

# **3DS Max for Games – Module III**

## **Character Design & Animation**

by  
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(Lesson Plan)

**Textbook:**  
FRANSON, David & THOMAS, Erik  
Game Character Design Complete  
Thomson Course Technology  
2007

## Lesson 1: Character Design

**Textbook:** Introduction and Chapter 1 (pgs. xii-16)

This lesson provides a foundation for character design, providing an overview of the lessons from the past that no student of character design can ignore. It will show how a great many of the most popular characters known today are based on Jungian archetypes, and also borrow from the great stories from the past, including mythology and religion.

Students will learn that they can create stories and characters that resonate with audiences by using time-tested elements from the past.

### Key Points:

- The Past as Foundation and Inspiration
  - mythology
  - art
  - books
  - comics
  - games
    - D&D
      - Monster manual
      - Deities & Demigods
  - Archetypes
    - Jungian archetypes
      - examples
    - The hero
      - Joseph Campbell

### Projects:

- See Character Animation Project Brief:
  - Character Profile and Back-story

**Recommended Study Time:** 2 weeks

## Lesson 2: Character Design Process

**Textbook:** Chapter 2 (pgs. 19-29)

In this lesson the process of bringing a character to life will be explained with examples. Game genre & technical limitations of the game engine will have an impact on the type of characters that will be appropriate, and this should be taken into account at the earliest stages of design. An artist should familiarize themselves with the genre in which they will work by researching other art in that genre, and also educate themselves on the different artistic styles that exist before settling on one in which to work. History and background story are keys to providing motivation for a character. Students must be careful to keep the cart before the horse, and are reminded that design of game-play comes before story, and so character design should start only after game-play design is complete.

Bringing a character to life takes time, as well as lots and lots of sketches. It is through sketches that a character can evolve from a two-dimensional idea to a personality that the audience can believe in and identify with. Expression sheets are used to explore different moods and action poses. When the character takes on a life of its own, the artist can move on to color studies. Students will be shown how to create model sheets to be used as reference in the modelling process.

### Key Points:

- Impact of Game Genre & Technical limitations on Character Design
  - game genre and character
  - hero vs enemy
    - humanoid or creature?
    - gun hand vs mitten hand vs fully articulated hand
- research
  - genre
  - style
  - reference material
- concept art
  - sketches
    - lots of sketches
  - Color studies
  - Expression sheets
- Model sheets
  - The Da Vinci pose
  - Model sheet views

### Projects:

- See Character Animation Project Brief:
  - Research & reference
  - 20 scanned pages of concept sketches
  - Model sheet
  - Character Sheet

**Recommended Study Time:** 2 weeks

## Lesson 3: Modeling a Humanoid

**Textbook:** Chapters 3 & 4 (pgs. 31-71)

In this lesson students will be shown how to model a humanoid character. Students will be taught the importance of planning ahead, and of approaching the modelling process in a methodical way. Emphasis will be placed on making the most of the current polygons before adding more, for modelling efficiency as well as for creating potential LOD models along the way. Extra detail is needed in areas that will bend and deform, such as the joints and things like tails and ponytails.

Students will have learned about modelling in previous courses. This lesson provides an over-the-shoulder look as the instructor provides tips and insights into various modelling methods, and for choosing the right method for any given shape.

### **Key Points:**

- Preparation for Modeling
  - Setting up reference planes
  - Setting up the working environment
- File Management
  - Incremental saves
  - Save for LOD
- How many parts?
  - Seamless mesh
  - Rigid parts
  - Separate binding
- What needs to move?
  - Deformation
  - Joints
- Knowing when to subdivide
- Optimization & cleanup
  - STL check modifier
  - Patch Holes modifier
  - Reset transforms, set pivot

### **Projects:**

- See Character Animation Project Brief:
  - Character Model

**Recommended Study Time:** 2 weeks

## Lesson 4: UVW Mapping a Humanoid

**Textbook:** Chapters 5 & 6 (pgs. 73-121)

This lesson will explain the process of applying mapping coordinates to a character model. There will always be seams to deal with, and this lesson will discuss choosing the best strategy for minimizing them and choosing where to place them.

