

TOXinvaders.

The Creation of a science-based game App

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National Library of Medicine – K12 Resources

The screenshot shows the homepage of the National Library of Medicine's Environmental Health Student Portal. The page features a navigation menu with links to Home, Air Pollution, Chemicals, Climate Change, Water Pollution, Videos, Games, Experiments, and For Teachers. A search bar and a 'Print this Page' button are also visible. The main content area includes a featured article titled 'What is Environmental Health?' with a 'Learn More' button, a video player about water pollution, and four topic-specific buttons: Air Pollution, Chemicals, Climate Change, and Water Pollution. The footer contains the NIH logo, contact information, and a list of site navigation links.

National Library of Medicine
Environmental Health Student Portal
Connecting Middle School Students to Environmental Health Information

Home | Air Pollution | Chemicals | Climate Change | Water Pollution | Videos | Games | Experiments | For Teachers

Search [] Go [] Print this Page []

What is Environmental Health ?
Environmental Health is the interrelationship between human health and the environment, either natural or manmade.
[Learn More](#)

Swimming or playing in polluted water can make you sick.
[Read more about water pollution.](#)

Air Pollution

Chemicals

Climate Change

Water Pollution

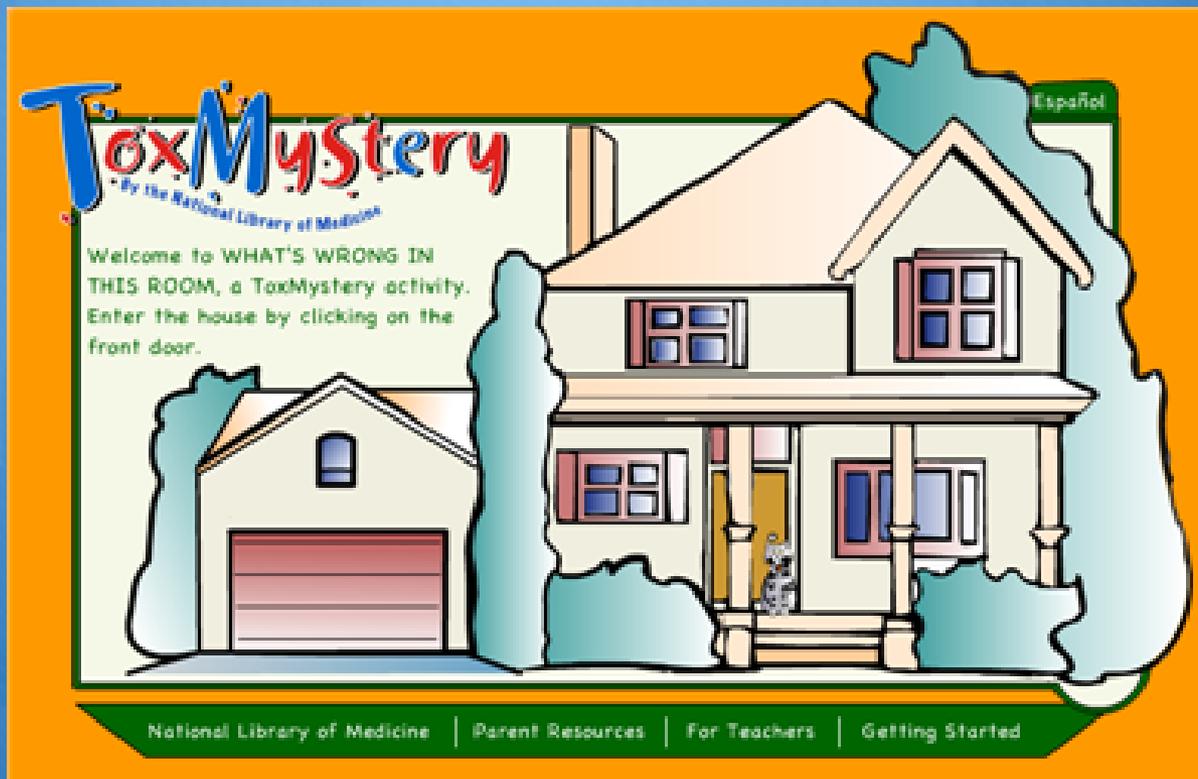
NIH
U.S. National Library of Medicine
National Institutes of Health
U.S. Department of Health and Human Services

Specialized Information Services
U.S. National Library of Medicine
National Institutes of Health
U.S. Department of Health and Human Services

What is Environmental Health? | About | Site Map
Copyright | Privacy | Freedom of Information Act | Accessibility
Videos and Players

Contact Us: tehip@tehl.nlm.nih.gov

Tox Mystery



ToxMystery

Español



Hi, I'm Toxie

Thanks for coming over. Can you help me find the hazards in my house? Start by clicking on a room.



