SCIENCE BUDDIES

Video & Computer Game Design SPECIAL ISSUE

AMD

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Physics and Video Games?

Differences in game quality, playability, and enjoyment depends on the 'physics' used in the game

Often the line between a blockbuster game and a mediocre one boils down to the application of physics within the game. For example, Angry Birds has made its way into many classroom discussions as a fulcrum for talking about physics, both real-world and within the game. When you slingshot a game bird at a structure, what laws of physics are in place? Do the game physics match up to real-world physics? Do they have to? Games that simulate familiar physics (like gravity or elasticity), or that create a sustained alternate set of physics, are often more compelling than games that do not. For game designers, "physics engines" help them set parameters that determine what happens in a variety of situations, including when things collide, when something shatters or explodes, and when it rains or snows. In the Making It Real: Incorporating Physics in Video Games project, students are guided in using the ExtremePhysics engine with GameMaker to explore physics in a two-dimensional game.

Getting Started

Designing Your *First* Video Game

Programs and game creation environments like **Scratch**, **GameMaker**, and **Gamestar Mechanic** make it fun and easy for students to make the leap from *playing* games to *creating* them. In video and computer design projects, students can explore game making fundamentals, apply game design "logic," and investigate what happens when they change game variables like speed, size, point systems, music, and the number of characters. Following steps of the engineering design process, students can storyboard, prototype, test, play, and share their games. At the same time, they'll be learning and applying science and math principles--and having fun!

"By creating games, students learn science, technology, engineering and math skills, as well as problem solving, critical thinking, language skills, and teamwork."

AMD Changing the Game

'Winning' Games

National Competitions Shine Spotlight on Innovative K-12 Video Game Design *(and the students who create them!)*

Students who explore video and computer game design can make their efforts do double duty by entering one of these national competitions:

- **National STEM Video Game Challenge**: This competition is an outgrowth of the Educate to

These Project Ideas put students in the game maker's seat using free Scratch software, developed by MIT:

- Want to Make a Video Game? Here's How!: Create a simple game of chase. *Will the dog catch the cat?* Fine-tuning the game variables lets students explore difficulty, playability, and fun.
- Quick Draw McPaws: Teach a Computer Kitty How to Draw Shapes: Use Scratch to make an on-screen sprite (or character) draw basic shapes.
- Scratch User Guide

Making a 'Game' of Game Design

How do you turn a gamer into a game designer? At Gamestar Mechanic, the answer is simple: make learning game design concepts and fundamentals *part of the game*! Created by the Institute of Play and E-line Media, Gamestar Mechanic is an online game development environment that introduces students to video game design as part of playing a game and solving in-game quests and challenges.

Note: A *free* Gamestar Mechanic membership offers an initial number of introductory challenges. (Teachers and parents: check the two-page overview.)

Games with a Message

Video Games Offer an Engaging, Hands-on Approach to Raising Public Awareness About Important Issues

Presented with interesting thematic challenges, many student video game designers are excited by projects that invite them to spin the video game model to create games that can teach players about social and environmental issues in a fun and innovative way.

- Go Fish! Creating an Ocean-Friendly Fishing Video Game challenges students to design a game that addresses the problem of "overfishing." Using GameMaker, students create a game in which players succeed by catching sustainable fish rather than endangered species.

Innovate Campaign, President Obama's initiative to promote a renewed focus on science, technology, engineering, and math (STEM) education. Team and individual middle and high school projects created using any application or language, including Gamestar Mechanic, GameMaker, Kodu, and Scratch, can be submitted. Deadline for submissions: March 12, 2012. See contest guidelines.

- **2012 Scholastic Art & Writing Awards**: The Alliance for Young Artists & Writers' annual competition includes a video game design category that bridges the divide between video game design as art and video game design as science, math, and engineering. Deadline for submissions: January 9, 2012. See contest guidelines.

Curious about previous winners? The National STEM Video Game Challenge 2010 Youth Prize Winners video offers an inspiring look at real students who are designing their own video games.

Careers for Video Game Fans

Systems Verification Engineer

Troubleshooting and testing for bugs before new components are put into high-tech devices helps ensure popular tools and features work as they should

Systems verification engineers like AMD's Kathy Hooper help make sure the products you use and love work! Read Kathy's story on the Science Buddies blog.

Learn more about the following careers related to video and computer game design:

- Computer Programmer
- Computer Software Engineer
- Computer Hardware Engineer
- Multimedia Artist or Animator
- Software Quality Assurance Engineer and Tester

Sounds Like Fun

Successful Game Design

- The Save a Life! Teach Hands-Only™ CPR project challenges students to develop an informational application using Scratch, to help spread the word--*and the beat*--about an important life-saving technique.

Planning the Perfect City

In the To Infinity and Beyond: Plan a City of the Future with Sim City project, students survey friends and family to find out what it takes to make a "great" city. Armed with varying ideas, students dive in as city planners and design a city with a population of 50,000 citizens using SimCity 4 Deluxe. A "scoring guide" helps students evaluate the city design. Students can then make improvements and design changes to address problems and increase the success and health of their future city. *Creating a perfect city might be tougher than you think!*

"Many students—including those who are tuning out in school—are turning on to video games outside of school."