Students will be shown the advantages of applying a checkerboard during UVW mapping. The lesson will demonstrate separating a character into logical parts, flattening and unwrapping those parts for mapping, and stitching the parts together to create efficient mapping. Finally the UVW mapping is rendered to create a template that can be used to create the texture map.

### Key Points:

- Texture coordinates vs texture images
- Planning ahead
  - Placing the seams
    - Separating parts
- Mapping
  - Checkerboard for reference
  - UVW Mapping modifier
  - UVW Unwrap modifier
    - Separating & flattening
    - Stitching
    - UVW template

### Projects:

- See Character Animation Project Brief:
  - UVW Layout
  - Texture Map

**Recommended Study Time:** 2 weeks

## Lesson 5: Character Animation - Setup

**Textbook:** Chapter 7 (pgs. 123-146)

This lesson demonstrates the process of setting up a character skeleton for animation.

Preliminary steps include freezing the mesh so that it can be seen but doesn't get in the way, and setting the surface to transparent to allow you to better see the mesh and the skeleton parts at the same time.

Creation of a biped skeleton will be demonstrated, along with the process of adjusting the structure of the skeleton. Limits on the number of bones or joints in game engines will be discussed, along with tips for choosing the appropriate number of spine and neck (and tail) links.

Students will learn to scale the bones to fit the mesh, and to place joints in the optimal location for bending. Great tools for working with symmetrical characters will be demonstrated.

### Key Points:

- Preparation
  - Freezing the mesh
  - Transparency
- Biped – rigging
  - Creating a Biped
  - Adjusting the Structure of the Biped
    - Game engines and link limitations
    - Figure Mode
    - How many spine links
    - How many neck links
    - The ponytails
    - The tail
  - Fitting the Biped to the mesh
    - Scaling the bones
    - Symmetry
      - Copy, cut and paste
    - Rubber band mode

### Projects:

- See Character Animation Project Brief:
  - Rigging

**Recommended Study Time:** 2 weeks

## Lesson 6: Skinning

**Textbook:** Review Chapter 7

This lesson explains and demonstrates the process of binding the mesh of the model to the skeleton. After the initial binding, the adjustments begin. Using envelopes makes the rigging very flexible, allowing the artist to make changes to the topology of the model if necessary after binding. Students will be shown how to scale and manipulate the envelopes for each bone in the skeleton, and how these changes affect the deformation of the model.

Adjusting vertex weights manually limits the extent to which you can make changes to the model, but is often necessary when setting up characters for games.

Again the software provides tools for working with symmetrical models, and these will be demonstrated.

The lesson will show how you should test your model while working, and how to give all deformations one last, thorough test when you think the model is ready for animation.

### **Key Points:**

- **Physique – skinning**
  - The Physique modifier
  - Binding the Biped to the mesh
    - Smooth
    - rigid
  - Working with envelopes
  - Adjusting vertex weights
  - Symmetry
    - Copy, cut and paste
  - Testing your binding

### **Projects:**

- See Character Animation Project Brief:
  - Skinning

**Recommended Study Time:** 2 weeks

## Lesson 7: Character Animation - Keyframes

**Textbook:** Chapter 8 (pgs. 149-173)

In this lesson the student will learn the mechanics of character animation in 3D Studio MAX. Forward Kinematics and Inverse Kinematics will be explained and demonstrated. They will be shown how extremities can be manipulated using either Forward or Inverse Kinematics.

Biped offers useful tools for selecting commonly used bones and animation tracks for them. Students will be familiarized with these tools and the strategies for working with a Biped skeleton. Keyframing will be demonstrated, and the editing of keyframes and motion in Track View shown. Setting the skeleton to use the Quaternian and Euler rotation options will be demonstrated. Tools for working with symmetry will be demonstrated.

### Key Points:

- **Animation - Mechanics**
  - Forward Kinematics
  - