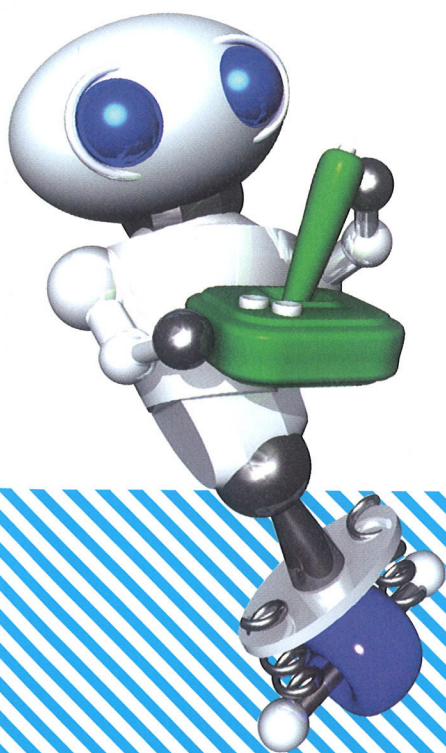


C H A P T E R 1

My Role on the Team

A video game team is made up of many different people with unique skills and abilities that make the entire team stronger. All modern video games are developed by teams of individuals each of whom is a specialist in performing one part of the game build. This chapter explores the individual strengths and weaknesses of video game design team members, the hard skills and soft skills needed for a design team member, and a description of the roles and responsibilities of a design team.



Objectives

After completing this chapter, you will be able to:

Define the roles and responsibilities of team members on a video game design team.

Describe the effects of group dynamics and the importance of team building for a video game design team.

Discuss methods of communication and scheduling for video game design teams.

Explain the relationship between development schedule and budget constraints in video game design.

Use listening, speaking, telecommunication, and nonverbal skills to effectively communicate with supervisors, co-workers, and customers.

Create written communication appropriate for the video game development industry.

Define terminology appropriate for the video game development industry.

Engage in constructive criticism.

Demonstrate personal and interpersonal skills appropriate for the workplace.

Solve problems by collaborating with others.

Identify personal strengths and weaknesses related to learning and work environments.

Describe job requirements for a variety of occupations within the game development industry.



video game is an electronic game that creates an artificial game environment on a video screen, **Figure 1-1**. A **video game designer** is a person involved in creating a video game. The successful video game designer needs to be able to do many different things. Additionally, the designer must interact well with others to get these things done. When you work as a video game designer, you will be part of a team. This requires you

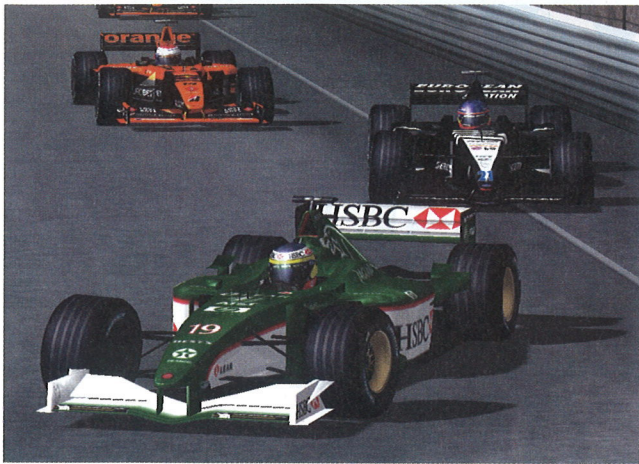


Figure 1-1. A modern video game has detailed graphics and realistic images. Notice how *EA Sports F1 2001* uses shadows for a better visual effect. A complex simulated environment of a racetrack was created for the game. (See copyright statement on page 2.)

to not only have all of the skills needed to actually design the game, but also the skills needed to communicate and get along with your team. In that sense, a game designer is the ultimate "team player."

The video game designer needs a set of physical and mental skills to complete the tasks demanded by their employer and the game being developed. To obtain these skills, you may need to take classes and workshops to properly develop skills for areas in which you are not very strong. Taking classes and workshops to keep technology and employability skills fresh makes the designer a lifelong learner.

There is no end in sight for new technology. As ideas for new technology become reality, a designer will have to acquire a working knowledge of how to use the technology in building game worlds. Be prepared to update your skills

in any technology and especially in game design. Reading technical manuals and trade magazines can help you stay in touch with new technologies.

Qualities of a Game Designer and Team



CHEAT CODE: *VIRTUAL WORLD*

A virtual world is the imaginary world created by computers. This imaginary place allows for both realistic and unrealistic events and characters. The designer determines how realistic the virtual world is that they create.

Working in the **virtual world** of game design almost gives you the idea the perfect designer could be built. If it were possible to assemble all of the attributes of imagination, technology skills, mathematics, linguistics, artistry, knowledge, and communication into a single person, perhaps designers would not need to work in teams. But, the essential **dynamic** of a team is how the strengths and weaknesses of each member work together to create a better product. This dynamic makes a team better than a single, superhuman designer.

Each team member excels at certain things, but is not as good doing other things, **Figure 1-2**. For example, one team member may be very artistic, but lacks an understanding of programming. On the other hand, another team member may be a topnotch programmer, but is weaker in the artistic area. If a team is to meet the objective, other members of the team will have to help in the areas where one individual may not have fully developed skills. In doing so, team members



Figure 1-2. People on design teams may look very different from you, but they are all needed to get the job done.



Figure 1-3. Just like an athlete, you need to know what you are capable of doing well. Determining your strengths and weaknesses will prepare you for working well on a team. When you find you cannot do something, get help or, if needed, training. This will make you more valuable in the future. (Comstock)



THINK ABOUT IT ACTIVITY 1.1

Think about a time when you were on a team and you felt you were best to lead a certain task. While being respectful of others on your team, how could you have communicated that you had the strengths needed to do the job?



CHEAT CODE: **HARD SKILLS**

Many hard skills you will learn in high school or college. Skills in areas such as math, reading, writing, computer programming, art or graphics design, keyboarding, etc., require training and practice to become an expert. Design teams expect you to have a portfolio to display these hard skills to show during your interview.

must be respectful of everybody on the team. **Constructive criticism** can help move a project forward by providing positive reinforcement and offering possible improvements or solutions. Negative criticism leads to bad feelings and does not help the person or team.

Teams are designed with the strengths and weaknesses of people in mind, **Figure 1-3**. Someone who is great at creating artistic backgrounds may not be very good at building logic statements. Would this person need to be on the team? Of course, because the team needs a great artist. To overcome the weakness in writing logic statements, the team just needs to find someone with great logic skills. Together, the team is a better group because each team member is allowed to excel in their best area. You are not going to be the best at every aspect of design. The trick is to balance the design team to build up strengths to overcome some weaknesses.

Once you have your team built, you will need some means of effective communication to keep it working properly and to avoid conflict. Good communication skills will help keep the team on track and focused on the goal: the creation of a quality game. The next sections discuss some attributes of an individual game designer. If you take a broader look at these skills, they are also the attributes of an effective design team.

Hard Skills

Hard skills are the technical requirements for a job. Most hard skills can be obtained through training and research. On the opposite side are soft skills. Soft skills are social graces, attitudes, and behaviors employer want. These are discussed later in this chapter. Together hard skills and soft skills make up the character of the employee.

CASE STUDY: SONIC HEROES AND TEAMWORK

Released in 2003 and 2004, *Sonic Heroes* introduced a new gameplay format that focused on teamwork. Instead of the standard mentality of a one-person army, this game focused on using a team with each member having unique strengths and weaknesses. Regardless if you chose team Sonic, Dark, Rose or Chaotix, your team consisted of character with strength in either speed, flight, or power.



Sonic Heroes requires teamwork to complete the set goal.

If you look at team Sonic and examine the strengths of the team members, you find Sonic has speed, Tails has flight, and Knuckles has power. During gameplay, the player must switch the lead character on the team to overcome certain obstacles and allow the rest of the team to follow. By forcing the player to determine which team member is best suited for each task, gameplay is enhanced. The player must use the strengths of all team members to achieve the goal of defeating Doctor Eggman.



The player must use the strengths of each team member to achieve the goal of defeating Doctor Eggman.

(Continued)

Imagination

Imagination is the act of creating a picture in your mind of something that does not exist or is not where you can see, hear, smell, or touch it. A game designer must be able to use imagination to create original settings, characters, and stories for the **game world**. To create this game world, you must first imagine the parts of the game.



CHEAT CODE: **GAME WORLD**

The game world is the setting in which gameplay takes place. In many cases, this is an imaginary place with make-believe rules where unique and original characters interact. In other cases, the game world may be based on a real place where actual laws of physics apply. A baseball

game would be set in a stadium, but another game may seek to realistically recreate a World War II battlefield.

Technology Competence

Technology competence, as related to video game design, is the ability to understand and use the newest computer/game platforms and programming/scripting languages. This skill is essential for video game design. Having a good level of competence in various technologies

(Continued)

When working on a design team or a cooperative team in your class, you will have to use the strengths of your team members to overcome obstacles. Each team member will have to take the lead in their area of strength. In this way, your differences are your strengths. Mixing your team with members who have different abilities and letting them each lead when their strengths are best suited for the situation will help everyone achieve the common goal of finishing the game.



