

Working so others can play: Jobs in video game development



by Olivia Crosby

You may find this hard to believe, but playing video games could be the first step to a career. Thousands of workers who develop video games for a living say their passion for playing is what drew them to their jobs. “I’ve always loved games,” says Hugh Riley, a game artist. “Making them is a dream come true.”

A love of games is an advantage in an industry whose stock and trade is fun and fantasy. But game development jobs also require serious skills. Only highly qualified people find jobs.

There are video games for every taste: sports, action, adventure, strategy, simulation, and education. Games are made for personal computers, consoles, arcades, and the Internet. Games even add excitement to some retail websites and electronic organizers.

Demand for video games is rising, and the industry is growing. Sales of game software generated more than \$6 billion last year, according to NPD Interactive Entertainment Service, a market research group based in New York. More than 19,000 new games were showcased at the 1999 Electronic Entertainment Expo in Los Angeles. And according to a Coopers and Lybrand study for the Interactive Software Developers Association, employment in the average development company grew by 18 percent between 1997 and 1998, with about 50,000 people working in video game development in 1998.

Most games are developed in small studios and then shipped to publishers who advertise and distribute them. This article describes the development stage of a video game, from concept to completion. Keep reading to learn about common development occupations, some of the advantages and disadvantages of a development career, and how to get started in the industry.

Occupations behind the screens

Job titles and duties of video game developers vary by game genre and company organization. Jobs change rapidly as new technologies emerge. For these and other reasons, the Bureau

Olivia Crosby is a contributing editor to the *OOQ*, (202) 691-5716.

DESIGNERS

of Labor Statistics (BLS) does not have employment or earnings data for most occupations within the video game industry. “Games are the Wild West of the computer industry,” says Chris Ulm, an assistant director at *Oddworld Inhabitants* in San Luis Obispo, California. “There’s no set way of organizing companies. Everyone does it differently.”

But there are some similarities. In every development studio, the people who make video games comprise four main teams: design, artistic, programming, and testing. The design team writes the game concept, character interactions, and gameplay elements. The artistic team creates images and composes music and sound. The programming team plans and codes software. And the testing team finds errors in the game before it is published.

Game designers

“Designers create fun,” says Christina McGavrin, a game designer at Maxis Studios—a division of Electronic Arts—in Walnut Creek, California. Game designers write the blueprint of the game. They decide the mission, theme, and rules of play. If the game is engrossing, designers have done their job.

Most development teams have a lead game designer, who is responsible for the overall concept and feel of the game. Level designers work with artists and programmers to lay out smaller sections of the game. Writer-designers write game text and dialogue. Some also write manuals and hint books.

The early stages of game design involve brainstorming, collaboration, and revision. Designers test their ideas by writing short scripts and narratives and sketching rough storyboards. The storyboards describe the action of the game with a sequence of pictures. As their concepts solidify, designers supervise the production of working video game demonstrations.

After the designers decide on the game concept, they write a detailed plan, called a design document. This document lays out every aspect of the game. It includes maps of each game setting and flow charts to show how events in the game may unfold. Everything the player might see, do, or hear is described somewhere in this document.

Designers are storytellers, with a twist: they invent a plot, but they let the player control the story and decide the outcome. They create a web of possibilities, and the player chooses a path.

A video game’s design evolves over time. New ideas lead to new levels, special features, and secret additions and shortcuts called codes. “One of the most difficult parts of designing is

deciding what to leave out,” says Ulm. Designers edit and add to the design document throughout development.

A designer’s main concern is to make the game entertaining and irresistible. “We have to understand what makes a game fun,” says McGavrin. “It’s our job to connect with the player.” But understanding fun is not as easy as it sounds. She explains, “Lots of people can say whether a game is good, but they can’t quantify what makes it good.” And harder still is recreating the effect.

Designers often challenge players by devising puzzles to solve or enemies to defeat. If a game is too easy, the designers make puzzles and enemies more cunning. The goal is to increase the game’s difficulty as the player gains new skills—to make a game easy to learn but hard to master.

The pace and rhythm of a video game are also critical to its success. Designers decide how quickly players move and how often they encounter obstacles and other characters. If the pace is too slow, the game is boring. If the pace is too fast, the game is confusing.

Designers work with artists, programmers, and musicians throughout development. In fact, sometimes a designer is also the lead programmer, artist, or producer. But even if designers have other duties, their role is unique. They oversee the entire game playing experience, instead of concentrating on one element. “Artists might want to paint beautifully intricate art, and that’s good,” says Ulm, “but if the art slows down the game too much, it can’t be used.”

Skills and training. Communication is one of a designer’s most important skills. “You need a strong ability to write, to

communicate ideas, and to persuade,” says Ulm. Creative writing, English, theater, and other liberal arts classes help many designers to strengthen those skills.

Designers also have to be good managers. They lead the development team and make sure it implements the game concept. They incorporate many people’s ideas into a single product.

Designers need technical skills as well: they need to understand computer programming and software design. “To be a good designer, you have to understand how games work,” says McGavrin. Designers have to be able to understand the technical hurdles programmers face.

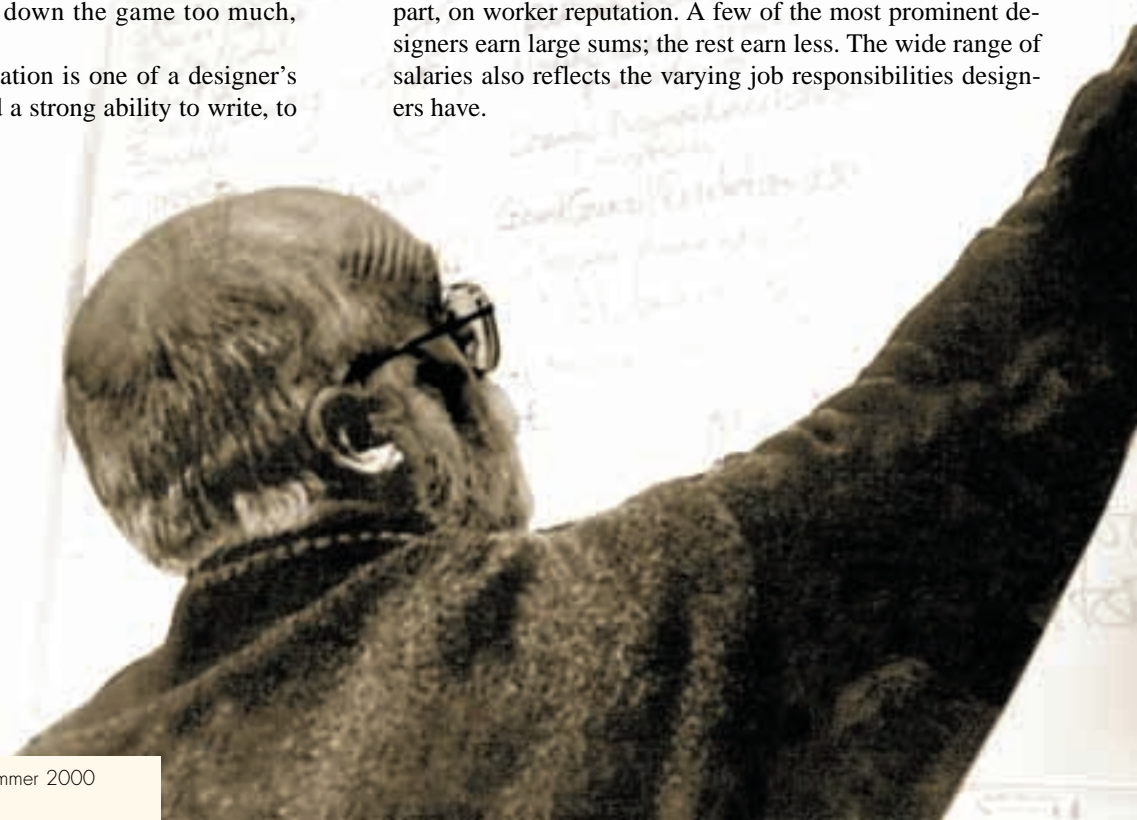
Most designers earn a college degree. The most common degree concentrations are English, art, and computer science.

However, a designer’s most significant training comes from experience. “There’s no such thing as an entry-level designer,” says Mark Keeper, manager of product development at Blizzard Entertainment in San Mateo, California. Designers usually begin their careers as game artists, programmers, testers, or producers.

Earnings. The Bureau of Labor Statistics does not have data for game designers, but industry sources suggest their salaries vary widely. Surveys by placement companies found that annual salaries for writers and designers usually ranged from \$35,000 to \$75,000 in 1998 and 1999.

Like other entertainment occupations, earnings depend, in part, on worker reputation. A few of the most prominent designers earn large sums; the rest earn less. The wide range of salaries also reflects the varying job responsibilities designers have.

Designers test ideas by writing short scripts and narratives.



Using modeling software, artists build characters within the computer. As Hugh Riley describes it, "We sculpt with digital clay."

ARTISTS

Nothing grabs a player's attention faster than the images on the screen. Artists create those graphics. During the concept stages of development, concept artists draw sketches and storyboards to illustrate and embellish the designers' ideas. Artists later create all the artwork the design document calls for, including creatures, settings, vehicles, and icons. All artists work under the direction of an artistic lead.

Video games are either two or three dimensions or a combination of both. In a 2-D game, artists draw images on paper and scan them into the computer. In a 3-D game, artists build images within the computer. Most new games have 3-D components.

There are three main types of 3-D artists: Character artists and animators, background modelers, and texture artists.

Character artist and animator. Character artists design and build creatures, including the one the player "becomes." Animators make those creatures move. Sometimes, the same person does both tasks.

Character artists begin by sketching the creature on paper or a white board. "We try to make the game look the way the designers intend," says Riley, formerly a lead character artist at Bethesda Softworks in Rockville, Maryland. "But at the same time, we have a tremendous amount of creative freedom."

When they have completed the creature's basic design, artists build it within the computer, using modeling software. They start with simple shapes, called primitive polygons. They twist, stretch, and combine the polygons until they have a skeleton covered with a wire mesh. As Riley describes it, "We sculpt with digital clay."

The character looks like a figure made of chicken wire. Then, the artist covers the character's mesh with a virtual skin and adds color.

Making static creatures and objects move is an animator's job. "I'm given a scene and told what my character has to do, who it will interact with, and where it is in the story," says Angie Jones, an animator at Oddworld Inhabitants.

When making an action sequence, she positions the creature by moving the bones within its mesh. She sets up key poses, and the computer fills in the others according to the timing Jones selects.

Animators often use real-world creatures as guides to create natural-looking movement. Animals make good guides; game creatures often are patterned after ostriches or horses. But people are important models, too. "Understanding human anatomy is important, even if your creatures aren't all that human," says Jones. "You have to be sure you're moving

the muscles in a realistic way."

Animation is more than creating natural motion, though. It takes skill in dramatics. Using facial expressions and body language, animators imbue characters with personalities, says Jones. "If I'm working on a scene with a lot of dialogue, I play the recording track many times. I'm listening for the words and inflections. I want to understand the emotions behind the movement in the scene."

Animators create two kinds of action sequences: cut scenes, the short movies that play at predetermined times in the game, and player-controlled action, such as running, jumping, or talking. During cut scenes, animators can make the action as detailed and complicated as they'd like. But when the player is in control, the animator is more constrained: the player must be able to produce most movements with a joystick, button, or menu selection.



Some artists sculpt models for 3-D scanning.

Two techniques for creating and animating objects combine computer graphics with real-world elements. In one technique, artists and production technicians build fiberglass or clay sculptures and scan them into the computer. The computer translates the data from the scan into a digital model. The model is then painted and animated in the computer.

In the other technique, developers use actors along with animators to create some action sequences. Actors perform motions with sensors attached to their bodies. The sensors record their positions. Artists use the data to animate computer characters. This motion-capture method is most often used in sports games.

Background artist or modeler. When players find themselves on alien planets or in theme parks, football stadiums, or other settings, they have background artists to thank for the view.

Background artists, sometimes called modelers, create video game settings. "I'm building playgrounds for the characters," says Michael Kirkbride, a background artist at Bethesda Softworks. "We draw and construct environments to the design team's specifications. Background artists work hand in hand with the level designer to create environments that fit the game."

Background artists begin by making sketches of the background suggested in the design document. Then, they draft

Photo courtesy of Oddworld Inhabitants

Sound designers compose the music and sound in a game. Without them, creaky doors, squealing tires, and roaring dinosaurs would be silent.

an accurately proportioned version on graph paper. “The scale has to be correct,” says Kirkbride. “Otherwise, you could make a structure too large or too small for the size of the characters.” Once they are satisfied with the drawings, artists mold the environment shape by shape, using the computer as a virtual movie set.

For example, artists creating a laboratory might use rectangles to form the walls, ceiling, windows, and doors; then, shape circles and cylinders into counters, stools, and sinks; and, finally, add any objects players will be able to pick up, such as test tubes, calculators, or fire extinguishers. A player would be able to walk around furniture and move through the lab in any direction.

Then, the artists add fill lights or spotlights to cast pools of brightness and shadow over the environment. They adjust the color and intensity of the lights to evoke a particular mood or time of day.

With 2-D games, backgrounds are not built within the computer. They are sketched with pen and paper, scanned into the computer, and colored. Each setting is drawn many times to capture different perspectives and fields of view.

Texture artist. These artists add detail to the surfaces of 3-D art. By adding texture to a wall, for example, they make it look like brick, plaster, or stone. They might make a creature’s eyes shiny and wet and its cheeks matte like skin.

Texture artists take a photograph or paint a picture of a surface they need. Then, they scan it into the computer.

Finally, they wrap the picture around the object in a process called texture mapping.

Some surface art requires detailed painting. For example, paintings of circuit boards or computer keyboards can be draped onto flat ledges.

All game artists have to contend with the technical constraints imposed by arcade machines, consoles, and personal computers. These playback devices have limited memory and processing power. Each element of the game is competing for a piece of memory and power.

When the image on the screen changes, the game software retrieves data from its database and redraws the image. This takes time. The more complicated the image, the more time it takes to render. To cope, game artists try to use the fewest possible polygons. They want to fool the eye into seeing more detail than is actually there.

Skills and training. Game artists need a visual imagination. They find inspiration by observing nature; studying movies, comics, and fine art; and experimenting with new ideas.

Game artists must also be able to apply basic math concepts, especially when working on 3-D games. “When you add a third axis, you really have to understand geometry,” says Jones.

Artists working in 3-D should know how to use modeling and animating software and should be able to teach themselves new features and techniques. Ability to communicate with programmers is another must.

Most people in these occupations have formal training in fine arts or art-related subjects, such as animation or industrial design. They study drawing, painting, color theory, sculpture, and graphic design. Those with bachelor’s degrees are usually more likely to be hired. “It is very important to get a traditional education in the arts,” says Jones. “The degree of artistic skill required is rising.” With each new game, players expect better art.

Earnings. BLS data show the average annual salary for artists across all industries is \$34,360. BLS does not collect earnings data specifically for video game artists and animators.

According to the Digital and Multimedia Occupational Guide published by the California Employment Development Department, multimedia artists and animators earned between \$25,000 and \$75,000 annually in 1995; art directors earned between \$30,000 and \$100,000. A survey taken at the 1999 Game Developers conference found that 3-D artists with at least 1 year of experience earned an average of \$59,211 in 1998. Animators earned more.



Photo courtesy of Oddworld Inhabitants

Concept artists draw storyboards to illustrate designers’ ideas.

SOUND DESIGNERS

Sound designers

Sound designers compose the music and sound in a game. Without them, creaky doors, squealing tires, and roaring dinosaurs would be silent. And their musical compositions intensify the player's experiences. "I like taking a product that already looks good and adding some extra excitement," says Andy Frazier, a freelance sound designer in Boston. "Sound draws players in and makes games more real."

Sound designers work closely with the game designers. Game designers describe the mood they want, often citing movie scores or popular musicians. The sound designer uses these analogies to discover what the designer wants.

Video game music should mesh with setting and plot. "I always have to consider where the player is in the story and how the music will affect his or her mood," says Frazier. He uses musical techniques to evoke emotions.

For Stephen Rippey, music director at Ensemble Studios in Dallas, composing appropriate music begins with research. "All of our games are based in history," he says. "The settings are civilizations that actually existed, so the first thing I do is research the period. If the game takes place in medieval Japan, I go find music from that setting."

Unlike movie composers, sound designers don't know what the characters will be doing as the music plays. Their music has to be simpler than movie scores because it should not interfere with dialogue or action noises.

Rippey and Frazier both compose music using a keyboard attached to a computer. With the keyboard, they simulate instruments. They command one-piece orchestras.

Sound designers also create sound effects. They add ambient noise, such as chirping forest creatures, dripping faucets, and distant conversation. Other sounds are triggered by an event, such as the swoosh of a basketball as it falls through the net.

Sound designers are given a list of sounds the game needs. They construct each effect by modifying an existing sound from a CD library or by finding and recording the sound themselves.

