensil to select one game they enjoyed the most from a provided checklist on that paper. See **Appendix A.**

In the small group evaluation, participants were asked a series of questions: "Did playing the games motivate you to recycle in your classroom and at home?", "Why do you think we did this activity?", and "I see that a lot of you did not enjoy 'Choosing plastics that you can recycle' or 'Reading the plastic's recycling labels'. Why?". The observer recorded the small group's responses on paper. Additionally, the observer took notes on the general reactions and behaviors of each learner and also of the implementation phase such as.

Procedures

As stated previously, the observer sat on the side of the classroom to have a clear view of all the participants. As the instructor presented the lesson/instructional material, the observer took notes of the participants behaviors, as well as noting the implementation of the lesson (e.g. procedural problems, time, accuracy of material, and ease of use). After the lesson was conducted, the observer called individual participants for the one-on-one evaluation interview. In the one-on-one evaluation, the observer took each learner to an isolated space in the classroom, and spent about three minutes with them and asked them the formative evaluation questions mentioned above, which were recorded on paper.

After individual interviews were completed, the team moved on to the small group evaluation. This was conducted with all learners present in the center of the classroom and the instructor and observer asked the three questions that were developed for this section of the

formative evaluation. The observer took note of the open-ended responses on paper.

Data

Observational Data was collected to evaluate participants' behaviors and reactions and the implementation of instructional material. See **Appendix B** for how learners with Lesson Objective Scores.

Data of Participants' Behaviors and Reactions

Learner 1 was highly distracted during the implementation of the instructional design. Learner 1 spoke to Learner 2 while the instructor was presenting slides of the lessons. Learner 1 had to be told to focus multiple times. Learner 1 was motivated by the games themselves, as they appeared to be excited and shouted out , "This one is plastic!", "All right, time for Game #2!", and asked, "Who won?!" at the end.

Learner 2 was observed slouching in their seat during the presentation of the lesson objectives. Learner 2 was caught glancing at Learner 1's Chromebook screen during a few of the games. Even though Learner 2 did not receive the highest test scores on the games, he expressed motivation as he shouted out, "I want another game!".

Learner 3 was the most quiet participant as they were not vocal. Learner 3 required assistance logging into Nearpod and typing the code to access the instructional material. Learner 3 did not speak during the presentation of the lesson objectives, had their eyes on the instructor, and followed directions. In Lesson Objective 3, which requires learners to read the plastic's label, the instructor noticed Learner 3 sitting quietly and not engaging with the game.The instructor approached Learner 3 and asked if they needed help with reading. The instructor proceeded to read the label's directions for each question. Learner 3 was told to match the directions of the label to the correct multiple choice option. The instructor noticed that Learner 3

incorrectly answered questions on Lesson Objective 4, consecutively. This game requires learners to select the plastic that are ready to recycle (clean, empty, and dry). The instructor stayed with the learner, repeating the game's direction until Learner 3 was able to show mastery.

Learner 4 was focused during the implementation of instructional material, as they were quiet and following all directions. Learner 4 danced with the music at the start of each game. Learner 4 was happy that they got all the answers correct on four of the five games as he clapped and praised himself. Learner 4 was motivated by the games as he animatedly shouted out, "All right!" and "It's a game again!". Learner 4 commented that the Game 2 looked too easy.

Data on Implementation

During the start of Lesson Objective 1, two of the learners were unfocused and kept talking to each other. This led the instructor to repeat the information on the slides and then asking the learners to sit in the front, closer to the instructor. Due to an effort of getting the learners to focus, the movement of seats in the middle of the first lesson, caused a disruption of instruction. This led to unpreparedness when the first game popped up after the last slide of the first lesson. The learners were not sure of what was happening and it did not allow the instructor to prepare them for how they were meant to proceed. Learners performed poorly in this game which required learners to select the item made of plastic.

During the slides of Lesson Objective 2, the environment was better prepared. The instructor had the ability to prepare the learners on the gamification section of the material, by letting them know what to expect from it. The game required learners to identify the recyclable plastics.

Lesson Objective 3 required learners to read and acknowledge a plastic's label on recycling. Participants scored lower in this section, as they were required to click on the image in

order to enlarge it. It was observed that Learner 1 and Learner 2 refused to follow instructions to enlarge the image so that they could proceed with the activity. Learner 3 received assistance from the instructor to enlarge the image and was read to. Learner 4 followed all steps and had the highest score.

The learners were given the opportunity to vote in choosing the theme of the game before commencing Lesson Objective 4. The participants expressed satisfaction selecting an outer space theme to compete in. The game was to choose which plastic was ready to recycle (clean, empty and dry). Learners scored the highest on this game.

In Lesson Objective 5, the learners had to match the plastic to the correct bin. The learners all scored high due to the fact they were able to self correct on this game. The learners were prompted to minimize the instruction window before each question, so that they could get a better view of the images to choose from.

