



# **Game Design: Using Computer Games to Promote Thinking Skills**

**PAGE CONFERENCE**

**April 23, 2010**

**Presenter: Susan McCoy  
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## Comments

- Introduction
- Thinking Skills Addressed
- Handouts for the GameMaker Course
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# INTRODUCTION

## The Game Maker Program.

Website – [www.yogames.com](http://www.yogames.com)

- ***Background on the Program***

- \* Designed by Professor Mark Overmars of Utrecht University, the Netherlands
- \* Introduced to the Center by Sean Harris, former Gifted Center student

- ***Downloadable from the internet***

The “free” or “Lite” version contains all of the components needed to create an exciting, original game. For a one-time fee of \$25.00, you can upgrade to the “Pro” version where additional features are available for your use.

Licensing packages are available at a special rate for educational institutions.

- ***Features on the Website***

- \* Resources
- \* Tutorials
- \* Sample Games
- \* Teacher Pages
- \* Forums
- \* Beta Testing
- \* Design Contests

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# Thinking Skills and Computer Game Design

## Creative Thinking

To begin the game making process, students must generate ideas for the theme and type of game, the sprites (images) to be used, how the game will end, how the game will move along, etc. All of these goals can be accomplished in a variety of ways.

Students can:

- Generate a list of computer games they have played.
- Sort games by type (maze, shooter, platform, etc.), identifying game types they particularly like to play.
- Discuss with others the types of games they like to play. Ask them to include obstacles they like to “beat.”
- Review the list of computer games and identify the themes.
- Generate a list of unique themes staying away from themes revolving around war, fighting or other types of violence. When students eliminate these themes, they are “free” to explore different possibilities.
- Explore websites that post a variety of sprites for non-commercial use. Often ideas are inspired by already created themes.
- Using the information generated by the process listed above, create a game plan identifying the type of game and theme for the new game, list the sprites, sounds and backgrounds to be used.

*Make sure students understand that adjustments can and will be made during the creation process.*

## Problem Solving

Students must pre-plan the game they want to create determining the outcome, either win or lose, and the obstacles the player will face. Problems to be solved might include: how will the game end (both the win and lose scenario), what obstacles will the player face, what is the most efficient way to program the objects to achieve the desired game play?

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- Addressing the problem of winning/losing the game, students draw on previous experience listing different ways to win/lose (beat the timer/time runs out, retain at least 1 life at the end of the game/all lives have been used, some health is still left at game end/health has run down to 0, etc).
- Taking into consideration the game type/theme, students choose the most sensible ending.
- Objects are created to advance the chosen strategy. Students should test the game after each programming addition is made. Bugs will occur during the programming process. Students learn to test each addition separately so they will be able to determine immediately which steps work and which ones cause problems. This is an important concept for students to understand in programming. Fixing the last problem is much easier than having to go back and figure out which step caused the bug since one object can affect a number of others.

## Decision Making

Since there are many ways to develop a particular outcome for the game, students must make decisions throughout the process using their knowledge and skill to find the most time and code-efficient method.

Code efficiency means that the programmer uses the fewest number of steps to produce the desired outcome. The simpler the code, the easier it is to debug. Also, a simple code allows other game creators to help when problems arise.

Sometimes, the game plan does not work the way the student wishes. At this point, the decision making process kicks in.

- Identify the problem. What is happening? What is supposed to happen? Model for the student how to talk through the programming steps. *Yes, talk out loud.* The GameMaker program follows a logical, “almost” English structure.
- Look through the Event and Action choices and devise a possible process to solve the problem. Pick the solution that has the least amount of steps or is the easiest to talk through.
- Program the object/objects necessary to implement the solution. Test the game. Debug as necessary.

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## Interactive Communication

Communication is a very important part of game creation. Both oral and written communication skills can be developed and refined using GameMaker. The following strategies will help expedite the game making process and develop communication skills.

- Require students to speak using jargon specific to the GameMaker program and programming in general. Learning how to communicate using the right words allows questions to be answered precisely with less room for error or extra work.
- Modeling active listening during questioning helps students to clearly understand answers and possible solutions. I require students to repeat my part of conversations to be sure they understand directions.
- Technical writing requires clear, uncomplicated prose that conveys to the user how to play the game. Have students read game directions from other games and manuals and determine how best to write their own directions. Directions should be short, clear and relevant to the game.
- Give students your full attention when discussing a problem. In my class, there is a rule that if I am in conference with another student, I am not to be interrupted. To make sure students do not forget their questions while waiting, I have devised a system that helps develop communication skills as well as patience. If a student has a question and I am busy, they take an index card from my desk and clearly and succinctly write the problem. They give me the card with their name on it and if more than one student has a question, I just hold the cards in the order they are given to me. When I am available, I address the next question in the stack. If I can not get to every question that period, I check out the problems after school, write a suggestion to the student and put the card in their folder for the next class. Interestingly, student more times than not figure out the answer before I get to them. They give themselves permission to explore answers.

Other process skills are certainly addressed in the game making process: analysis, synthesis and evaluation, self-directed learning, time management. The ones I chose are the ones I address to my students in my class. I want them to understand the process of their thoughts as well as the outcome.

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# Handouts

The following pages are samples of the handouts used to organize a game design class and help students remain focused on developing their games.

The Handouts Section Includes:

- Record Sheet
- Game Planner
- Guided Practice Directions
- Creating a Home Screen and Game Manual
- Directions for Commonly Used Specialized Events and Actions
- List of Media Websites

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# Game Design Assignment Record Sheet

Name \_\_\_\_\_ Day \_\_\_\_\_ Period \_\_\_\_\_

A game plan must be submitted and approved before you can start to construct your game. Please use the game planner form to develop and submit your plan. If you are working with a partner, submit only one game plan form for your team.

	Date Completed	Score and Comments 1 - 5	Student Initials	Teacher Initials
<b>Simple Game</b> <i>Hit the Ball</i>				
<b>Simple Game</b> <b>Ramp Up</b>				
<b>Game Plan</b>				
<b>Home Screen</b> <b>and Game Info</b>				
<b>Game</b> <b>Completed</b>				

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## GAME PLAN DETAILS

Name \_\_\_\_\_ Day \_\_\_\_\_ Per \_\_\_\_\_

Describe your game. Include the type of game (maze, chase, shooter, etc.), the story line or description of game play and the object of the game.

List the sprites, sounds and backgrounds you will need to begin creating your game.

How do you win? What happens when you win? (Please be specific – high score table, restart game, etc.)

What obstacles will the player face when trying to work through the game?

How do you lose? What happens if you lose? (Please be specific – high score table, restart game, etc.)

How does the player advance to the next level if there is more than one?

**Notes:**

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## **Guided Practice - Making A Simple Game**

*This tutorial is used after the students have become familiar with the GameMaker program and are ready to practice using the components of GameMaker independently. Students follow the directions, customizing the sprites, sounds and backgrounds but making a specific game. This practice “manual” follows the game planner format. This document was adapted from the “First Game” tutorial on the yoyogames.com website.*

### **Step One: Describe the Game**

The game will be very simple: There is a ball that is bouncing around between some walls. The player should try to click on the ball with the mouse. Each time the ball is clicked, a point is scored.

### **Things You Need**

- Two different objects: the ball and the wall.
- Two different sprites: one for the wall object and one for the ball object.
- A sound for when you click on the ball with the mouse.
- A background picture for the room.
- One room in which the game takes place.

### **Step Two: Collect the Elements**

#### **Add the Sprites**

*(You can make your own sprites or choose one from Sprites in the Public Folder. Do not use the Internet at this time)\_*

*The Wall (The sprite will be used to create a border around a room. It can be any image.)*

- From the **Resources** menu select **Create Sprite**.
- A form will open. In the **Name** field type “wall”.
- Click the **Load Sprite** button and choose an image from the Sprites folder. Double click the sprite. Close the form.

*The Ball (The sprite does not have to be a “ball.” Choose any image that will move around a room.)*

- From the **Resources** menu select **Create Sprite**.
- A form will open. In the **Name** field type “ball”.
- Click the **Load Sprite** button and choose an image from the Sprites folder. Double click the sprite. Close the form.

#### **Add a Sound**

- From the **Resources** menu select **Create Sound**. A different form opens.
- Give the sound a name and click **Load Sound**.
- Double click a sound that makes sense for when the ball is clicked. Listen to the sound by clicking the green arrow on the form. If you like the sound, close the form or choose another sound in the same way. Close the form.

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### Add Background- (Choose one from Backgrounds in the Public Folder.)

- From the **Resources** menu select **Create Background**.
- Give the background a name and choose **Load Background**.
- Click the top background then use the down arrow key to see the rest. Double click the background you would like to use. Close the form.

### Step Three: Add the Objects and Actions

#### **Make the Wall Object**

- From the **Resources** menu choose **Create Object**.
- A form will open that looks more complex than the ones used so far. Give the object the name “wall.”
- Click “**no sprite**” and choose the sprite you picked for the wall.
- Because a wall is solid you should check the box labeled **Solid**. You can make the wall visible or invisible. Close the form.

#### **Make the Ball Object**

A few things have to happen with the ball object. Objects can have several actions attached to them.

- From the **Resources** menu choose **Create Object**.
- Name the object “**ball**” then click “**no sprite**” and choose the sprite you picked for the ball.
- We don't make the ball solid but we do want it to be visible. For the ball we need to define some behaviors. DO NOT CLOSE THE FORM.

#### **Define What Happens When the Ball is Created in a Room**

- In the center section of the Object Properties window, you see an empty column titled **Events**. Below it there is a button labeled **Add Event**. Click it and you will see all possible events.
- Select the **create event**. This is now added to the list of events. At the far right you see all the possible actions, in a number of groups with tabs sticking out to the right.
- From the **move** group, choose the action with the 8 red arrows and drag it to the column titled **Action** in the middle. This action will make the object move in a particular direction.
- Once you drop it in the action list, a dialog pops up in which you can indicate the direction of motion. Select all the 8 arrows to choose a random direction. Do not click the square in the middle. You can make the speed anything between 2 and 8. Close the dialog. Now the ball will start moving at the moment it is created.

#### **Define What Happens When the Ball Meets the Wall**

- Next, define what should happen when the ball collides with the wall.
- Again click **Add Event**. Click on the button for **collision event** and in the drop down menu select the wall object.
- For this event we need the bounce action. From the **move** tab, choose the action with the blue line and red-arrowed angle (bottom right) and drag it to the action list in the middle. There is no need to change anything in the dialog box at this time so just close it.

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## Define What Happens When the Ball is Clicked by the Mouse

Finally we need to define what to do when the user clicks the ball with the left mouse button. Again click **Add Event**, select the **Mouse event** and select the left mouse button from the pull-down menu.

### For this event we need a few actions:

- **To play a sound.** This can be found in the tab of **main1** actions. Drag the **Speaker icon** into the **Action section** and select the correct sound you chose.
- **To add the score** click on the **score tab**. Choose the **Set score action** (upper left corner), type in a value of 1 and check the **Relative** box. This means that 1 is added to the current score.
- **To make the ball jump to a new random position** use the **Move tab** and drag the icon with the question mark under the **JUMP** section. There is no need to change anything in the dialog box at this time so just close it.

## Step 4: Setting Up the Room

The objects are now ready. The last thing you need to do is to make the room.

- Add a new room to the game by choosing **Create Room** from the **Resources** menu.
- Next you will add your background to the room. On the left of the gray grid area, you will see some tabs one of which is labeled **Background**.
- Click **Visible When Room Starts** then click the little window that says **No Image**. (Select the Background image from the drop down menu.)
- Now we will add the objects to the room. Click the **Objects Tab**; then click in the gray space in the column. Select the **wall** object from the pull-down menu. You will see the sprite for that object in the upper left hand of the column.
- By left clicking in the room, you can place instances of that object where you want them. *You can remove instances using the right mouse button.*
- Click the **Maximize** icon in the upper right hand corner of the screen to see the entire screen.
- Create a boundary around the room using the wall object.
- Once you have finished the wall boundary, change to the ball object.
- Place 1 or 2 ball objects in the room.

## *Your Game is Ready to Play.*

### Testing the Game

Choose **RUN** from the Menu bar and click **Run Manually** to see what happens.

If you made no mistakes, the ball starts moving around. Try clicking on it with the mouse and see what happens.

*These directions are a modification of the first tutorial from the GameMaker website.*

*Explanations have been added from the student's version for your benefit.*

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## ***Independent Practice***

Once students have completed the Simple Game, they are asked to take the game a step further by making it more complicated. At this point, students begin to experiment with other Events and Actions. They are asked to form plans for objects and try to carry out the plan. Students are encouraged to try to program the objects without help first. If the object works, great. If not, students have a basis for asking specific questions about its construction. At this point, students begin asking each other for help. It is a great opportunity for each child's gifts to shine.

## ***Long-Term Independent Project***

Now that students have made a game with guidance, they begin making their own game. Students map out a plan, gather elements (sprites, backgrounds, sounds) and develop the game debugging and editing as they go. Students are encouraged to have others play their game at various stages to get feedback from an impartial participant who knows how the program works.

## ***Publishing Student Games***

When a student finishes their game, they want others to be able to play it. They are very proud of their work. At the end of the class, I create a CD for all class participants. I add the student's individual folder, all completed games done by all students who took my class that semester and a folder of games created by former students. These games were so well done that I use them as examples when I introduce the unit. It is a very strong incentive for students to become a part of my example games folder.

Our center holds an end of the year celebration of students' work. My contribution is a game arcade where I showcase the best games of the year. I make my choices based on student feedback. During the last few weeks of the term, students play each other's games and invariably some games are praised more than others. After checking that the game contains all the necessary components and that it runs without glitches, I add it to the arcade. Having your game chosen for the Celebration of Learning Game Arcade is the ultimate pat on the back.

The YoYoGames website offers a feature where game designers can upload their games to the site for testing and critiquing by others. Many of my students take advantage of this feature, but there is a caveat. The people who critique on this site do not spare feelings. They are very honest and brutal. Make sure you remind students who want to publish this way that they have to have very thick skin.

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## Creating a Home Screen

Create a New Room and name it home, main, or whatever makes sense for an opening screen.

Create a sprite for the title, the start button and a button for accessing the game manual. You can make the button look however you want as long it is clear to the user what they do. Sprites can be made in the editor or create them in another graphics program.

Add a new object for each button. The title has no action associated with it so it does not have to be programmed. However, the start button should take you to the first room and the information button should take you to the game manual. You will use a left click Event for the start and info buttons unless you have another way you want these to be accessed. The start button will use a Next Room Action (main1) and the info button will use a Game Information Action (main2).

Finally, move the new room to the first position in the ROOM folder and check to make sure it works. You can move it to the end again if don't want it to open first while you are still working on your game.

## Creating a Game Manual

Double click the Game Information link at the bottom of the folder list in the white column to the left of the construction window.

Type your first and last name then ENTER.

Type your first and last name then ENTER.

Type the most recent date then ENTER.

Type a brief description of your game, maybe the object or a short story. Include whatever you need to introduce the game.

Include any credits if you used another website to get sprites, backgrounds or sounds. You do not have to credit Gamemaker.

Explain how the game is played and any special instructions your user might need to know.

Finally, you can format the background (paint palette), the text (the red and blue "T"), change the font type, style or size or alignment. These options are all located above the yellow text area.

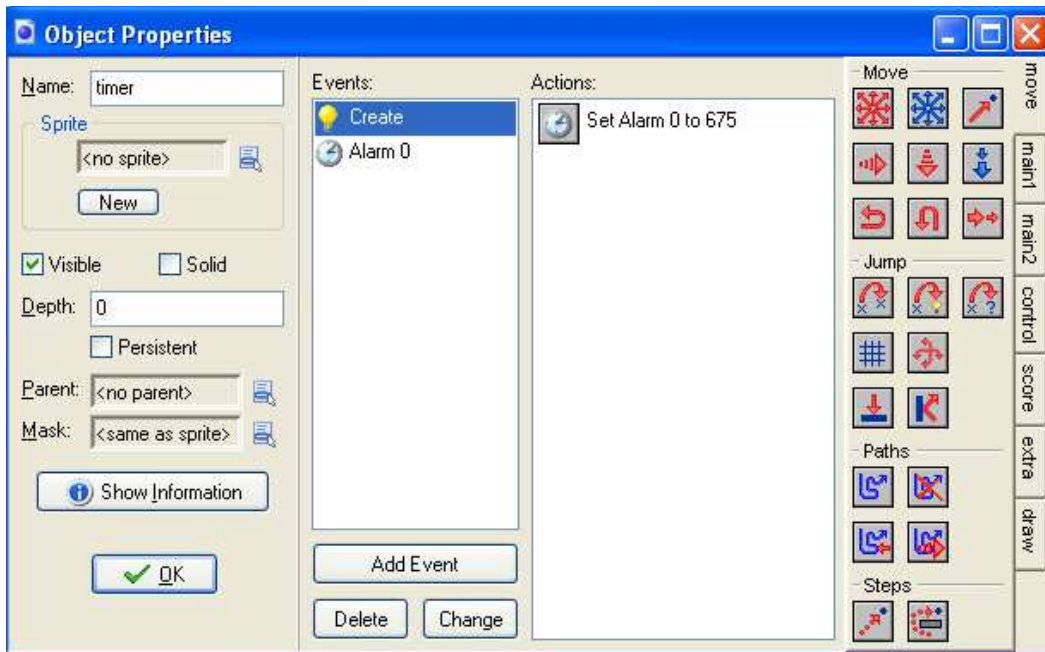
When you are done, close the window and save it. You can make changes at any time.