An important part of the job is to find creative ways to make sound. To produce the twang of a catapult, for example, Rippey laid a ruler across the edge of a table and hit it. An engineer recorded the noise, and Rippey edited it using computer software.

Sound designers edit almost every sound they use: they might lower a pitch, add an echo, loop the sound to make it longer, or mix it with other sounds.

They balance realism with the entertainment value of exaggeration, routinely sweetening natural sounds for dramatic effect.



To create sound effects, sound designers modify an existing noise or find and record it themselves.

When choosing noises, sound designers also have to be aware of the game-playing environment. When designing for arcades, for example, they make effects loud and simple. For a home system, sounds can be more complex.

Skills and training. Sound designers should be musically creative. They spend time listening to all types of music and usually learn to play at least one instrument.

Training in audio engineering also is helpful because sound designers mix and record sounds and dialogue. Some technical schools and community colleges provide formal training, but most sound designers learn audio engineering skills on the job.

Sound designers also need to learn the basics of computer hardware and software to predict how their compositions will sound to the player. Some arcade speakers, for example, distort certain pitches and tones.

Many sound designers have a bachelor's degree in music. They study music theory and composition. Some have education in film scoring.

Earnings. BLS has no data on sound designers. Many sound designers are contract workers who charge a fee for every minute of music they complete. A few receive royalties if the soundtrack is released as a separate CD or as part of a television score. Job search agency surveys show experienced composers earn from \$45,000 to \$70,000 annually.

Programmers translate ideas into mathematical equations that the computer understands.

PROGRAMMERS

Programmers

Game programmers are software engineers who plan and write video game software. They turn ideas, art, and music into a game that works.

When designers describe an event in the game, programmers translate the idea into mathematical equations the computer understands. As a vehicle physics programmer for a racing game by Angel Studios in Carlsbad, California, Santiago Beccera wrote algorithms for the movement of cars in his game. The algorithms describe how the cars turn corners; how quickly they accelerate, decelerate, and stop; and how they react to crashes. “The mathematician we were working with understood the physics of the car,” he says. “The designer knew how it should feel to the player. I was balancing the two.”

Game programmers control the speed and placement of art and sound. They control how high a car flies over a jump, for example. In a low gravity environment, like space, programmers might instruct the computer to move the car to a higher position to make the jump bouncier.

Game programmers search for the most efficient way to write software. They need to accomplish as much as possible with the fewest possible instructions and a fast processing time. A slightly faster program could give artists hundreds of additional polygons to use or game designers room for more features. Online and 3-D games make speed even more critical.

Video game software needs to be flexible as well as fast. Good programmers write code that can be changed without destroying the game. Some games have features allowing players to add new levels and effects. If a program is sufficiently flexible, large parts of the software can be used in other games.

There are many specialists on a programming team—including engine, artificial intelligence, graphics, sound, and tool programmers—each handling a different aspect of programming games. “Programmers deal with graphics, artificial intelligence, user interfaces, the Internet—there are so many different kinds of problems to solve,” says designer and former lead programmer McGavrin. These programmers all work under a lead programmer or technical director.

Engine programmers write the software that makes video games run. Graphics engine programmers, for example, control how graphics are stored and reproduced by the computer. As part of this job, they might write a collision program to prevent objects from moving through each other when they touch.

They might also write a culling program to find and eliminate unnecessary pieces of art, like skin hidden under clothing or details of a far away object. The fewer polygons rendered, the faster the game. Recently, engine programmers have tried to make video games automatically reduce their level of detail when they run on a slow computer.

Artificial intelligence programmers write code to make computer-controlled characters act realistically. They write a set of rules to dictate how characters react to the player.

Because space is limited in video game software, game artificial intelligence has been rudimentary in the past. But faster computers are making better artificial intelligence possible.

Graphics programmers work with artists to perfect the playback of animations. *Sound programmers* work with sound designers in the same way. They might improve the game’s authenticity by adding random sounds to a repeating sound loop.

Tool programmers write software for artists, designers, and sound designers to use within the development studio. Some of these software tools convert art, sound, and game play into data that will work in the game. Other tools help developers to edit their work and see how it will look when the game is finished.

To make the development process easier, tool programmers tweak their tools and add helpful features. Other members of the team come to them with wish lists and suggestions.