Allyson Peerman, AMD
"Video Game Design: The Missing Ingredient?"
U.S.News & World Report

Making a Good Game Better

Understanding the Nuts and Bolts of Game Design Can Enhance Game Play and Increase the Fun

Once you've created your initial game framework, it's time to test and tweak! *Does the game work? Is it too hard? Is it winnable?* Exploring the nuts and bolts that influence the game's difficulty and playability can turn a basic game into something exceptional. These Project Ideas help you investigate two important aspects of game

Combines Audio, Art, and Solid Gameplay

What a game "sounds" like may make a difference in how players respond--and in who can play

Just like in a movie, the music and sound effects in a game may influence your enjoyment of the game. In many cases, sound effects clue gamers in to what is happening on screen and signal successes or danger. The following projects let students explore the importance of sound in thinking about game design:

- Playing Along with Video Games: Investigating the Role of Procedural Music: Music in today's games often evolves *with* the game. This type of game music is called "procedural music" and is *programmed* so that what you hear is tightly tied to what is happening in the game at any given moment. In this project, students explore and test procedural music in a game of their own design.
- Creating a Video Game for the Blind: With well-planned sound clues used throughout a game, blind and visually impaired people can also enjoy video games. This project challenges students to create a game that succeeds for players with and without vision concerns.

Sponsor Spotlight: AMD

AMD: Sparking Student Interest in Science Through Video Game Design

AMD Changing the Game encourages student exploration of science, technology, engineering, and math (STEM) through video game design

AMD and Science Buddies believe that quality tools, resources, and Project Ideas for video and computer game design encourage students to learn and use science while having fun with game design and testing. *The bonus?* They may get so caught up in design and programming that they don't realize how much they're learning. What they realize is that they can ***do it***.

Watch the AMD Changing the Game video.

design:

- Power Play: How Does Animation Timing Affect Your Perception of Game Action?: Timing intervals contribute to realistic character movement. *How important is timing in sports-based games?*
- Hit Boxes: How Size Affects Score: Running through a row of coins may help the player level up, but hit boxes that are too small can make a game unplayable. *What's the right balance?*

On the 'Move' with Video Games

'Steering' the On-Screen Car

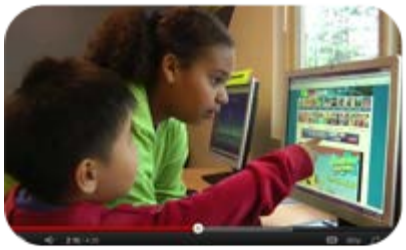
Does using a steering wheel-shaped remote control make it easier to learn to play a racing game? If you have grown up using a joystick, a remote, or a touch screen, learning new game control schemes may seem like second nature. But for some players, pressing a combination of buttons to perform a jump or drive a car isn't intuitive.

The Out of Control! project explores the effectiveness of using "natural mapping" schemes for game play. *Are there certain audiences that natural mapping schemes target? What other advantages does natural mapping offer?*

A Video Game Workout?

Many popular gaming platforms rely on players 'moving' to simulate on-screen actions and behaviors. To win the race, you may need to run in place faster than the on-screen contenders. Want to bowl a perfect 300? You'll need to master your arm motions with the remote to control your aim, speed, and curve.

Tennis, soccer, dance, and boxing are just a few of the video-game sports you can play indoors, in front of a TV, and with a remote in hand. Today's "off-the-couch" *exergames* are fun to play, but do they have **health benefits**? It's a question



AMD Foundation Supports Exciting Resource Development for Video Game Design Education

AMD Changing the Game supports a number of exciting educational resources and websites for students and teachers. We encourage you to explore some of these AMD-supported initiatives:

- **Level Up!**: A collaboration between the AMD Foundation, the Alliance for Young Artists & Writers, and Scholastic. Level Up! offers resources for middle and high school teachers to support video game design in the classroom. The site offers standards-based **lessons** and **worksheets** for beginners (using Gamestar Mechanic) and for intermediate designers (using Activate! (for intermediate designers).
- **Activate!**: A game design learning resource for students ages 13-15, created by PETLab and funded by the AMD Foundation. Activate! challenge projects encourage game creation about "green" issues, such as energy conservation, solar power, and pollution.
- **Boys & Girls Clubs of America offers Game Tech Program**: funded by the AMD Foundation and designed by PETLab, Game Tech offers resources for facilitators and activities and instruction that enable club participants to explore game design fundamentals using Scratch.

Science Buddies Resources

Resources for Video and Computer Game Design Projects and Classroom Instruction

- Kid-Friendly Programming Languages

students can investigate in the Sweating the Score: Can Video Games Be a Form of Exercise? project.

Great Graphics

Pixel Perfect

Advances in screen technologies make today's sprites and characters look more and more realistic

1985: 16 x 12 pixels

Mario today looks a whole lot better than he did in 1985! In The Pixel Puzzle: Why Video Game Characters Look Better Today, students can experiment with their own pixel drawings for a firsthand introduction to screen resolution and the relationship between pixels and the level of detail and realism in video game graphics.

- Tips and Resources for Making Video and Computer Games
- Resources for STEM Education Through Video Game and Animation Creation
- GameMaker User Guide
- Scratch User Guide
- How to Get Started Downloading and Using Storytelling Alice
- Engineering Design Process Guide
- Video and Computer Game Science Fair Project Ideas

What's Your Favorite Game Development Environment?

Are you a student video game designer? What program or environment do you use? Why do you like it? **Let us know!**

Looking for a Perfect Project for *You*?

Our Topic Selection Wizard can help guide you to a science project that fits your areas of interest *and* meets science fair requirements. Give it a try today!

Supplies in a Box: Science Buddies Introduces Project Idea Kits

Kits make it even easier to get started on a science project!

When you order a Science Buddies kit through the AquaPhoenix Education website, you'll receive everything you need to perform the experiment (with minor exceptions, like perishable items). We hope you'll find the new kits a convenient way to gather your materials so you can spend more time on your science project and less time worrying about shopping for supplies. See a full list of available kits.

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AMD Foundation
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