ToxMystery

Español

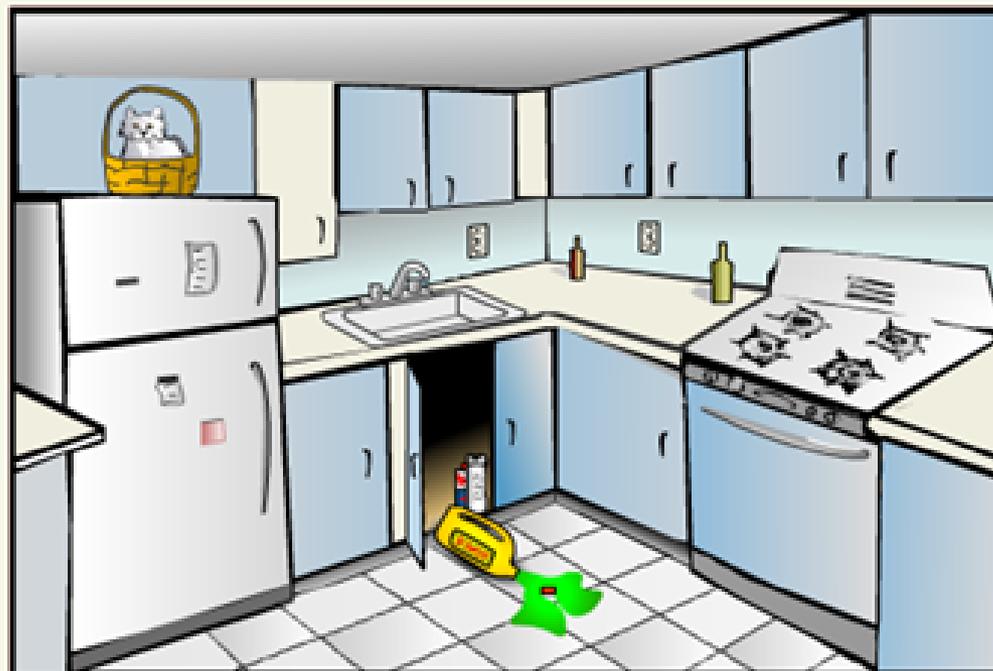
START OVER



Here's the kitchen!

There are 4
hazards in this room.

You have found 1.



National Library of Medicine

Parent Resources

For Teachers

Getting Started

ToxMystery

Español

START OVER



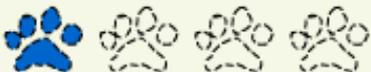
What chemical is found in this dishwashing detergent?

Here's the kitchen.
There are 4 hazards in this room.
You have found 1.

Hint?

- carbon monoxide
- chlorine
- sulfur dioxide

Close



National Library of Medicine

Parent Resources

For Teachers

Getting Started

ToxMystery

Español

START OVER



Chlorine is correct!

Chlorine is used in some forms of dishwashing detergent, bleach, and other cleaning chemicals.

Chlorine is very powerful, and if it gets mixed with other chemicals in your home, it can release a harmful gas.

Here's the kitchen!

There are 4 hazards in this room.

You have found 1

More Info

Close



National Library of Medicine

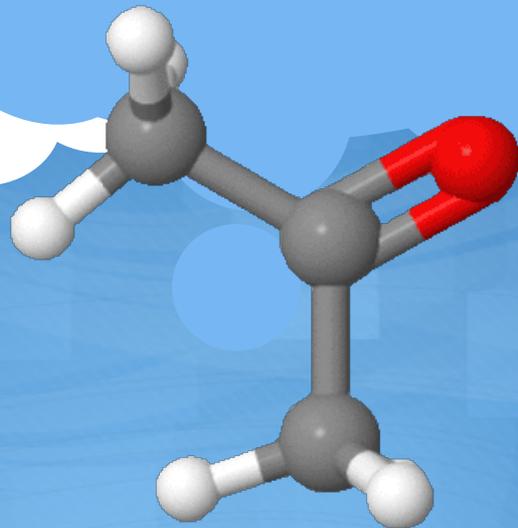
Parent Resources

For Teachers

Getting Started

Combining gaming with educational content





TOXinvaders Development Process

From an Idea to Prototype



Initial idea

- Simple
- Popular
- Educational
- Audience - K12 Students

Space Invaders to TOX Invaders



TOXinvaders version 0.0

Development process

- design

- Determine device/technology/software – iPhone/iPad/iOS/Object C/Xcode
- Outline the game challenges - three levels
- Game loop – shoot toxic chemicals, avoid toxic metals, catch golden coins



Development process

- iOS SDK, Object C, Xcode

```
TOXInvaders > ToxClean > Game > Menu > LevelViewController.m | No Selection
//
//  LevelViewController.m
//  ToxClean
//
//  Created by ying sun on 2/27/14.
//  Copyright (c) 2014 Ying Sun. All rights reserved.
//

#import "LevelViewController.h"
#define ResourcePath(path)[NSBundle mainBundle] pathForResource:path ofType:
nil]

#define ImageWithPath(path)[UIImage imageNamed:[NSBundle mainBundle]
path]]

@interface LevelViewController ()

@end

@implementation LevelViewController

- (id)initWithNibName:(NSString *)nibNameOrNil bundle:(NSBundle *)
nibBundleOrNil
{
    self = [super initWithNibName:nibNameOrNil bundle:nibBundleOrNil];
    if (self) {
        // Custom initialization
    }
    return self;
}

- (void)viewDidLoad
{
    [super viewDidLoad];
    // Do any additional setup after loading the view.
}
```