A team should have a good mix of skills and abilities.

**CHEAT CODE: RPG**

A role-playing game, known simply as an RPG, is an action game in which the player takes on the role of a hero. The central premise of an RPG is for the player to gain strength and experience through quests, battles, and challenges.

**CHEAT CODE: GAME ENGINE**

A game engine is a computer software program that simplifies the design process converting the game engine simple commands into complex computer code.

allows the designer to understand what can and cannot be done.

For example, a designer might envision a game world for an **RPG** where the game player speaks into a microphone to communicate with the characters in the game or a game where the player must identify smell. These are great ideas and awesome immersion strategies, but they are not realistic goals based on current technology.

Immersion strategies are ideas that will connect the player to the action in the imaginary game world. Realistic graphics, storyline, plot, interesting characters, and player actions are all great immersion strategies used by designers with today's technology.

The designer may not need to have the technical skills to develop new technologies, but must understand the limits of current technology, **Figure 1-4**. Having said this, a designer must also attempt to push technology to the limits and beyond. Without attempts to do more than has been done before, we would all still be playing tic-tac-toe on scratch paper.

Analytical/Logical Competence

It takes a good grasp of basic logic to convert an idea into a program line in a **game engine**. More than just scripting, a video game designer must be able to analyze what strengths and weaknesses will work on each character or character class. Creating a logical structure of initial strength and a means of gaining strength and skill will help build a better game structure.

A video game designer needs to analyze how the player will navigate obstacles. The designer also needs to establish structures so the player will have the power or skill to defeat stronger obstacles or challenges as the game progresses.

- When will the player "level up?"
- What is the reward for the completion of a task?
- What tools or weapons will be needed for the quest?

These types of questions help the designer analyze the game and logically construct a functioning game, **Figure 1-5**.



Figure 1-4. Keeping up to date on the newest technology, like the virtual reality data suit shown here, is critical to designing the newest forms of video game entertainment. (See copyright statement on page 2.)

Mathematics/Science Competence

If you do not have good math skills, you are well behind the competition when it comes to applicants looking for the best jobs in video game design. Designers need to have both basic math and higher-level math skills including **geometry** and **trigonometry**, which are fields of math dealing with shapes, angles, and curves. Skill in **probability**, which is math dealing with random numbers and possible outcomes, is also a necessity.

A working knowledge of physics and the mathematical formulas needed to simulate the real world is often a requirement. **Physics** is the science of matter and energy: how things like gravity or the path of an object in motion work in the real world. In the game world, characters and objects interact with their surroundings. A video game designer can use physics to help determine how this interaction occurs.

In addition to math and science skills, employers expect video game designers to have a basic understanding and working knowledge of mathematical computer applications, such as spreadsheets. **Spreadsheets** show data in tables or charts. They are useful tools for creating project budgets. Working with budgets and keeping

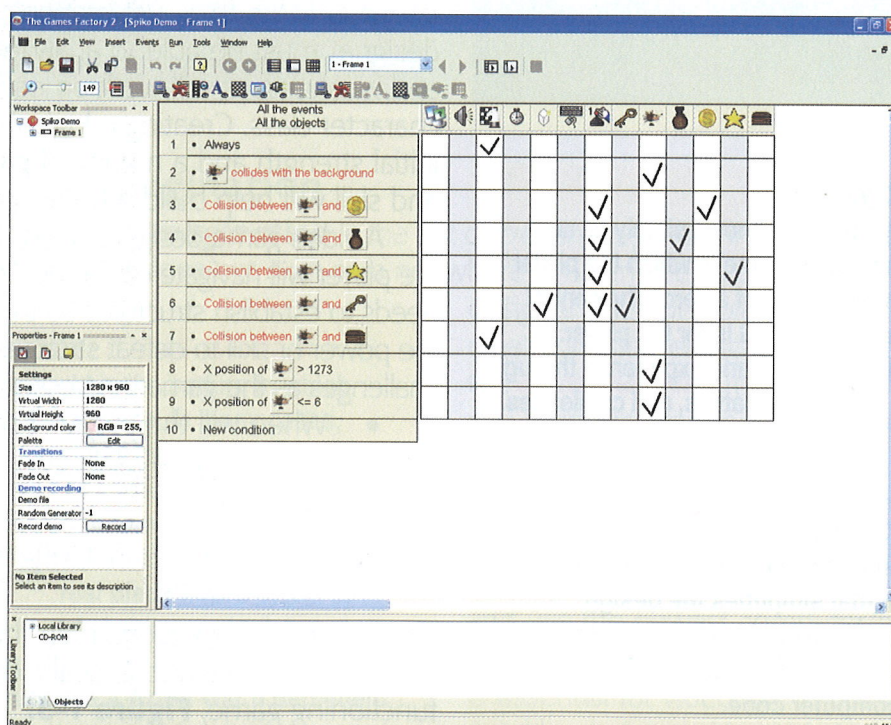


Figure 1-5. This point-and-click interface of The Games Factory 2 builds the underlying code that will eventually run the game.

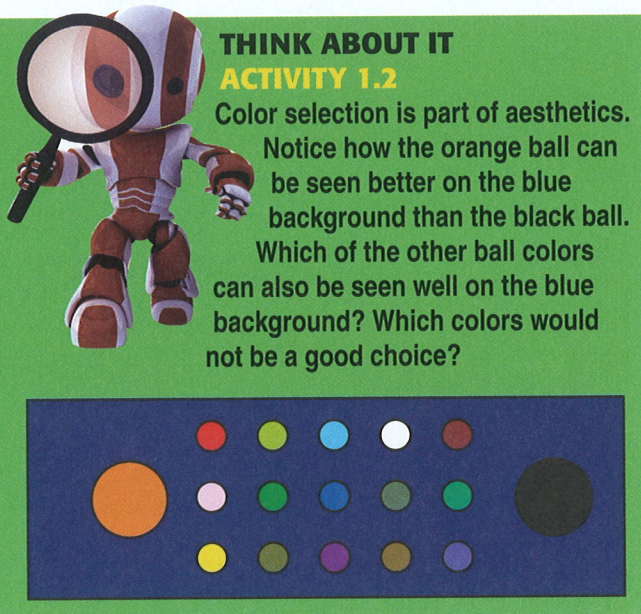
budget records are also very important in design. Costs and expenses need to be recovered through selling the game. When more time is spent on a project than planned for, the cost of the project goes up. Going **over budget**, or spending more money than has been allocated for the project, is very bad management.

Aesthetic Competence

Aesthetic competence is the ability to determine what is pleasing to the eye. While it is not required that all video game designers be expert

artists, some artistic skills are needed. To produce character sketches, backgrounds, and game objects that are both visually appealing and properly scaled, a designer must know some basic art skills, **Figure 1-6**. Size and scale, proportions, colors, appropriate sounds, and sound levels are all part of the aesthetic tools that the video game designer must evaluate during production.

A simple example of aesthetic competence might be to know what color of ball shows up best on a dark blue background. Imagine if your choices are a black ball or an orange ball. The orange ball is a contrasting color to blue and would show up better. The black ball might not be seen on a dark blue background.



THINK ABOUT IT
ACTIVITY 1.2
Color selection is part of aesthetics. Notice how the orange ball can be seen better on the blue background than the black ball. Which of the other ball colors can also be seen well on the blue background? Which colors would not be a good choice?

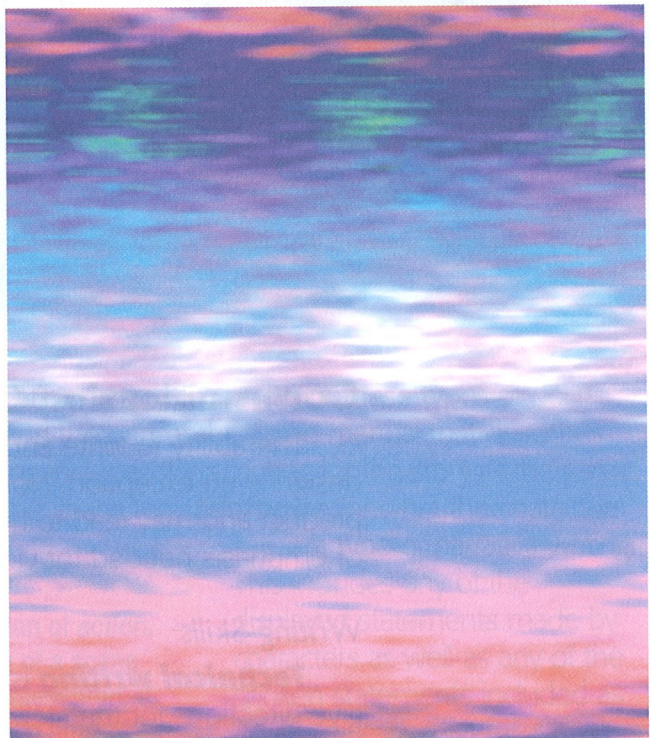
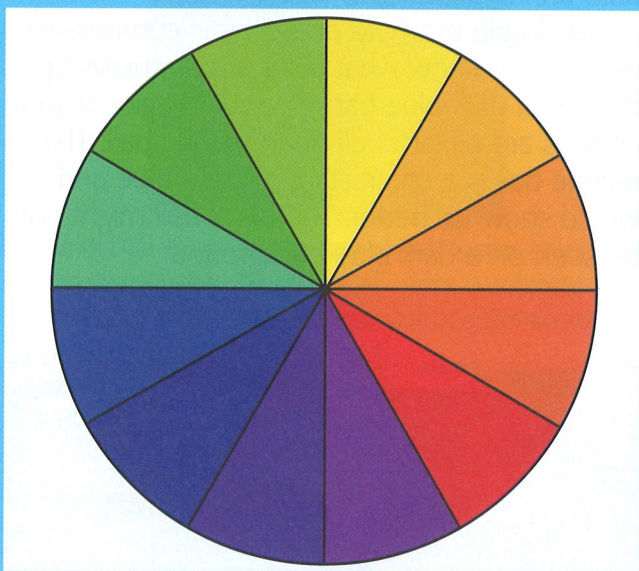


Figure 1-6. Some artistic skill is needed to work in the video game industry. Graphic artists must have a high level of artistic skill. Both of these images are similar, other than the colors used. Which one would work best for a background image to show a setting sun reflecting on water? What if the game is a science fiction game?

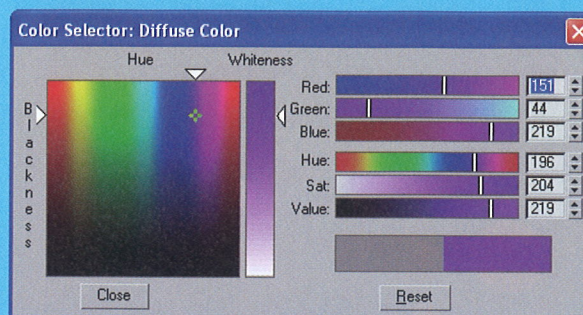
CASE STUDY: THE COLOR WHEEL

The three primary colors are red, blue, and yellow. These three colors are mixed to create all other colors. A device called a color wheel is used to select colors that work well together. The three secondary colors are green, orange, and purple. These colors are made by mixing the two adjoining primary colors, such as yellow and red to make orange. The tertiary color wheel shown here contains the three primary colors, three secondary colors, and six tertiary colors. An infinite number of mixes means millions of different color combinations can be created.



A tertiary color wheel shows the primary, secondary, and tertiary colors.

Printers use a slight variation of the three primary colors. They use cyan, magenta, and yellow, along with a key color (CMYK), to blend all colors. Video equipment, such as computer displays and televisions, uses another variation of the three primary colors. This equipment uses red, green, and blue (RGB) color values to make all colors. RGB mixing can produce 16,581,375 color combinations at 24-bit color depth. Notice the color wheel from the software 3ds max shown here.



Computer display uses a variation of the three primary colors, known as RGB.

Two basic principles of color are used to create a pleasing image. These principles involve the position of colors on the color wheel. Matching, or analogous, colors are next to each other. Opposing, or complementary, colors are across from each other.

(Continued)

Communication Competence

The ability to write and speak well is important for any job. Video game design is no exception. Not communicating effectively will result in a poor product and may lead to hurt feelings. The next sections describe the areas of emphasis needed for video game designers to properly communicate.

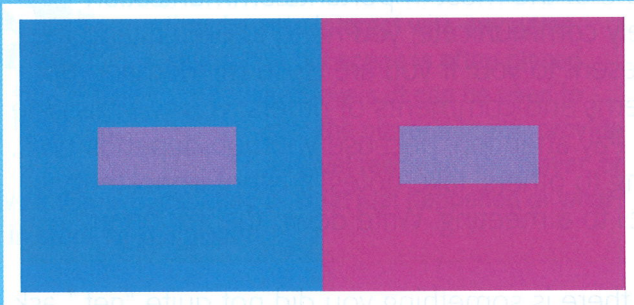
Writing Skills

Technical writing is creating documents in a precise manner that give directions for the steps and processes needed in design. The instruction manual for a video game is an example of technical writing, as are letters and memos. The ability to create these types of documents is an essential skill for the video game designer.

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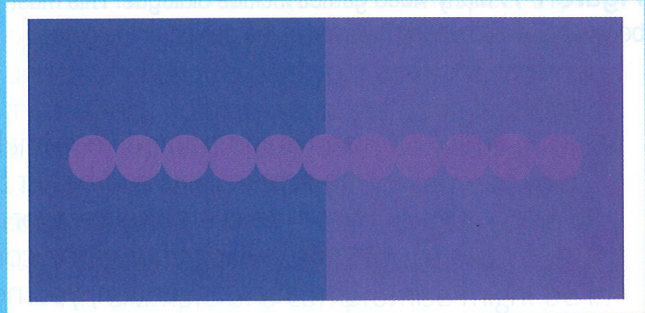
A character or object should be created with matching colors to create maximum harmony for that design. Use of matching colors helps the entire object appear unified and not a mixture of many pieces. Contrast indicates how well one color looks against another. To create maximum contrast, use complementary colors directly opposite of each other on a color wheel. Contrasting colors need not be exactly opposite. But, the closer they are to opposite, the higher the contrast.

Look at the blue and purple boxes shown here. The color in the small boxes is the same. Notice how the small box is easier to see in the large purple box. In this example, the blue box is a dominant color due to the large size when compared to the small box. Your eyes tend to focus on the contrasting color elements of the subordinate color in the small box.



Notice how color choice has a dramatic impact on how you see the small rectangle.

Now, look at the blue and purple boxes with light-colored circles. All balls are the same size and color. The ball to the far left is the most obvious and easiest to see. The ball to the far right is the least obvious and hardest to see. Notice how the ball on the far right almost disappears as it gets farther away from the darker blue background.



The ball on the far left is easiest to see, while the ball on the far right is hardest to see.

Narrative writing is creating a story. Examples of these types of documents include **storyboards** and the part of the game manual that describes the game world. Narrative writing includes the scripting for the story of the game and any of the statements by the characters. **Dialogue**, or what the characters

say, is a type of narrative writing. This includes any of the displayed statements made by characters as well as any of the spoken statements included as audio voice-overs, **Figure 1-7**. Think of this writing style as similar to the writing of a play.

**CHEAT CODE: STORYBOARD**

A storyboard is a graphical plan of action. It includes a simple drawing of a scene and a quick detail about the action. A storyboard is like a cartoon strip of what you are going to create.



Figure 1-7. Many video games include dialogue. This must be written by somebody involved in the design of the game.

Presentation Skills

Public speaking skills are a must for game designers. You will have to pitch your ideas to your team, management, and investors. You must be comfortable with speaking in front of others. You need to know how to get your point across in a brief summary format that gains interest in your ideas and excitement for the product.

Selling is *everybody's* job. Without sales, there is no money to pay anyone. That does not mean you will be expected to stand on the corner exchanging games for cash. It does mean that you will be asked to present your ideas

and stand behind your final product. If you designed it and it is your vision on screen, you had better be able to talk about it and convince others that your ideas are the best for this project. Whether it is selling your ideas to your team, selling your game concept to management, or a more formal presentation at a convention, you need good speaking and presentation skills.

Listening Skills

Listening skills are some of the most important communication skills. Before you can effectively communicate, you need to understand the points and opinions others present to you. If you are close minded and do not actively listen to the concerns and comments of others, you will miss the point and do things all wrong. Pay attention, because your job depends on it.

- When you are listening to others, take notes. It is not impolite to bring a pad and pencil to a meeting. Write down the important points.
- Ask questions. When there is something you did not quite "get," ask someone to clarify the point. Do not be afraid to get clarification.
- Listen carefully because if you do not do the job correctly, you will have to do it again or look for a new job.
- When you speak with someone, try to summarize their points when speaking with them. This **active listening skill** is very important to your understanding of the discussion and also allows the other person to know that you "get" what they are trying to say.

An example of active listening may be a statement like:

"Let me see if I understand you correctly; you want the character to be able to fly many different airships and have the ability to jump from one to the other when they get close."

This statement may have summarized a 10 minute presentation into a few sentences for clarification.



Figure 1-8. This design team is working on a problem. Teamwork is important in all businesses and this is true of video game design as well.

Compromise

Learning and accepting that you will likely never get exactly what you want is critical to success in designing a video game. Your vision of a video game may need many items changed, modified, or even deleted. Sometimes it is just too difficult to complete, too expensive to implement, will take too long to complete, or outside of the team's vision. You **will** work on a team in the video game design field.

You need to understand and respect the opinions of others, just as they must be willing to understand and respect your opinions. Without this respect, nothing would get done because of all of the arguing. You need to be willing to allow certain changes in exchange for some of your

ideas. This solution is called a **compromise**, where everybody gets some of what they want, but not necessarily all of what they want, **Figure 1-8.**

An example of a compromise might be in your character. You want a tall character, but the background designers want a short background frame to save on computer memory. You might both compromise to include some changes to your character so it will fit the background and the game plays correctly. In exchange, you might get to include a **cinematic cut scene** with your character in full detail. Look for a decision where both parties win. This is called a **win-win solution**.