Photo by Harrison Allen, courtesy of Bethesda Softworks



Developing strong math skills helps programmers describe a video game object’s movement through space.

TESTERS

Skills and training. Because they are translating ideas into numerical equations, programmers need strong math skills. “In high school and college, I took as much math as I could,” says Becerra. “I use ideas from trigonometry, linear algebra, and analytical geometry all the time.” These subjects teach programmers to describe how the objects in a video game move through space and hone programmers’ ability to manipulate numbers.

Game programmers should learn C and C++, as these are the programming languages most often used in the industry. Many jobs also require assembly language.

Standards change quickly in the industry; programmers need to learn new languages and techniques throughout their careers.

Most game programmers have a bachelor’s degree in computer science, although some major in related subjects, such as cognitive science and electrical engineering. Those working on complex problems, such as a new artificial intelligence system, sometimes have advanced degrees.

Earnings. According to BLS, computer engineers—including hardware and software engineers—across all industries earned an average of \$59,850 in 1998. Programmers across all industries earned an average of \$47,550. BLS does not collect data specifically for software engineers and programmers in the video game industry.

However, most game programmers fall into the BLS category of computer engineers because they design game software or apply mathematical theory to solve programming problems. Many entry-level game programmers who spend most of their time coding software rather than designing it or applying theory fall into the category of programmer.

According to job search agency surveys, experienced game programmers usually earn a base salary of between \$60,000 and \$80,000 annually. The survey at the 1999 Game Developers conference found that average earnings of game programmers with more than 1 year of experience were \$59,127 in 1998. Lead programmers earned more.

Game testers

Testers play games for a living. They find errors in video game software before it is shipped to stores. They play each part of a game, trying to ferret out graphic glitches, computer crashes, and other bugs. “I play games most of the day,” says Cory Nelson, a testing manager at Interplay Entertainment Corporation in Irvine, California.

Most of the problems testers find are technical: characters who walk through walls, artwork or sound that disappears, or

a game level that won’t load. Other problems are with gameplay. “If you spend two hours getting past a monster and only earn two points, there’s something wrong,” says Nelson. Testers identify places that are too hard, too easy, or too confusing.



Testers identify problems in a video game before it is released to the public.

ENTRY LEVEL

ent sort. “There are so many ways to do something,” she says. “I love to find the best way to combine art with technology.”

Video game studios also offer casual work environments. “You can wear jeans and a T-shirt every day,” says Ramakers. Moreover, many video game companies offer perks for workers, such as free sodas, subsidized lunches, and onsite gyms.

Studios offer traditional benefits as well. Many give workers stock options, health insurance, vacation pay, and bonuses for completing a game.

The best rewards are not financial, though. When a video game hits the shelves, developers see people enjoying what they have made. “Kids are so impressed when I tell them what I do,” says Jones. And video game players of all ages are vocal with their praise. “When fans like your work,” says Frazier, “they let you know right away.” Successful developers are deluged with fan e-mails.

Late nights and big risks

Game development isn’t always so glamorous. You may spend late nights playing video games, but developers spend late nights making them. They work evenings and weekends to meet deadlines. “I’ve put in 12-hour days or stayed until 2 or 3 in the morning,” says Beccera. Riley kept a sleeping bag under his desk at Bethesda Softworks. “I’m practically living here by the end of a project,” he says.

Testers’ work schedules are especially irregular, usually including nights or weekends. Many work part time, and most are hired for only one game. Small developing studios bring in teams for short periods. Large publishing houses have a year-round staff.

Making video games may also bring disappointment. Despite all the hard work that goes into creating them, many games never make it to the stores. “Only a small percentage of games are published,” says Becerra. “That can be demoralizing.”

Frequent job changes are another drawback. Many development companies are small startups, where the work lasts only as long as a single project. Workers must be prepared to work for many companies throughout their careers.

Jumping into the entry level

Preparing for a career in video game development starts early. Developers say that high school and college students should get a well-rounded education. Students should study math to hone their reasoning skills and study writing and liberal arts to nurture their creativity. Finding opportunities to

work as a member of a team is also useful.

After high school, students need education and training specific to the game occupation they want to pursue as a career. Most of these occupations require training in computer programming or the arts. The training recommended for each occupation is discussed above in the skills and training section for that occupation.

People who want to develop video games usually need some experience before they land their first job. Many people begin as hobbyists, making simple games themselves or with friends. They learn how by reading books and websites. Participating in class projects or internships is also a good way to get experience.