Welcome to Xcode

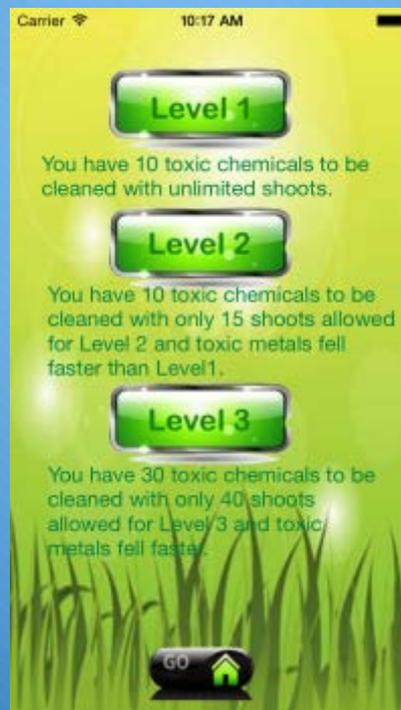
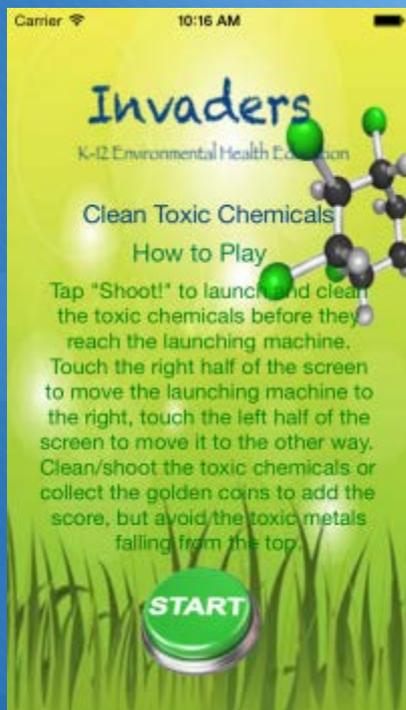
Version 6.2 (6C86e)

-  **Get started with a playground**
Explore new ideas quickly and easily.
-  **Create a new Xcode project**
Start building a new iPhone, iPad or Mac application.
-  **Check out an existing project**
Start working on something from an SCM repository

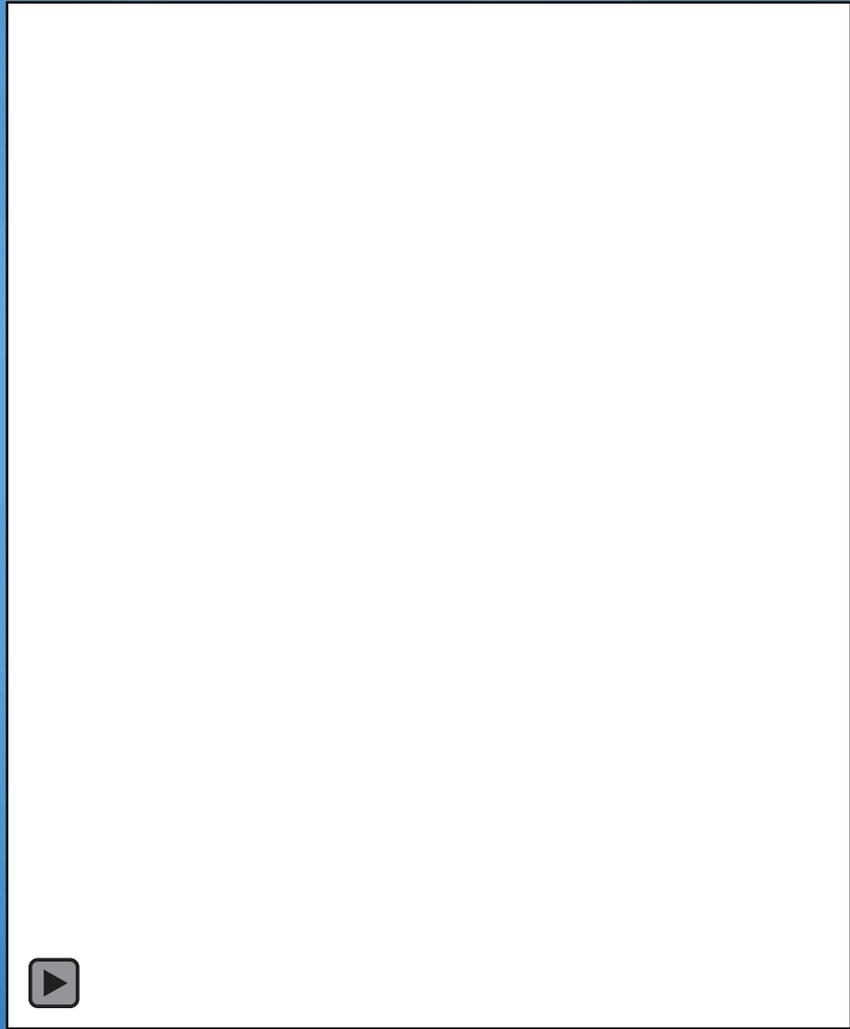
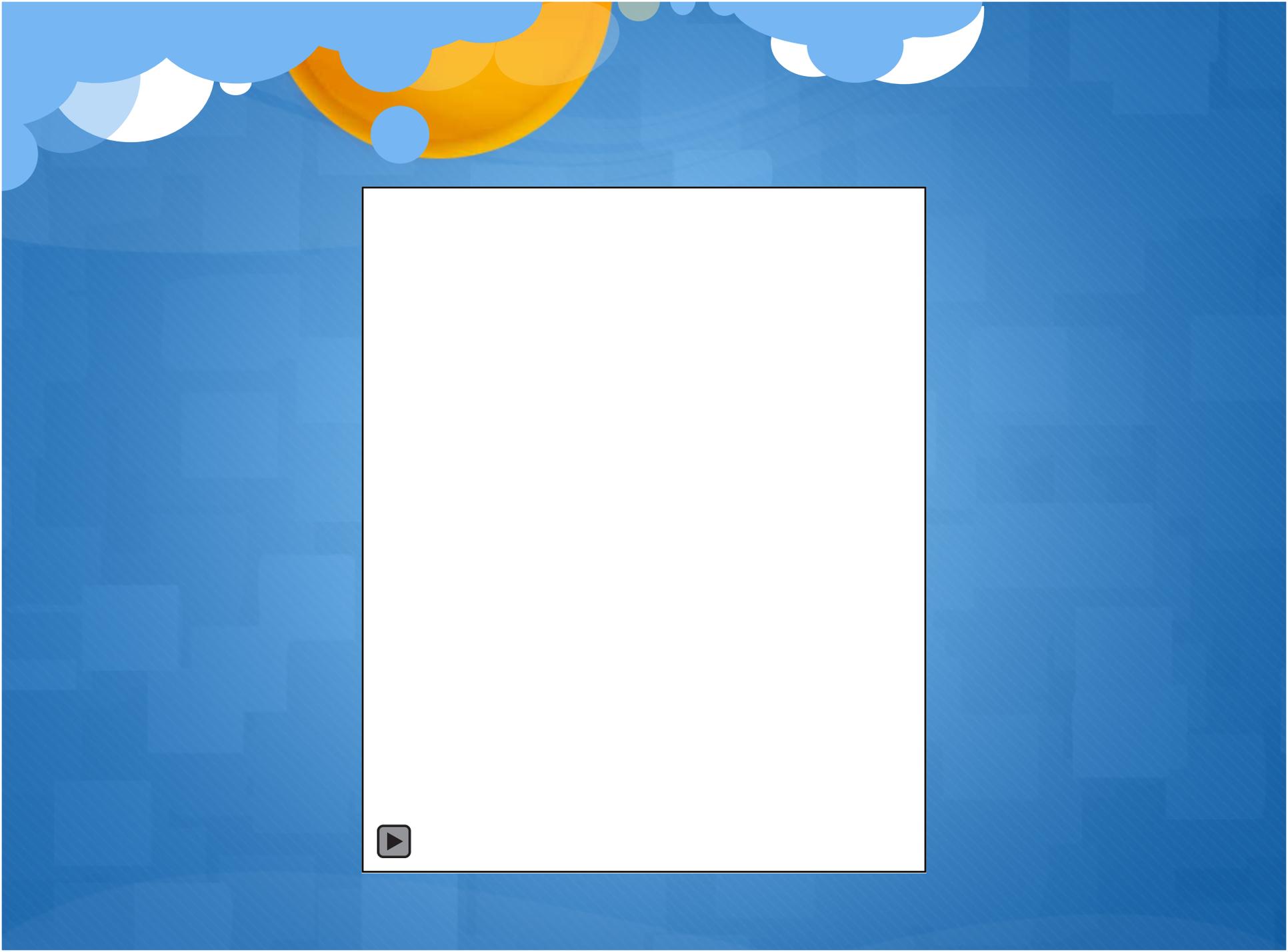
Show this window when Xcode launches