One-on-One Formative Evaluation Responses

The data collected from all four learners in the one-on-one interview showed that they enjoyed the instructional material in a gamification process. All learners agreed that recycling is important and that they should start recycling in school. They reported that they learned to throw clean plastics in the recycle bin and that recycling helps the environment and saves the animals. However, learners did continuously use the term "trash" instead of the proper term "recycle".

Table 1-1 consists of the one-on-one interview responses.

One-on-One Formative Evaluation Interview Responses

		Learner 1	**Learner 2**	**Learner 3**	**Learner 4**
1.	**What did you think of the game?**				

		I like them a lot	I like them a lot	I like them a lot	I like them a lot
2.	**What did you learn after this lesson?**	"I learned to throw trash away and that it can be replaced. No plastic. You cannot throw away plastic."	"Putting trash away. Not on the floor. Trash goes with trash. Clean trash goes in the trash can."	"I learned to clean plastic and trash."	"I learned recycling is good for the planet. Not recycling makes the Earth one pile of trash."
3.	**What do you think about recycling now?**	"It's important."	"Recycling is good for the world. It won't hurt animals; they won't drown and die. "	"I think it's important."	"It is better for the environment. It helps with biomes and animals on Earth."
4.	**Do we need to recycle at school?**	"I do. I like recycling at school."	"Yeah."	"Yes, you have to throw away trash."	"Yes, definitely."
5.	**What lesson did you like the most? (Select One)**	[Selecting] Plastics Items Game.	[Selecting] the Plastics that are Ready to Recycle Game.	Matching Plastics to the Correct Bin Game.	Matching Plastics to the Correct Bin Game.

Table 1-1

Small Group Formative Evaluation Responses

The learners were asked three open-ended questions in a small group by the instructor. The observer recorded their verbal responses and behaviors. The first question asked was, "Does playing the games motivate you to recycle in your community and in the classroom?"All of the learners responded enthusiastically, "Yes!". The second question asked was, "Why do you think we did this activity?" Learner 2 said, "To teach us it's good for our environment." The other learners remained quiet. The instructor re-asked the small group if they had anything else to add. No other comments were made by the small group. The instructor moved on to the last question, "I see that a lot of you did not enjoy games that required you to choose the plastic that can be recycled and to read the plastic's label. Why?" Learner 1 responded, "It was…..bored." Learner

4 added, "Yea, it was plain." The observer noted that Learner 3 did not participate in answering the questions aloud with the small group. In contrast, Learner 3 responded to all one-on-one questions.

Revisions

Dick et al. (2022) asserts "[formative] evaluations should be designed to produce data to pinpoint specific areas where the instruction is faulty and to suggest how it should be revised." After noting observations in the Implementation Phase and collecting the data in the Formative Evaluation Phase, several revisions needed to be made to ensure our instructional material is effective and learners learn to recycle plastics properly.

First, our team agreed that the instructional material should be presented over the span of a few days. Restricting our instructional material to be presented in forty-five minutes in one day, was not enough time for the target population to grasp the concept of the more difficult lesson objectives. It would be beneficial for the instructor to present the instructional material across 2 or 3 days, allowing time for discussion that includes other real-world examples. Our goal is to ensure learners make connections, find success in games, by resonating with them in hopes to change their behaviors and attitudes towards recycling and environmentally friendly practices.

Secondly, our team agreed right after the presentation of each lesson objective and before starting their respective game, there should be a slide providing clear directions to the game ahead. It may be beneficial for the instructor to allow time for discussion or provide teaching opportunities prior, so learners would be able to complete the games independently and receive high scores on the games.

Third, in the small group evaluation, it was noted that learners did not enjoy Lesson Objective Games 2 and 3, in which they had to select plastics that can be recycled and also read

the plastic's label…thus resulting in poor scores on the games. Our participants stated the games as "bored" and "plain". Our team thought a nice revision is to make these two games more engaging (in order to make them enjoyable) and to allow the students to self-correct their answers (in order to improve scores). This will be accomplished by making these two games into matching activities. The matching activities were held to high regard to Learner 3 and Learner 4.

Lastly, we also discussed how we could minimize interruptions due to the learners' unexpected behavior. This could be remedied by reminding learners to demonstrate that they are "ready to learn". Our target population needs to be reminded of this often. Learners should not be speaking when the instructor is talking, should be making eye contact, sitting up straight, have hands folded nicely together, and the Chromebooks screens facing away from the learner so they may pay attention to the lesson.

Reflections

The knowledge cultivated during this project was learning and understanding in depth the subject in which we chose to create our instructional material. Through our research, not only did we find out how to properly recycle plastics, in order to reflect our understanding onto the material, but we were also pleased to find peer-reviewed articles of other countries that used gamification to teach children to recycle and promote environmentally-friendly behaviors. We were thrilled to have found the Nearpod platform to utilize and create our instructional material to teach learners how to recycle plastics through the gamification process. We had hands-on experience in designing instructional material that helped us understand all the work that goes into creating instructional materials. The beta-test was enjoyable, since we were able to see our material from a concept on paper to a real life product. It was gratifying to see our target populations overall well-received reactions to the instructional material. The beta-test revealed

what aspects worked and did not work, which allowed us to make revisions in preparation for the implementation phase.

As a team, one of our initial struggles was being granted permission to assess our target audience. The campus administrator required permission slips to be sent out to parents to grant permission in a timely manner. This process took a couple weeks to finally obtain permission from the administration and to begin analyzing our target audience with a pre-test in order to brainstorm and design our instructional material.

Another challenge faced was learning the logistics to the Nearpod platform and its ease of use. One team member struggled with saving the slides she created, which was stressful and worrisome. Thankfully, the slides appeared at a later time.

Additionally, we found out that each time we accessed the instructional material on Nearpod, opening the slides automatically set it to the 'edit mode'. On edit mode, our Nearpod link and game code would no longer be accessible online. This was discovered when our team posted the link to our instructional material on Canvas. We received messages from our instructor and classmates that they could not view or participate in our instructional material. Once we found out, we went to Nearpod and saw a pop-up box explain that the link and code will no longer work. We then learned to not edit (aka touch) or open the contents of the instructional material in order to keep our link active. After posting a new active link, our instructor and classmates ran into an issue of not being able to experience our instructional material's games. This occurred because the questions to the games were posted as a PDF, making it so one could not click on answers without knowing if they got an answer correct or incorrect. It also was confusing after clicking the instructional material to start a game, the first question to the game would appear on the screen. One would think to click the arrow located on

the side of the page to get to the next question. Yet, if you clicked the arrow, the instructional material would immediately take you to the next lesson objective. However, the second question was located underneath the first question and so on, meaning one would have to scroll down. Nonetheless, no one could not interact with the game as it was posted as a PDF. After being brought to our attention, our team could not figure out settings to have our classmates and professor play any games. We were advised to submit a screen record of someone playing the games.

Within the Analysis phase, our team struggled in formulating a solid goal objective. Through making thoughtful revisions to our original flowchart, we were able to establish our goal statement as " Primary grade student learners will recycle plastics at school and public settings using appropriate recycling bins". In regards to the Development phase, it was difficult thinking of unbiased plastic items that all learners could recognize and writing age-appropriate language.

Moving forward, the knowledge and skills learned in Instructional Design will be incorporated and enhanced in developing future instructional materials The teachers in the team will incorporate the steps of the ADDIE model as we structure and create lessons for our students' educational benefit. In particular, we will stress the results we find in the analysis phase in order to develop meaningful lessons based on what the students currently know and will need to know.

References

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Appendix A

Interview Questions

LETS LEARN TO RECYCLE PLASTICS
Target audience: 1st-3rd graders
Individual 1:1 Q's

1.. What did you think about the games?

I hated them **I do not care** **They were ok** **They were good** **I like them a lot**

2. What did you learn after this lesson?

3. What do you think about recycling now?

4. Do we need to recycle at school?

5. .What lesson did you enjoy the most?**

- ☐ Selecting plastic items
- ☐ Choosing plastics that you can recycle
- ☐ Choosing the items that are ready to recycle
- ☐ Reading plastic's recycling labels
- ☐ Matching plastics to correct bin

Small Group Q's
1. Did playing the games **motivate** you to recycle in your classroom and at home?

2. Why do you think we did this activity?

3. I see that a lot of you did not enjoy _____ the most. Why?

Appendix B

Participants Scores

Game Objectives

Download | Email

23 Slides | 4 Students | Live Participation - VSFTK

Launched: Nov 7, 2022, 8:33 AM

Summary | Activity Reports | Student Reports

STUDENTS	TOTAL Participation	TIME TO CLIMB Score	TIME TO CLIMB Score	TIME TO CLIMB Score	TIME TO CLIMB Score	MATCHING PAIRS Participation	MATCHING PAIRS Participation	MATCHING PAIRS Participation	MATCHING PAIRS Participation
Class Averages	96%	76%	78%	70%	97%	100%	100%	100%	100%
Learner 3 IP: 204.100.220.2	97%	38%	50%	67%	88%	✓	✓	✓	✓
Learner 1 IP: 204.100.220.2	91%	63%	100%	17%	100%	✓	✓	✓	✓
Learner 4 Nickname: t h i n g y IP: 204.100.220.2	100%	100%	75%	100%	100%	✓	✓	✓	✓
Learner 2 Nickname: william IP: 204.100.220.2	94%	63%	88%	83%	100%	✓	✓	✓	✓