When applying for jobs, candidates are expected to demonstrate their skill. Artists and sound designers compile short



Photo courtesy of Oddworld Inhabitants

Because game developers work in teams, aspiring developers should try to get team-oriented experience.

INTERNSHIPS

demo reels of their best work. They send the demo and a résumé to employers.

Programmers, too, often send a few small pieces of software they've written. "We look for some kind of programming experience," says Keeper. "Most people have programmed something in college. It doesn't necessarily have to be a game, just a small piece of software that works."

Testing is another occupation of entry into the development job market. Because little or no specialized training is required, testing is one of the easiest ways to gain industry experience. And because much of the work is part time, students can work as testers while attending school.

Experienced testers may become managers or team leaders. They organize and track the work of other testers, allocating the team's time to find the most destructive bugs.

Testing is often a stepping stone to other occupations. Some testers move into producer or project management positions. Those with the right training sometimes make the leap into artistic or programming jobs.

Internships: Beta test your career

College internships are one of the best ways to start a career in video game development. An internship will help you confirm your interest and help you secure a permanent job when the time comes.

As mentioned previously, game development studios value experience. Many developers start out as interns for that reason. "We need people who can contribute to the team right away," says Saladino, a programmer, designer, and former intern. "We've had a lot of success with interns."

An intern's work varies by occupation. Art students might draw icons and textures and add color to 3-D models. Sound students might help to record sounds and to gather and create sound effects. And programming students might write code for one function in the game or help the graphics programmer import graphics into the game.

Many students intern after their junior year in college, but timing is flexible. Saladino started interning after his first year in college. Beccera began his internship while working on a master's degree.

You should look for opportunities at least 6 months before you want to work as an intern. Game company websites, Internet job boards, newspaper classified advertisements, and career counseling offices are good places to find openings. Contacting companies without published openings also is suggested. Many small companies that don't advertise still accept interns.

Competing for positions

The video game industry is highly competitive. Entry-level sound designers have the most difficulty finding jobs because most designers are hired for only a short time during the later phases of development. The importance and prestige of music in video games is growing, but, for now, there are few jobs. Some sound designers supplement game development work with other scoring jobs.

However, some occupations are easier to enter. Qualified programmers, especially those with 3-D skills or artificial intelligence expertise, are in high demand. Also in demand are artists with experience using the latest modeling and animation software. They are the most likely to find jobs. Artists without as much experience working in 3-D often start out in texture mapping jobs.

Where you live, too, affects your chances of finding a development job. Most video game companies are located in California, Illinois, Washington, Texas, Maryland, and Massachusetts. If you don't live in one of those States, you might face even more competition. But would-be developers don't always have to relocate. More than 15 States have at least one small game studio. Some of the websites listed at the end of this article include directories of company names and locations.

Exploring further

To learn more about video game development, visit your public library for books about programming, animation, and game design. Some libraries also subscribe to industry magazines, such as *Game Developers Magazine*, *Game WEEK*, and *Games Business*.

The *Occupational Outlook Handbook*, available at most libraries, has information about the duties, working conditions, training requirements, and job prospects for more than 250 occupations. While the *Handbook* does not specifically address the video game industry, it does include general information about artists, musicians, broadcast technicians, computer programmers, and computer engineers.

Career counseling offices are another good source of information. Counselors may be able to help you find internship, volunteer, and job shadowing opportunities. And they can help you choose appropriate courses.

The Internet also has a wealth of information about video game jobs. Each of the sites listed below includes a set of links to other pages with more information.

Animation World Magazine includes articles about animation jobs in the film, television, and video game industries.

<http://www.awn.com/mag>

Many game company websites offer a glimpse into development.

Gamasutra includes articles written by professional game developers describing technical innovations and offering accounts of recent development projects.

<http://www.gamasutra.com>

Game Developers Network includes development resources and a dictionary of development terms.

<http://www.gamedev.net>

Gamejobs.com offers a list of video game companies and a list of available jobs. <http://www.gamejobs.com>

Get in the game includes articles about job searching and industry developments. <http://www.gignews.com>

Skillsnet provides an overview of multimedia and video game occupations, including job descriptions, interviews, training requirements, and links to other sites. <http://www.skillsnet.net>

Video game companies also have corporate websites. Many include job descriptions and offer a glimpse into the development process.

Professional associations are another source of information. Two established associations are:

Computer Game Developers Association
600 Harrison St.
San Francisco, CA 94107
(415) 905-2474

<http://www.cgda.org>

Interactive Digital Software Association
12775 Eye St., NW., Suite 420
Washington, DC 20006
(202) 833-4372

<http://www.idsa.org>

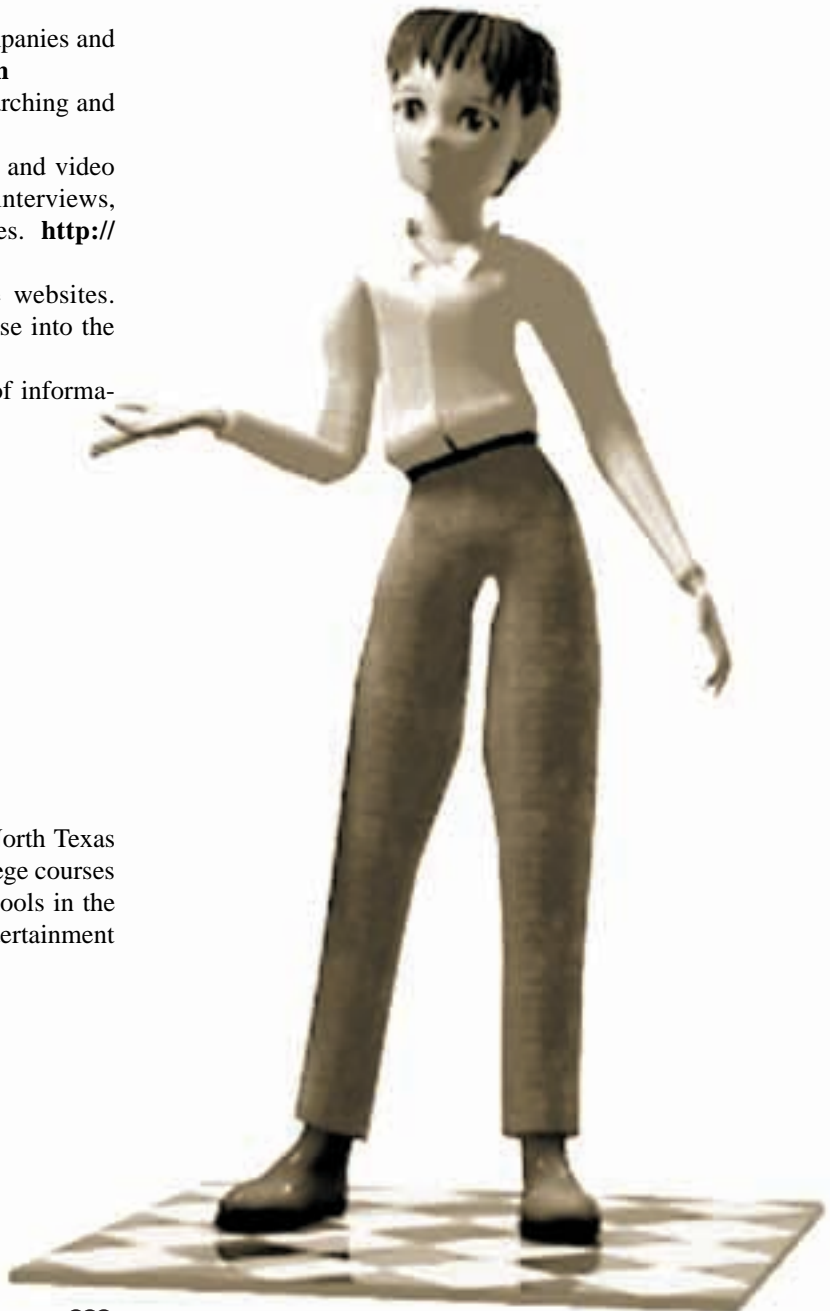
Some universities, such as the University of North Texas and the University of California, Irvine, offer college courses in video game development. In addition, two schools in the United States exist exclusively to train digital entertainment developers. For information, contact:

DigiPen Institute of Technology
5001-150th Ave., NW.
Redmond, WA 98052
(425) 558-0299

<http://www.digipen.edu>

Full Sail University
University Blvd., Suite 160
Winter Park, FL 32792
(407) 697-0100

<http://www.fullsail.com>



000