CHEAT CODE: **CINEMATIC CUT SCENE**

A cinematic cut scene is a movie-like segment of a game that does not require the player to interact with any game element. A cut scene is often placed between levels. It can be used to give the player a break, provide a visual reward to the player, or

give a visual summation of what just happened or what is in store for the player.



THINK ABOUT IT ACTIVITY 1.3

Think about a time when you had a disagreement with your parents, a teacher, or a friend. Could you have made a compromise to get a win-win situation? Describe how you could have compromised.

Background Information and Research

Essential to game designers is the ability to conduct **research**. Finding out what is current in publishing, gaming, art, technology, etc., is one of the most important elements to a current and successful game. This does not mean that you just use the Internet. Research might mean going to stores, surveying game players, going to trade shows, creating an inter-

active blog, and networking with other game designers and computer engineers to find out what might be in development for three to five years from now. Getting information on what others are doing will give you an edge to getting involved in more projects and more high-end game builds.

Some of these research skills play an important role in marketing and finding a target audience. Although, you may need to use these skills in other ways. If you are designing a video game with ninja characters, maybe you

will have to research the history, geography, and culture of Japan at that time. Using symbols and artifacts that have meaning to that time period or culture will help bring a realistic feel to the game. Additionally, if you design a space-based game, you may need to find out information on the planets, gravity, and momentum to program events to work in space. For example, you might do some research on new discoveries in space and use names of real planets, stars, and galaxies in your game, **Figure 1-9**. With a little research you could find out if there is a real planet where scientists think life might be found. Using some imagination, you could create a concept based on that information.

You need to be able to continue to learn and research needed information to stay on top as a game designer. New ideas are needed. Your job will be to find out what they are and how they work.

Soft Skills/Workplace Skills

Just as important as the technical skills and competencies discussed above (hard skills) are the soft skills needed to be a good employee. **Soft skills** are personal qualities and behaviors that help create better personal and interpersonal skills. Each of these skills is more of a character trait or habit than a learned skill. If you were building a virtual employee, you would want to give them lots of "strength points" in the following areas.

- **Responsibility** is the ability to bring an assigned task to a successful conclusion.
- **Dependability** is the ability to be relied upon and trusted.
- **Punctuality** is being on time and prepared.
- **Positive attitude** is an outlook on a situation that emphasizes an upbeat outcome.
- **Initiative** is forward thinking and taking on additional responsibilities without having to wait for someone to tell you to do it.



Figure 1-9. A researcher might take a quick trip to the NASA website and find inspiration like this artistic rendering of Epsilon Eridani images taken from the Spitzer space telescope. Three-dimensional models, textures, and many other game development tools are available at no charge from NASA for game and simulation designers. (NASA)

- **Respect for self** is a belief that you are important and treating yourself as important.
- **Respect for others** is a belief that the opinions and beliefs of others are important.
- **Professional dress** is clothing appropriate for the workplace or event.

Some of the most important skills needed to be successful on a team are not those found in a textbook or college course. They are the simple, everyday soft skills needed to treat people with respect and effectively communicate. Regardless of your strengths in hard skills, if you cannot work on a team, you will not be working in this field for very long. The games are too complex for a single person to complete in their lifetime. Now is the time to practice getting along with people and gain strength in soft skills.

Video game design studios are often fun and exciting places to work with benefits hard to find in other employment opportunities. Included in the soft skill set was the professional dress. While it is commonplace for a design studio to allow tee shirts and flip-flops to help the employees feel comfortable and relaxed, it is important to remember there are times when a more professional dress is required. The professional dress requirement may change with your responsibilities. When at the studio, casual dress may be the norm. However, at a client meeting or convention presentation, more formal attire will be required.

As with most of the attributes of a game designer, there is a range between a **strength** and a **weakness**. Each job title has a specific requirement for just how strong an employee must be in that area. Those who aspire to become a creative director or other high-ranking manager will need high strength in all of the soft skill areas as well as high strength in their specific area of expertise (hard skill). The next section takes a look at some of the jobs available on a design team and what skills are most important for each.

I Am a Team Player

A video game design team is essential to designing today's large games. The video game design industry is not standardized or held to the structure of the job titles listed in this book. However, this section attempts to give some structure to the roles needed for video game development.

Most video game design companies assign jobs and responsibilities based on experience, skill, and the needs of a game design project. Teams might be very flexible. A skilled employee might function as a specialist on several teams at the same time due to the limited availability of that person's special skill set. A **specialist** is someone with strong attributes in a certain area. These attributes are often unique strengths that required special training to achieve. As discussed in the previous section, teams function best when strengths and weaknesses are balanced. This balancing is the main driving force for role assignment. Individuals with the greatest number of strengths will typically have more opportunities to work on and lead more teams.

By dividing the responsibilities that come with a large video game project, the project becomes more manageable and easier to build. A large team may have one or more of each of the team members discussed in this section.

A common misconception about the game design team is that all people have equal say in the design process. This is not true. Game design is *not* a democracy with everyone voting on what might be the best option, **Figure 1-10**. Everyone has a supervisor and that supervisor has the final word on any element of the game. This results in a team *hierarchy*. This is similar to how your school works. You have teachers to report to and ask questions of. The teacher is like your supervisor. A problem you report to your teacher (supervisor) will be taken to the next administrator for a decision if needed. Otherwise, all the students would ask the principal every question. If you want to see changes, you



CHEAT CODE: **HIERARCHY**

Design companies are organized in a hierarchy to streamline decision-making. Just like in the military, job titles show the rank of the employee. In the army, you might hold rank as a private or a general. On the design team you might hold job title as a level designer or a lead designer.

Each person reports to a boss with higher authority.

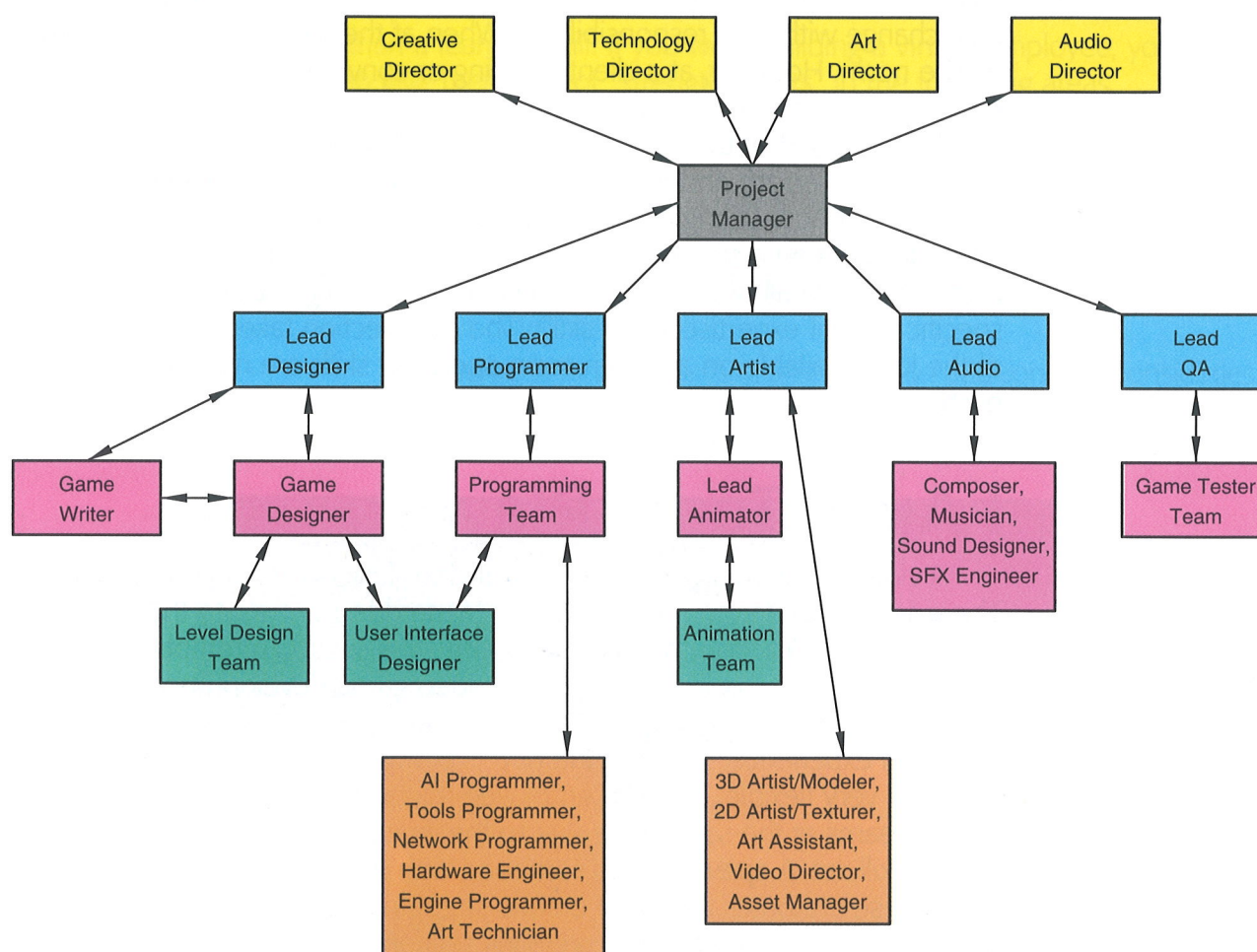


Figure 1-10. This is an example of a responsibility hierarchy used in video game design. This chart represents a simplified version of communication between departments for video game development. This hierarchy will vary from company to company.