# Setting a Timer

Sometimes, you want to have an event happen in the game at a certain time. You might want an object to appear or disappear, or you might want to change levels after a particular amount of time has elapsed. Follow the next steps to create a timer.

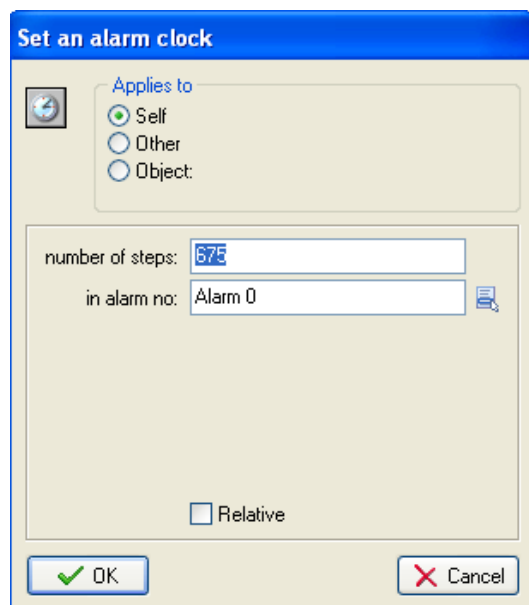
**Remember: these steps are a guideline for creating a timer. You will adapt the directions to work with your game plan.**

1. Create an object called something like “timer.”
2. Since this is just a time keeper, you would not need a sprite. Since there is no sprite, you can leave the object Visible.



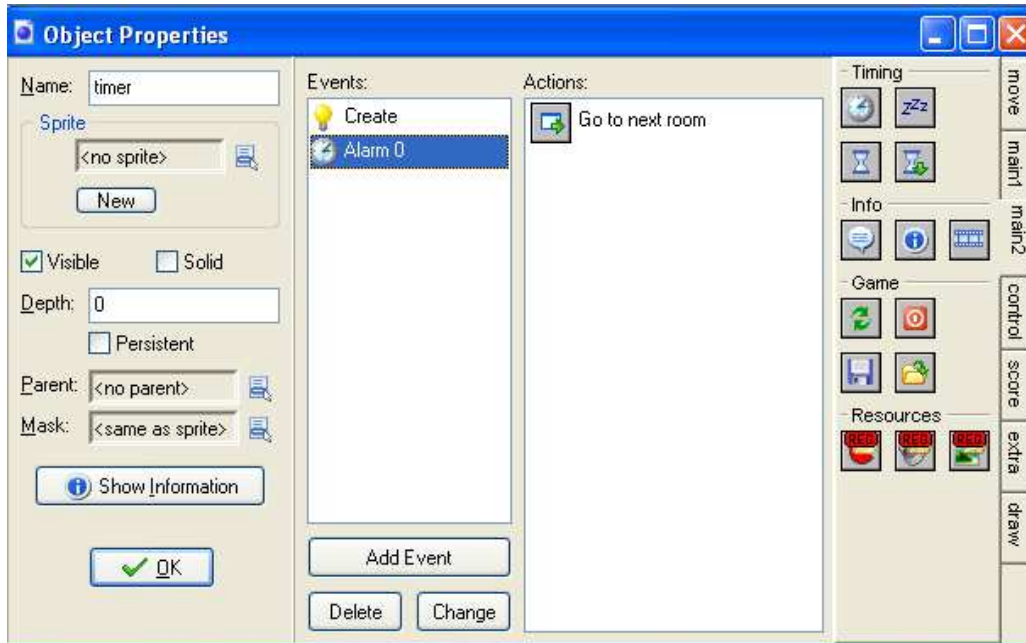
3. Now Add a **Create Event** and assign it an Alarm from the **MAIN2** tab. Set the parameters for the amount of time you want to use (15 steps equals 1 second). Identify the **Alarm Event** to which the timer is applied (You

can set up to 11 alarms).