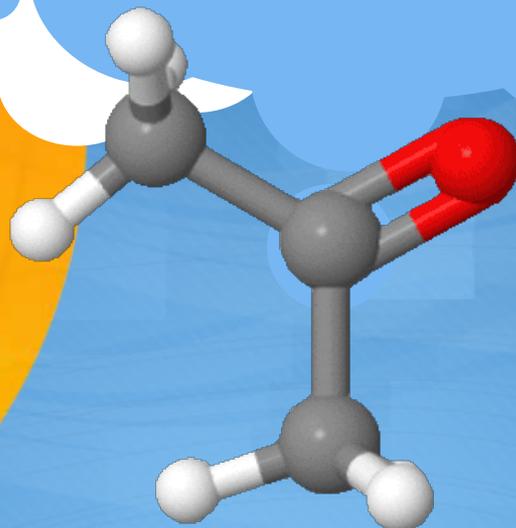
Development process

- prototype



TOXinvaders version 0.5





TOXinvaders Development Process

From Prototype to Production



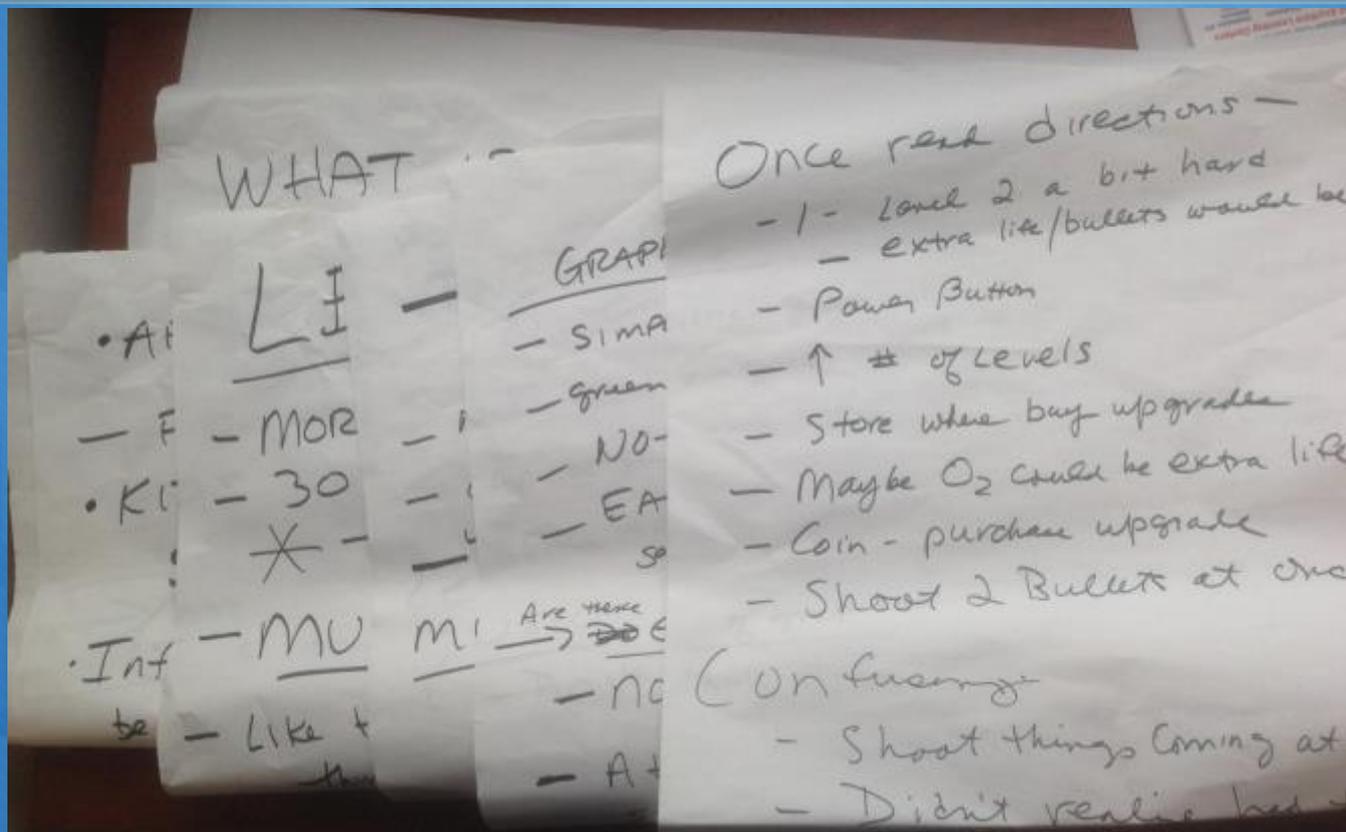
Development process

- focus group

- Conducted focus group several times
- Invited middle school students to play the game and provided suggestions
- Gathered and analyzed the feedback.
- Added more functions, modified the features.

Development process

- comments from focus group



Content: Quiz Questions

The screenshot shows the NIH Tox Town website. At the top left is the NIH logo and the text "Tox Town Environmental health concerns and toxic chemicals where you live, work, and play". A search bar is located at the top right. A navigation menu on the left includes links for Home, Text Version, Página principal, Neighborhoods, Locations, and Chemicals. The main content area is titled "Chemicals" and contains several paragraphs of text and a list of links. On the right side, there is a vertical column of "Interactive Graphic Neighborhoods" with images and labels for City, Farm, Town, US Border Regions, and Port.