Figure 1-11. Shown here is a rugby scrum. Notice how all of the players interlock to form a single working group. (See copyright statement on page 2.)



CHEAT CODE: PRODUCER

The publisher is responsible for the marketing and selling of a video game. The internal publisher (IP) works with the design team to include features that will make the game sell. The IP sets the design timeline and makes sure the design team keeps true to the

original concept of the game. The outside publisher (OP) is in charge of making the game discs and all packaging. The OP also sets up promotions and advertising to get people to buy the game after it is ready to sell.

have to convince your superiors that your idea is a better way. Work on communication and compromise to get that done.

Of course, the team has a say in the building of the game. Many game studios use **scrum methodology**. Scrum is a rugby term used to describe how the team lines up to get the ball. They interlock to form one big wall of players acting as a single unit, **Figure 1-11**. In video game design, this scrum is composed of all members of an interdisciplinary team. An **interdisciplinary team** is one composed of members with different skills—designers, programmers, artist, sound designers, quality assurance—assigned to a single project. These teammates work together and share ideas to get the final product completed. They ask for help from the project leads, specialists, creative director, and **internal producer (IP)** when needed. The management of the team falls to the project lead. The IP is assigned a game to oversee. The job of the IP is to make sure the project is on time and meets the needs of the **outside producer (OP)**. All of these people work together with a single goal of completing the game.

Creative Director

In a large project, a **creative director** will be assigned to set the vision and direction the team will take in completing the game. This person may be responsible for selecting the personnel and assigning job roles for each person or team used to build a game. Additionally, most communication between the company management and the design team will be done through the creative director.

Most marketing functions to promote the game and present the progress of the game development will be performed by the creative director. The creative director also communicates with the other director-level managers within the company to monitor progress and set the creative vision of the projects. In most companies, a creative director will oversee many game projects at the same time.



CHEAT CODE: GAME BUILD

More than just game design, a game build incorporates design, programming, art, sound, testing, marketing, prototyping, and more. A game build includes all of the effort needed to construct a game from concept to finished product.

Project Manager

The **project manager** is responsible for coordinating all of the lead managers and ensuring that all project components are on task and well managed. This role may be a stand-alone position on a large **game build**, but is

more typically assigned to the lead designer or other leader in smaller game builds. A project manager will only manage a single project at a time.

One of the most important roles of the project manager is the setting of the production schedule and tracking that all jobs are completed on time and on budget. A useful tool in the management of any project is a Gantt chart. A **Gantt chart** helps display the tasks needed by each department along a timeline for completion, **Figure 1-12**. Many software products are available to help project managers track their progress using a Gantt chart.

Lead Designer

A **lead designer** reports to the creative director and acts as the day-to-day leader of the team. This person is responsible for the overall function of the design team, project completion, budgeting, final build decisions, and coherent flow from level to level. This includes following the vision of the game and making sure the game world, characters, objects, animations, etc., fit the vision and story. The lead designer is responsible for making the game concept come to life in a playable game. Often, the lead designer is very experienced and has special skills in leadership, game design, and artistic design.

Game Designer

The **game designer** reports directly to the lead designer and lead programmer. This person is responsible for establishing the rules of the game, finalizing the design documents, and ensuring the game will be

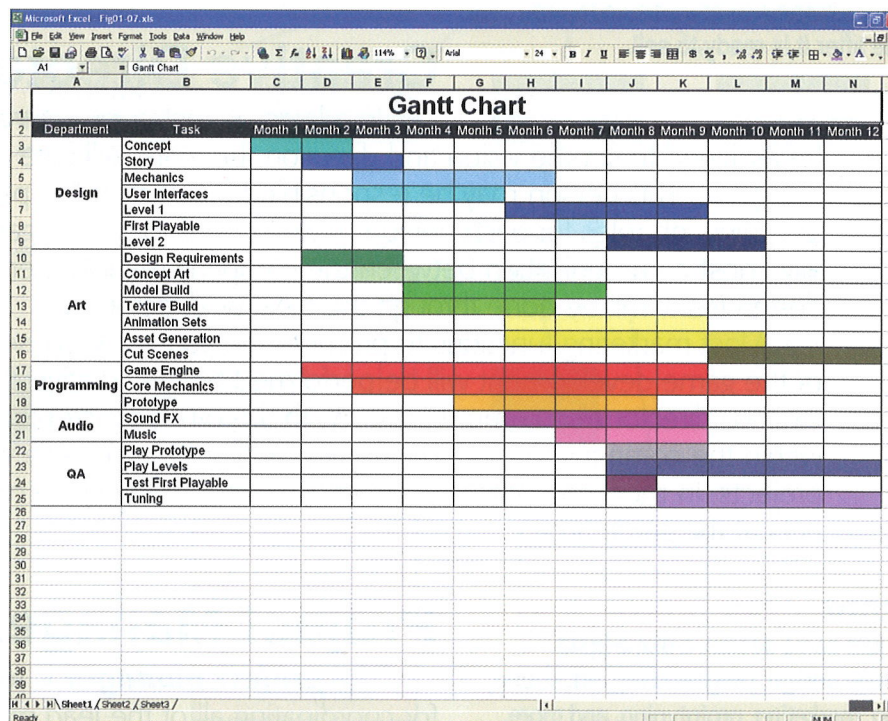


Figure 1-12. This is a sample Gantt chart displaying some common tasks of a video game design team. The colored bars are used to represent when tasks are to begin and end to meet the deadline of production. Equally important is the view in each column that shows which tasks will be occurring at the same time.

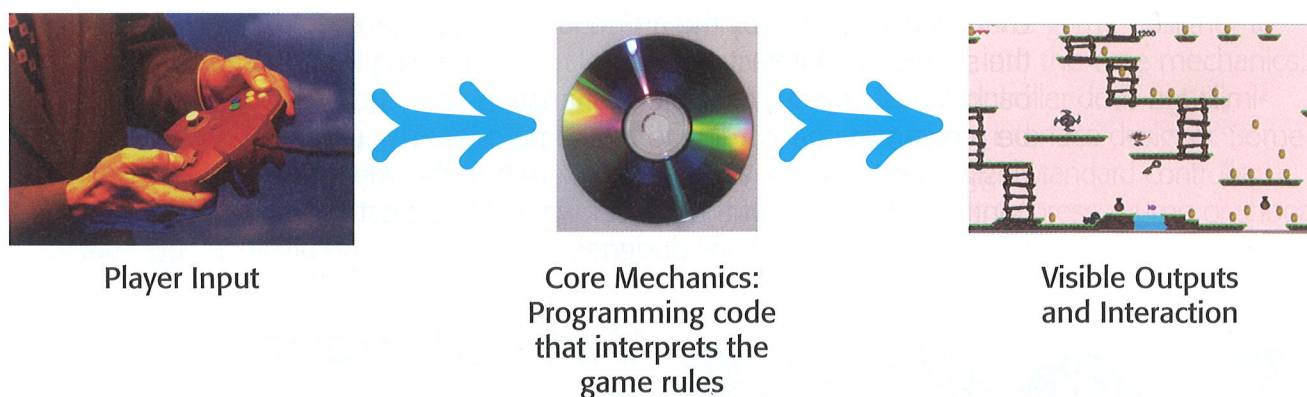


Figure 1-13. The core mechanics of a video game determine the visible output and interactions based on the player input.

assembled and working as imagined. In other words, this job is the one that makes sure the game works according to the vision. This vision will include the overall view of the complete game world and how the player will progress from one level to another to tell the story of the game.

The game designer has the skills to perform most of the duties needed in the game build. Most important to this position is the ability to program the core mechanics of the game. The **core mechanics** are the programming rules that determine how the game works, **Figure 1-13**.



CHEAT CODE: PHYSICS ENGINE

Sometimes the programming of the core mechanics might include creating a physics engine. The physics engine uses mathematical formulas to create rules for movements, like gravity, speed, flight, the traveling path of a projectile, bouncing, explosions, and other game movements.

explosions, and other game movements.

The core mechanics establishes the game rules or **physics engine**, such as the characters can walk on grass and will sink on water or open spaces. Another rule might be that a player can pass through a cloud, but cannot pass through a tree, door, or wall. Each of these rules needs to be programmed into the game. Without good rules in the core mechanics, players think a game has a **glitch**, which is a programming error.

Level Designer

As you may have guessed, a **level designer** is responsible for creating the game world and game functions for a single level. In a multilevel game, it would be reasonable to have several level designers who report to the game designer. Each level designer is responsible for implementing the

designs from the **design documents** into working game levels. This job also requires great communication skills as the ability to construct a level will take input from the user interface designers, game writers, art designers, and audio engineers.