4. Now you will create an **Alarm Event** to correspond to the Alarm you set in the parameters for the **Create Event**. Assign it whatever action you want to occur when the timer goes off. (This example has the player go to the next room. However, you could make the game end, the room restart, etc.).



5. Finally you must place the Timer in the room. Since you can not see the object, it doesn't matter where you place it as long as it isn't on top of any other object. Run the game to check for any bugs.

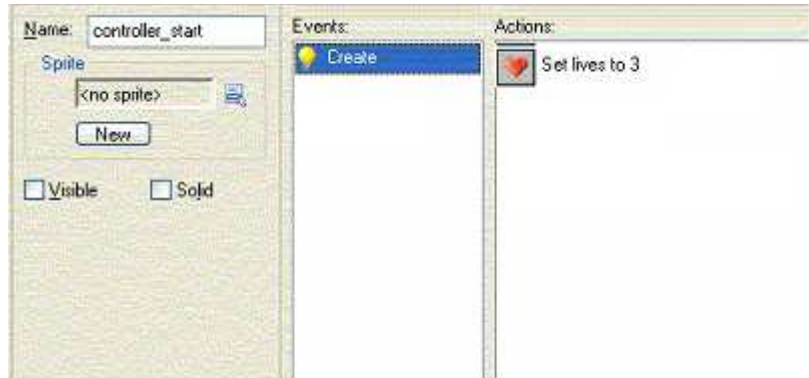
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# Programming Lives

First add an object that will establish the lives at the beginning of the game. The object might do other things as well. It will not be visible in the game or be assigned a sprite.

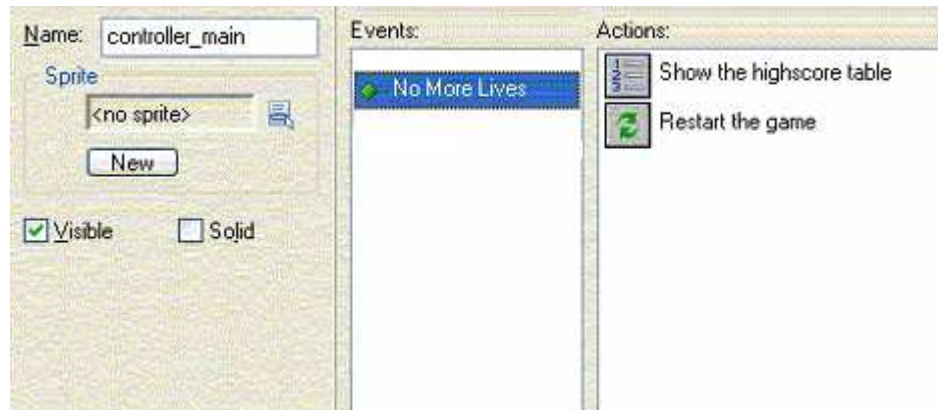
Add a **Create Event** and assign it a “**Set lives to . . .**” **Action**. Assign the number of lives you want to start.

This object will be placed in the first level of the game.



Now you need to add another object that will act when all lives are gone. You can call it anything that indicates its function of controlling lives or whatever else it will control. This object should not be assigned a sprite. If you want to see sprites that show the player how many lives they have, make the object visible.

Add an event **NO MORE LIVES**. Add the actions you want to happen when the lives are gone.



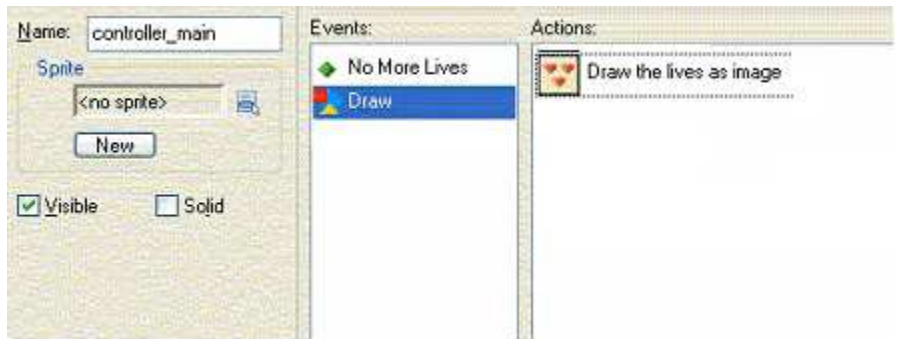
## NEXT

You may want to place an image of the lives in the room so the player will know how many lives have been used.

First, make sure you have an area in the room where the lives can be displayed. This is usually in one of the corners.

Second, make note of the x and y coordinates for that place.

Now you will add a DRAW event to the main controller which will display the lives as an image in the game.



Add the action “Draw Lives As Image” in the DRAW event. The following dialogue box will come up. This is where you add the x and y coordinates and the sprite you want to represent the lives. This object can be placed anywhere in the room.

**NOTE: If the lives do not show up when you run the game, try un-checking Relative.**

The last thing you need to do is to program one of the other objects to take away lives when there is a collision or some other action that would logically take away lives.

Programming **HEALTH** works the same way, except you use the **Health** section of the **Score Tab** and **Draw Health** from the **Draw Tab**.

You can do Lives and Health in the same game.

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# List of Media Websites

I have looked at these websites and at that time, they were up and running. When you use anything from these sites, please read to see how you give credit to the site. Some want a link back, some have a logo they want you use. Please give the appropriate credit since this keeps these kinds of resources “free.” Also, be sure to use virus scan software on your computer. Some websites are known to have spyware, etc. and you do not want your computer to be infected.

## Clip Art and Animations

[picsearch.com](http://picsearch.com) – search engine for images  
[gifs.net](http://gifs.net)  
[fg-a.com](http://fg-a.com)  
[tsgk.captainn.net](http://tsgk.captainn.net) – strips  
[bghq.com](http://bghq.com) – game-type background graphics

## Free Sound Files

[mididb.com](http://mididb.com)  
[partnersinrhyme.com](http://partnersinrhyme.com) – sound effects  
[findsounds.com](http://findsounds.com) – sound effects  
[mobrien.com](http://mobrien.com) (user name –spidermonkey password – canada)  
[lynnemusic.com](http://lynnemusic.com) (mood music not modern)  
(on the home page click the link to MIDI files)

## Other

[grsites.com](http://grsites.com) - lots of stuff (headings, titles, etc.) You must register to use this site. It is a free registration and well worth it if you are doing lots of gaming or web design.  
[gamemaker.wikicomplete.info](http://gamemaker.wikicomplete.info) – excellent source for questions about programming and coding in Game Maker. Very easy to understand



# Standards

Since it is important that all classes taught adhere to certain standards, you will find the Pennsylvania Department of Education Technology and Writing standards reinforced using GameMaker as presented in the game making course.

## The following PDE Technology Standards are addressed during the Game Design course.

### *Inquiry and Design*

#### 3.2.10

##### **Identify and apply the technological design process to solve problems.**

- Examine the problem; rank all necessary information and all questions that must be answered.
- Propose and analyze a solution.
- Implement the solution.
- Evaluate the solution, test, redesign and improve as necessary.

### *Technological Devices*

#### 3.7.10

##### **Utilize computer software to solve specific problems.**

- Identify legal restrictions in the use of software and the output of data.
- Describe and demonstrate how two or more software applications can be used to produce an output.
- Select and apply software designed to meet specific needs.

#### 3.7.7

##### **Apply computer software to solve specific problems.**

- Identify software designed to meet specific needs (e.g., Computer Aided Drafting, design software, tutorial, financial, presentation software).
- Identify and solve basic software problems relevant to specific software applications.
- Identify basic multimedia applications.

## The following PDE Writing Standards are addressed during the Game Design course.

### *Quality of Writing*

#### 1.5.8

##### **Write with a sharp, distinct focus.**

- Identify topic, task and audience.

##### **Write using well-developed content appropriate for the topic.**

- Gather, determine validity and reliability of and organize information.
- Employ the most effective format for purpose and audience.
- Write paragraphs that have details and information specific to the topic and relevant to the focus.

##### **Edit writing using the conventions of language.**

- Spell common, frequently used words correctly.
- Use capital letters correctly.
- Punctuate correctly (periods, exclamation points, question marks, commas, quotation marks, apostrophes, colons, semicolons, parentheses).
- Use complete sentences (simple, compound, complex, declarative, interrogative, exclamatory and imperative).

<http://www.pde.state.pa.us/> - Academic Standards link