NIH Tox Town Environmental health concerns and toxic chemicals where you live, work, and play

U.S. National Library of Medicine

Share Search

Home

Text Version

Página principal

Neighborhoods

Locations

Chemicals

- Acetone
- Ammonia
- Arsenic
- Asbestos
- Benzene
- Bisphenol A (BPA)
- Cadmium
- Carbon Dioxide
- Carbon Monoxide
- Chlorine
- Chlorofluorocarbons (CFCs)
- Chromium
- Crude Oil
- Diesel
- Dioxins
- Endocrine Disruptors
- Ethylene Glycol
- Ethylene Oxide
- Formaldehyde
- Gasoline
- Lead
- Mercury

Chemicals [en español](#)

Tox Town provides information in non-technical language on many well-known chemicals found in everyday locations. Chemical information is provided from the [TOXNET](#) and [MedlinePlus](#) resources of the National Library of Medicine, as well as other authoritative sources.

There are two versions of each neighborhood. Click on one of the neighborhoods pictured on the right → to go to the graphic version of each neighborhood. Or click on the neighborhood name in the list on the left ← for a text version. The graphic version includes sounds, animation, and other special features. The content is identical for both versions.

For chemical information, click on one of the neighborhoods pictured on the right → to go to the graphic version of each neighborhood. Then click on the 'All Chemicals' button for a list of over 40 chemicals. Or click on the left ← for a text version list.

Click on a chemical, like [Arsenic](#) or [Carbon Monoxide](#), to see where it might be found in a neighborhood. There is a description for each chemical and links to basic information about how a chemical might affect one's health.

For more on Tox Town chemicals:

- [About](#) answers how chemicals are selected for Tox Town.
- [Are these chemicals in MY community?](#)
- Chemicals in Tox Town
 - [Acetone](#)
 - [Ammonia](#)
 - [Arsenic](#)
 - [Asbestos](#)
 - [Benzene](#)
 - [Bisphenol A \(BPA\)](#)
 - [Cadmium](#)
 - [Carbon Dioxide](#)
 - [Carbon Monoxide](#)
 - [Chlorine](#)
 - [Chlorofluorocarbons \(CFCs\)](#)

Interactive Graphic Neighborhoods

- [City](#)
- [Farm](#)
- [Town](#)
- [US Border Regions](#)
- [Port](#)

Content: Instructions and Tutorials

For players: Shoot bad chemicals and collect good ones. Learn new things, pass quizzes with flying colors, and unlock new levels. Page through the screens to learn how to play!

For teachers: This interactive game from the **National Library of Medicine (NLM)** incorporates engaging hands-on gaming with quizzes that test knowledge about the chemicals found in the game. It also provides information about the chemicals. The game is designed to support lessons about core curricular concepts about environmental health. It works best as a supplement to NLM websites, such as Tox Town, Environmental Health Student Portal, and ChemIDplus.

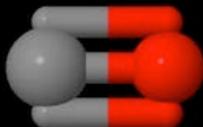
Graphic Design

- old image

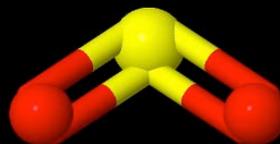
- Selected royalty free images
- Used 2D chemical structures from NLM ChemID Plus



Carbon
Monoxid



Sulfur
Dioxide



Retake Quiz

The screenshot shows the ChemIDplus web interface. At the top, it displays the NIH U.S. National Library of Medicine logo and the TOXNET TOXICOLOGY DATA NETWORK header. The main content area is titled "ChemIDplus A TOXNET DATABASE" and includes a search bar with "Search", "Clear", "History", and "Help" buttons. Below the search bar, there are several filter sections: "Substance Identification" (Name/Synonym, Equals), "Toxicity" (Test, Species, Route, Effect), "Physical Properties" (Melting Point, Measurement Type), and "Locator Codes". On the right side, there are "Structure" and "Molecular Weight" filters. The interface also shows the number of records available for each filter and a "Display 5 results" button at the bottom.



Graphic Design

- improve images

- Invited professional graphic designer to create high quality game images based on our requirements
- Two series of images – one for iPad, one for iPhone