The level designer brings all of the parts, objects, backgrounds, characters, and actions together. Using the rules of the core mechanics, each part on the level must be programmed to perform properly. A level designer will take the



CHEAT CODE: DESIGN DOCUMENTS

To make sure the game is built correctly and that everyone is working toward the same goal, design documents are needed to record all decisions. Designers and managers can look at these documents to see the final decisions on concept,

character, game world, art, programming, and platform.

characters designed by the art department and program how they move on the screen and interact with the player. Everything from the game level map, background objects, characters, animation sequences, and displays must be programmed according to the game rules. The ultimate goal of a level designer is to design and program a part of the game so the player can input control to the game without incurring a glitch. Most of the hands-on programming is done by the level designer.

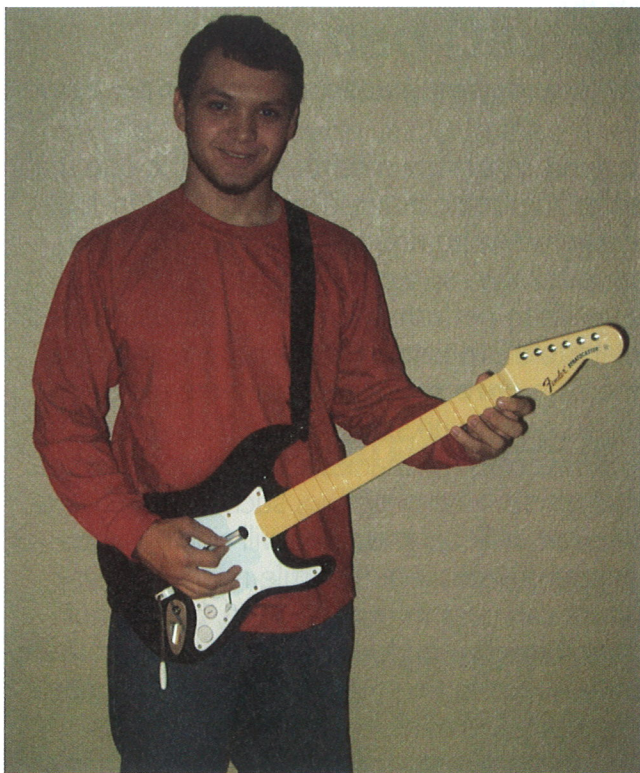


Figure 1-14. The games *Guitar Hero* and *Rock Band* use game-specific controllers. Here, a guitar controller is being used.



CHEAT CODE: *ERGONOMICS*

A formal definition of ergonomics is the study of how the body works and how humans interact with tools and environments. Game designers simplify this definition to mean how comfortable players are while performing tasks without injury. In gaming, ergonomics

typically focuses on how the controller is designed and how the player can use the controller without much training. If a controller is complex, hard to understand, or uncomfortable to use, players will quit playing. This would be a failure of the user interface designer and an unsuccessful game.

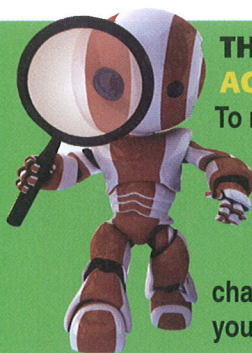
User Interface Designer

A **user interface (UI)** is basically the controls that the player uses to move and interact with the game. Thus, the **user interface designer** is responsible for creating these controls. In the early days of video game design, there was really little need for this specialist position. Most games used a standard controller or joystick. But in today's huge games with multiplayer and online gameplay, the job of making all the players function properly and connect to the game world is a full-time job.

Added recently to this role is the use of game-specific controllers, **Figure 1-14**. Designing a guitar for *Guitar Hero* and instruments for *Rock Band* that function and properly input information for each player is a major component of the game. Additionally, motion-based controllers like those on the Nintendo Wii system can take teams of user interface designers to get these games to function as imagined.

The major role of the user interface designer is to help the player connect to and become immersed in the game world. This job is even more important as the ultimate goal of any game is to increase **immersion**, which is the feeling of being part of the game world. Realistic UI designs that bring the player closer to being in a true virtual reality game world means the user interface designer must be able to use the most advanced technology to make the game interaction as realistic and **ergonomic** as possible.

The user interface designer works closely with both the creative director and lead director when designing a new user interface control. Later in the design process, this person will

**THINK ABOUT IT
ACTIVITY 1.4**

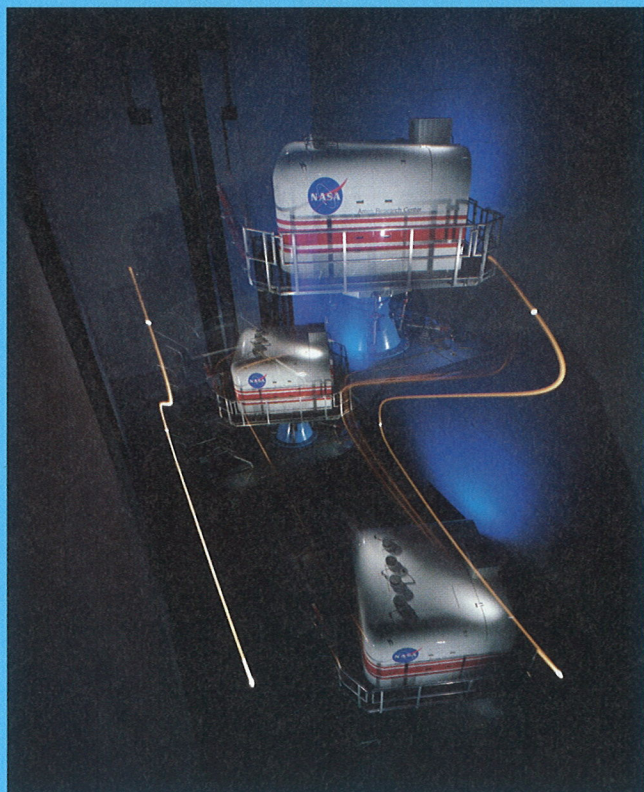
To make the game experience as realistic as possible, user interface designers are making more-realistic controls. Think about your favorite game. What changes to the user interface would you make?

work more closely with the game designer to program the controller into the core mechanics.

Using a standard controller does not eliminate the need for a user interface designer. Some typical UI problems using a standard controller might include being able to press a jump or shoot button while moving. Having to press too many buttons at the same time or buttons that are far apart will make the game too hard to play, destroy the immersion, and frustrate the player.

**CASE STUDY:
NASA FLIGHT SIMULATORS**

Flight simulators are popular video games. The controls simulate a complete reality. The game even gives the sensation of movement, of rising and falling, based on user input and the surrounding virtual environment. One of the most advanced flight simulators is the Vertical Motion Flight Simulator at NASA.



The cabin is mounted on a hydraulic platform. The cabin can be removed and replaced with a different cabin to change from a space shuttle simulator to a jet fighter simulator. Four different cabins/cockpits have been designed for this simulator. (NASA)

This simulator allows for the most realistic flight simulation experience. To accomplish this, it uses a cabin mounted on a hydraulic platform to create real movement. In addition to the shifting movement from the hydraulic platform, this simulator actually moves up and down as much as 60 feet and front to back as much as 40 feet for extremely realistic simulation of movement. Pilots of the space shuttle train using this simulator.

For the pilots training on this simulator, the feeling of movement in the cabin realistically represents almost any feeling of actual flight. To make the simulation truly realistic, three additional elements are needed to complete the overall experience. Out-the-window graphics, flight instruments, and flight controls are programmed to interact with the movement of the cabin.



This is a cockpit view with multiple screens to simulate an out-the-window view. (NASA)

(Continued)

(Continued)

Out-the-window graphics uses multiple video screens to simulate the view from each window. Complete with high-definition video, it can be difficult to tell the difference between the simulation and the real view outside of the actual space shuttle window. This helps pilots experience conditions they will actually see in the real world.

Flight instruments are exact copies of those the pilot would see in the real world. These are in the same location as in the space shuttle. They also function in the same way as the real instruments.



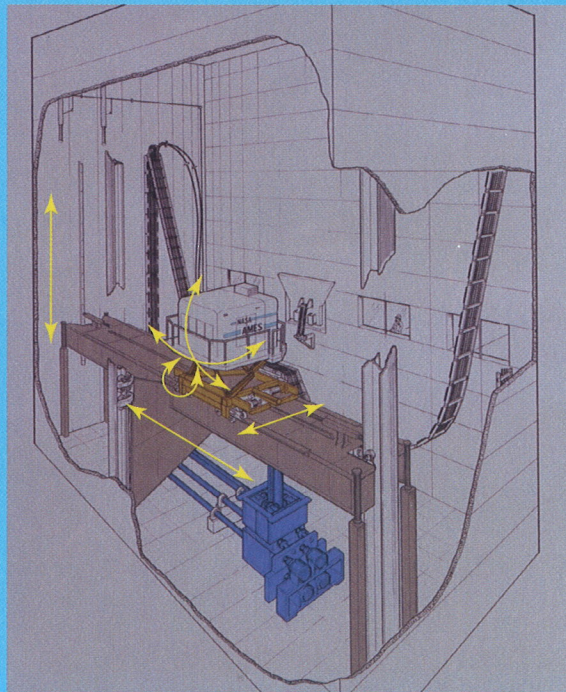
Some control screens use a heads-up display to overlay information directly on the viewing screen. This feature, also used in video games, allows the user to see the information without looking away from the screen. (NASA)

The last piece of the puzzle to make this simulator the most realistic possible is the use of flight controls. The flight controls are identical to those used on the actual vehicle. The user interface designer had to incorporate real controls into this "video game" to make the simulator a true representation of what the pilot will experience in the real world.



These are the joystick and foot pedals used in this simulator cabin. (NASA)

In addition to the controls, the user interface design team had to program features of the heads-up display (HUD), instrument readouts, the hydraulic movements of the cabin, and movement of the base platform to create the complete user experience. Together these control systems create the ultimate 3D adventure.



This drawing shows the movements possible for the cabin. Yellow arrows show the tilting movements of the hydraulic platform. The yellow arrows show the movement of the motion platform in real three-dimensional space. (NASA)

(Illustrations: NASA and the Ames Research Center)

Game Writer

Game writers are the dramatic writers for the team. These writers are responsible for creating character depth and interaction. For character depth, a writer might create a **backstory**, or history, of how and why this character came to be. A game introduction also provides dramatic information for the player to understand the imaginary world that the game is trying to create.

Along with the historical and storyline writing, the game writers have to add dialogue. This may be in either written or verbal form. Dialogue allows interaction between the player and the other characters within the game world. Many other types of story-based dialogue and dramatic writing take place within a game or a cut scene.

This job requires skills beyond simple writing skills. It takes a person who is a good dramatic writer, savvy with technology, and an excellent communicator. Everyone on the team will be begging for cut scenes and interactive dialogue to make their levels and characters come to life. A game writer must make some compromises as a daily part of work to make the level designers and game designer happy.

The hardest part of the game writer's job is to keep all of the aspects of character and dialogue moving the story forward. From the opening scene to the final obstacle, the game must be written to properly flow from start to finish. Without good writing and dialogue to tell the player what they are expected to do, a game will fail. For this reason, the game writer will ultimately report directly to the lead designer.

Art Designer/Lead Artist

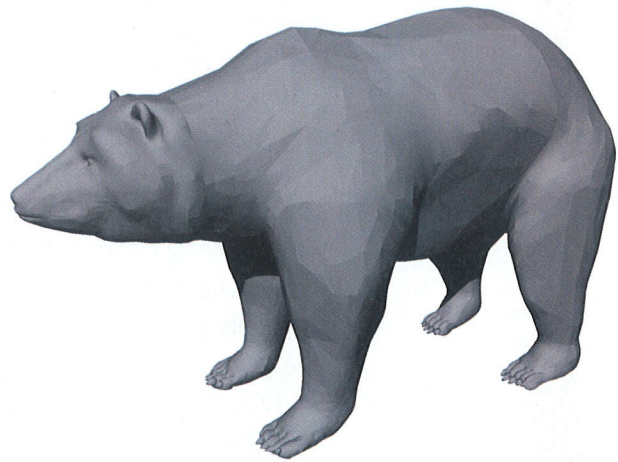
The **art designer**, sometimes called the **lead artist**, creates the visual elements of the game. These visual elements will be either two dimensional (2D) or three dimensional (3D). The difference between 2D and 3D can be seen as a real life example of a sheet of paper. A flat sheet of paper is a 2D object that has only height and width. If you take that same sheet of paper and ball it up, it becomes a 3D object with height, width, and depth. Often, an art designer will work on several teams at the same time. Since their work on the project is vital to the success of the game and its vision, art designers report directly to the lead designer or creative director.

The visual elements of a game are called assets. An **asset** is an object, character, or background that can be inserted into a game. A two-dimensional (2D) asset is called a **sprite**. A three-dimensional (3D) asset is called a **model**, **Figure 1-15**. Depending on the need for each game, an asset may be animated with multiple poses, like a walking character, or a static (nonmoving) object, like a fire hydrant. It is the job of the art director and the team of artists to produce each asset for the design team to program into the working game.

Every character, building, movement, object, backdrop, and everything else seen on screen must be created and designed to properly function. A level designer might want a 3D tree model in the level. The art designer has to create a tree that will fit with the theme and style of the level. Imagine a creepy scene with a scary house and then a bright, cheery peach tree in



A

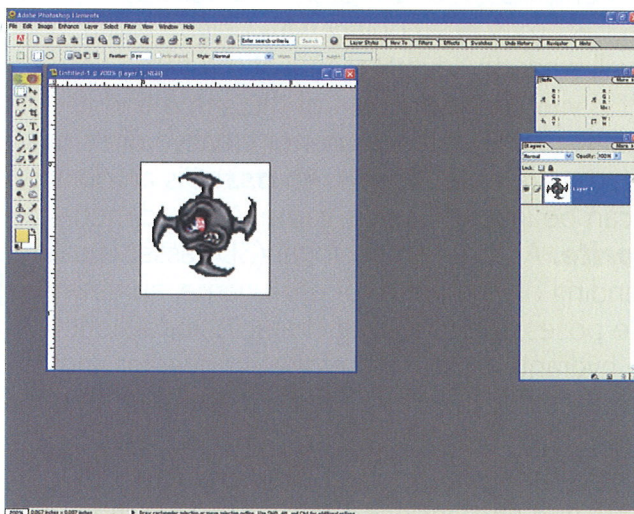


B

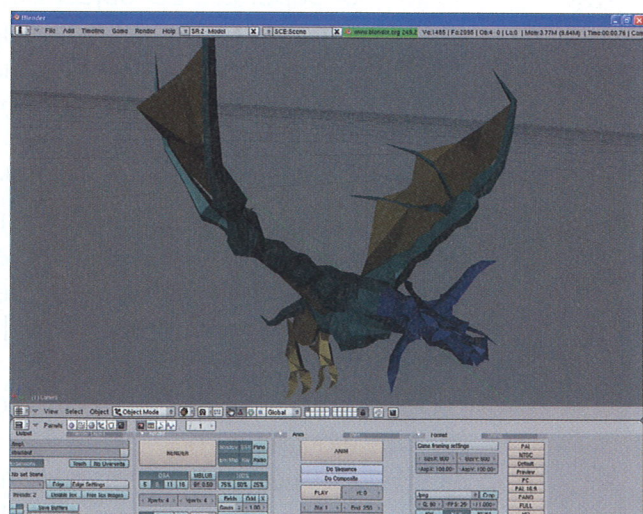
Figure 1-15. A—Two-dimensional game assets are known as sprites. B—Three-dimensional game assets are known as models.

front of the house. This tree does not fit the theme and feel of the scene. Instead, a dying tree with scraggly branches and broken limbs might work better in the scene. Each visual element of the game must match the others and function within the level.

The art designer might start work with a basic sketch of a character. Then, all of the features of the character are built based on the sketch, **Figure 1-16.** This process may take a lot of patience. The lead designer may request several changes on each design until it looks exactly right. Characters



A



B

Figure 1-16. A—Sprite editors use tools similar to those found in Microsoft Paint or Adobe Photoshop. B—Model editors use tools similar to those found in Blender, 3ds max, or Maya.

might be the most important and most difficult features to design. A character might be made up of a hundred moving parts with tools and movements that change during gameplay.

Art designers have one of the most significant and important jobs in creating a successful video game. This usually requires a team of artists working together to get all of the assets designed for a single video game. With video game trends leaning toward high-definition graphics and realistic movements, skilled art designers are usually in high demand.

Audio Engineer

The job of the **audio engineer** is to create all of the sounds that add depth to the game, **Figure 1-17**. Every noise needs to be created by the audio engineer. This includes:

- **Active sounds**, like that of a door creaking as it is opened.
- **Background music** needed to set the mood of the level.
- **Voice-overs** used in dialogue and narrations.
- **Ambient sounds**, like the buzzing of a bee or leaves rustling in the wind.

Just like the art designer, the audio engineer might be working on several projects at the same time. The project manager and game designer are in constant communication with the audio engineer to make sure the sounds match the vision and mood of the game they are creating.

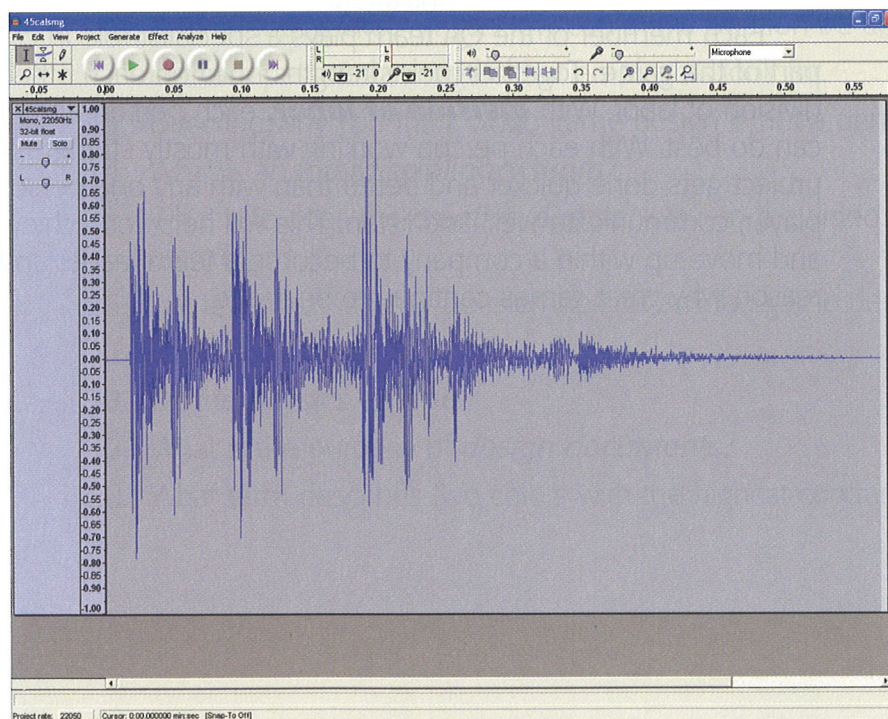


Figure 1-17. A sound engineer will use sound mixing and editing software, similar to Audacity shown here, to add sound tracks and create needed sounds for the game. Audacity is a useful freeware program used by many beginners and students.