TOX*invaders*

@NLM/SIS K-12 Environmental Health Education

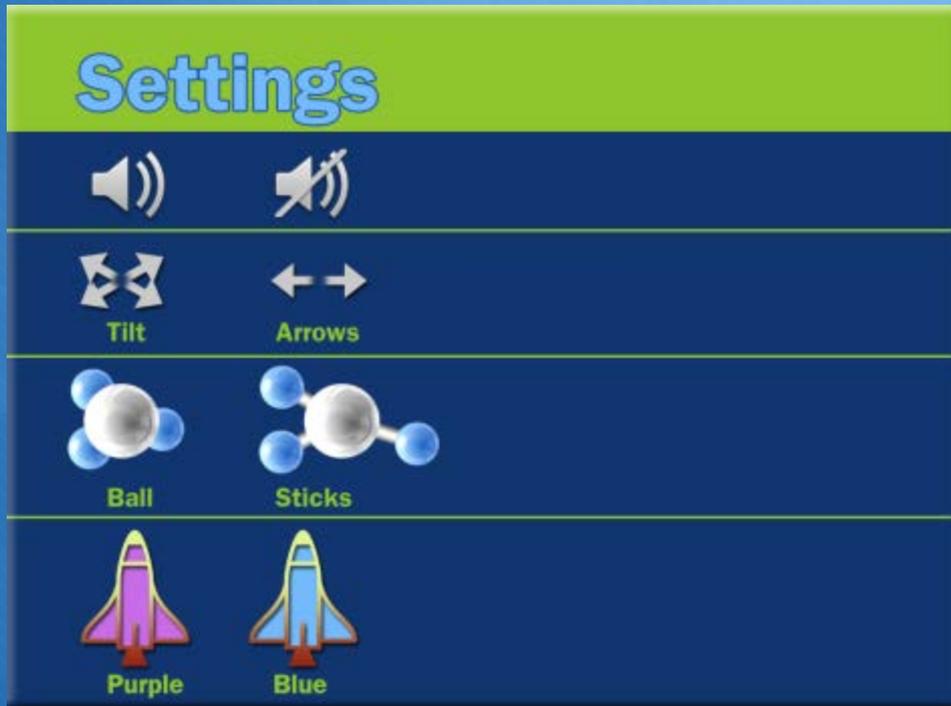
SAVE our environment from TOXIC CHEMICALS



Start

Graphic Design

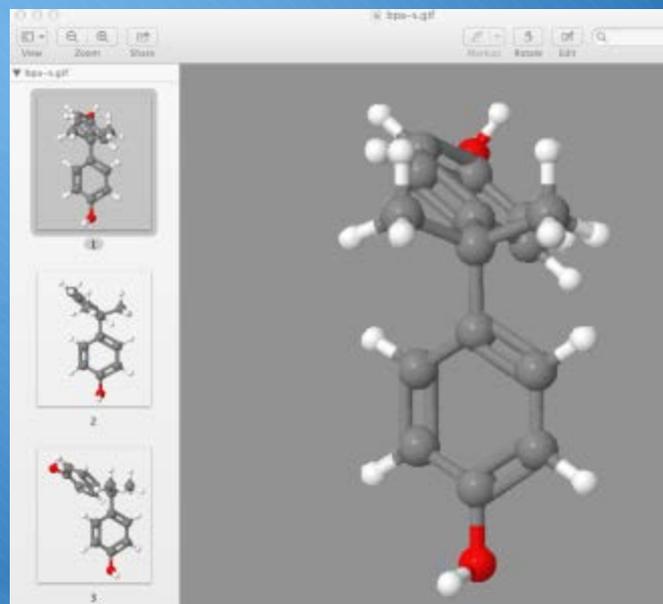
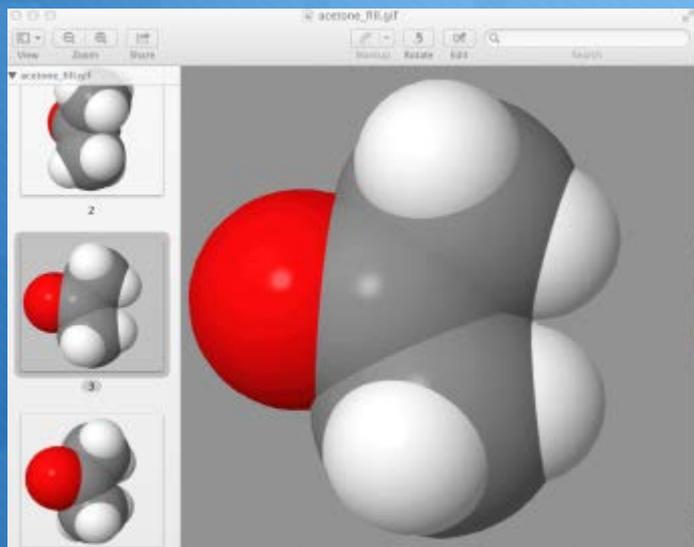
- improve images



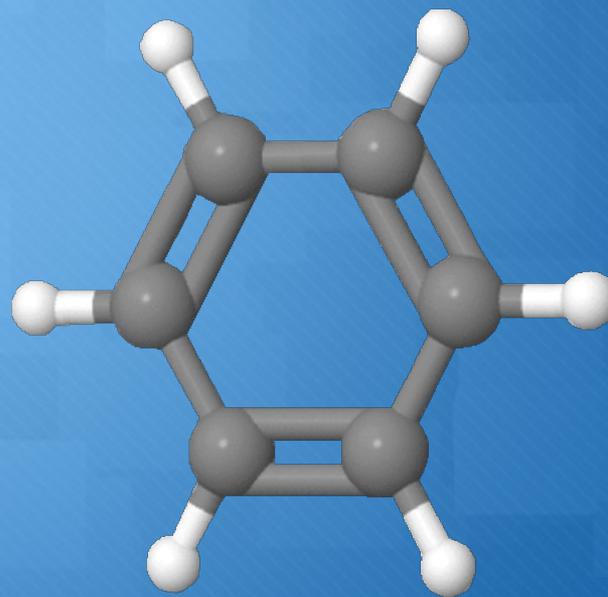
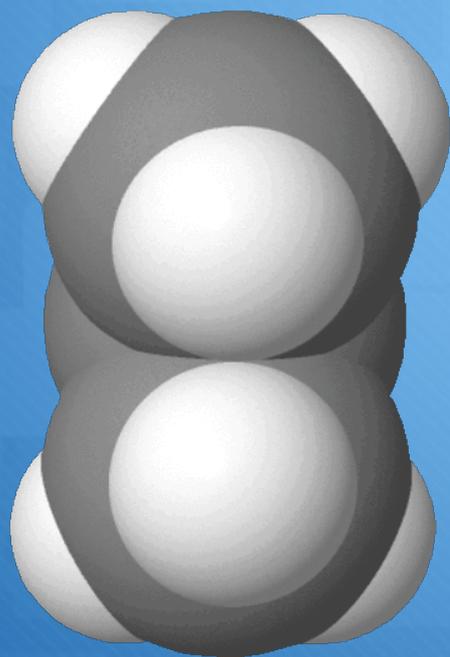
Graphic Design

- Chemical structures

- Replace 2D chemical structures with NLM/SIS ChemID Plus new product – 3D animated chemical structures



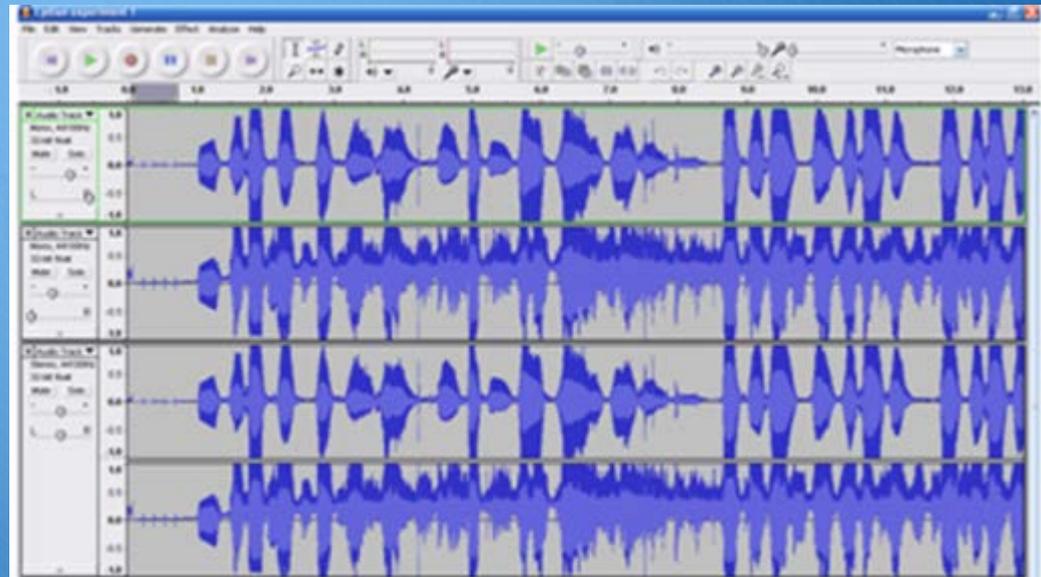
Animated 3D Chemicals



TOXinvaders: Audio

Required:

- Sound effects
- Music
- Narration





TOXinvaders: Audio

Challenges and solutions

- Finding free sounds
- Finding sounds that accurately conveyed the game's ambience

Solution

- No or low cost online sounds and music:
free-loops.com and soundbible.com

TOXinvaders: Audio



Demo of the game



Download TOXinvaders on the App Store for FREE

iTunes Preview

Overview Music Video Charts

TOXinvaders

[View More by This Developer](#)

By National Library of Medicine

Open iTunes to buy and download apps.



[View in iTunes](#)

+ This app is designed for both iPhone and iPad

Free

Category: Games
Released: Mar 07, 2015
Version: 1.0
Size: 28.3 MB
Language: English
Seller: National Library of Medicine
© 2015 National Library of Medicine
Rated 4+

Description

TOXinvaders game, by National Library of Medicine (NLM), engages young adolescents in a fast-paced attack on toxic chemicals in the environment. The game supports middle school science concepts about environment and health.

[National Library of Medicine Web Site](#) > [TOXinvaders Support](#) >

[...More](#)

Screenshots

iPhone | iPad