Quality Assurance Tester/Game Tester

The **quality assurance (QA) tester**, or **game tester**, is the person that actually gets paid to play video games. This is usually an entry-level position in a video game design studio. A game tester will play games and levels over and over again to test every part of the game for proper operation.



CHEAT CODE: **CHEAT CODE**

To make the job of the QA team easier, programmers put in codes to allow the testers the ability to have unlimited lives, unlimited cash, jump to levels, and other features. This prevents the game tester from having to start over after running into the first obstacle tested. Cheat codes

are usually not removed after the game is published and these codes are eventually leaked to the public. It is typically not the purpose of the video game design team to allow the player to cheat their way past an obstacle, but these hidden codes are needed to allow proper testing.

When the game passes all of the quality assurance tests, it is free of bugs. **Cheat codes** are built into the game for the QA team to help them navigate through the game. A game tester might have to spend the day running into every obstacle in a game or doing things to try to make the game crash. The objective here is to make sure each object reacts as it should. This is a different objective than the game player. A game player, such as yourself, wants to beat the game and assumes everything works properly.

A QA job requires a very good game player with some programming knowledge. The game tester needs to be able to navigate the game, give input to the designers on glitches discovered, and tell the user interface designer how the controls work. This means a lot of communication.

Each member of the QA team plays a specialist role in creating their part of the game. Together their strengths build on each other through the division of labor. With **division of labor**, each person does the job they can do best. With each person working with mostly strength attributes, the project gets done quicker and better than with any one person. Be a team player, communicate well, and listen. This will help you achieve your goals and move up within a company to become a team leader and an important reason why great games continue to be made.

Chapter 1 Review Questions

Answer the following questions on a separate sheet of paper or complete the digital test provided by your instructor.

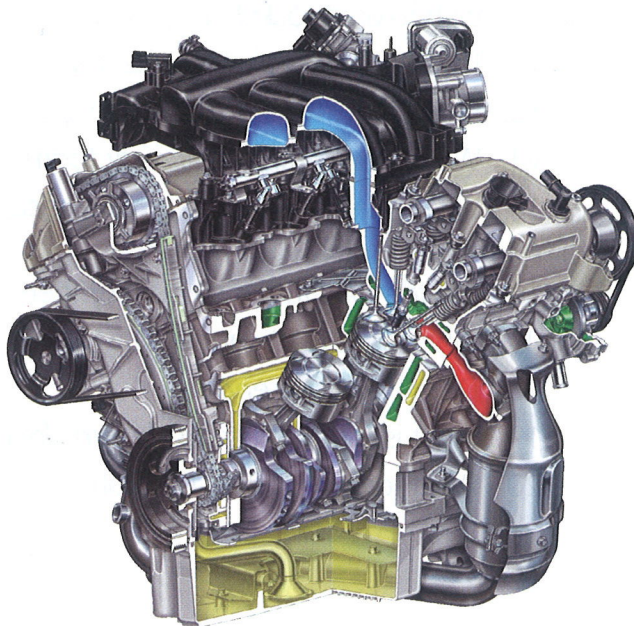
1. In your own words, define the term *lifelong learner*.
2. What is the *dynamic* of a team?
3. How is *constructive criticism* helpful?
4. Write a brief, one-sentence summary of the difference between hard skills and soft skills.
5. In what three areas of math should a video game designer have strong skills?
6. Why would someone wanting to become a video game designer need to learn how to use spreadsheets?
7. If the background in a video game is dark, what colors may be best to use for the characters and tools used by the character? Why?
8. How does *technical writing* differ from *narrative writing*?
9. What is the purpose of a *storyboard*?
10. How can you use *active listening* to improve communication?
11. You and a teammate differ on the design of a flying character. You want the character to have a flying cape. Your teammate wants to have the character fly using rocket boots. In the end, the character is designed with foldout rocket wings. How could this solution be described?
12. List four personal strengths that employers look for.
13. Describe why you think video game design is not a democracy.
14. What is an *interdisciplinary team*?
15. What role does the *creative director* play on the video game design team?
16. List ten jobs that may be members of a video game design team.
17. What is a *Gantt chart*?
18. Define *physics engine*.
19. What is the purpose of *design documents*?
20. What term describes two colors with the highest contrast?

Cross-Curricular STEM Activities

1. David was a boy working in a machine shop building parts to marine engines at the age of 13. One day he asked his boss, Mrs. Abram, why did she become a machinist? Mrs. Abram spoke frankly to David and the two had a conversation on how she learned the machinist trade back in World War II when the nation needed women to work the factories while the men were at war. At the end of the conversation, Mrs. Abram told David to tell her what the most important part to an engine was on Friday before he could get his paycheck. David was a good machinist and knew every part of an engine. He thought about every part and how it worked.

- The pistons go up and down to create movement from the burning fuel.
- The rods connected the pistons to the crankshaft to change the direction of movement.
- The crankshaft turned to create the rotation needed to spin the propeller.
- The spark plugs were needed to ignite the fuel to start the movement.
- The cams opened the valves to let the engine breathe in air and close to seal the ignition.

The list went on and on until David had listed every part of the engine and could not determine what one part was the most important.

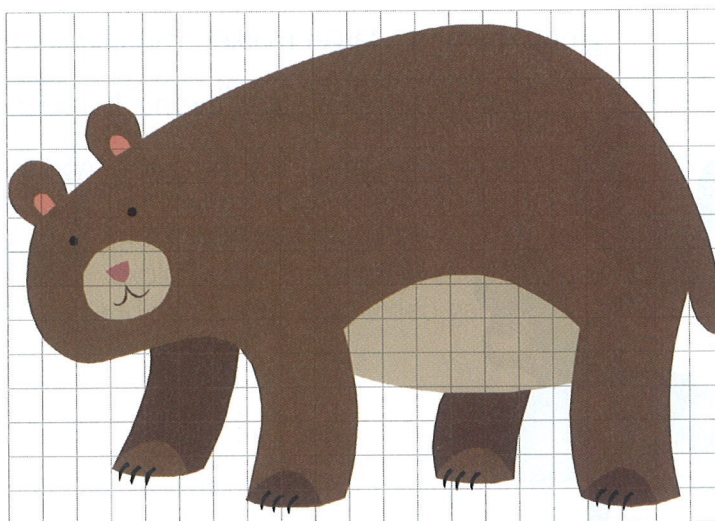


(Ford)

On Friday, David went to pick up his paycheck. Mrs. Abram asked David if he had the answer. David replied, "I was really hoping you forgot about that. I thought about that all week and I could not figure out which part was the most important."

Mrs. Abram reached in her desk and took out David's paycheck. She said, "The answer is the part that is broken". She handed David his paycheck and stated, "when any one part is broken, all the others won't work". David thought about the parts of the engine again and how if any one part was missing, the entire system would not work. He thanked Mrs. Abram and left. David is now the Vice President of International Ship Repair. He tells this story to keep the memory of his friend and mentor, Mrs. Abram, alive.

- A. Apply the most important part of an engine to a video game design team. Explain how the teammates work together and which part is the most important part.
 - B. Research and list three modern-day jobs that you feel are male dominant. List another three modern-day jobs that you feel are female dominant
2. A Gantt chart is shown in Figure 1-12. Use spreadsheet software, such as Microsoft Excel, to create a Gantt chart showing all of the classes you intend to take before you graduate. Use a timeline in months or semesters and organize your classes by subject (department) and course (task). Using a word processor, such as Microsoft Word, write a one-page memo to your instructor describing what you wish to achieve by taking the courses you have outlined.
3. Two-dimensional figures have only height and width. Look at the 2D bear figure below on a grid map.
- A. How many units tall is the bear?
 - B. How many units wide is the bear?
 - C. What would the height of the bear be if it is reduced to $\frac{1}{3}$ of its current value?
 - D. To keep the bear proportional (same scale for height and width), what would the width of the reduced figure be?



4. Form into groups of two or three. Research, debate, and form a group opinion on each of the Think About It activities in this chapter. Prepare a PowerPoint presentation of ten slides (five to seven minutes) to present to the class explaining the group's opinions for each Think About It activity. Include text, pictures, video, animations, and slide transitions as appropriate to help explain your positions.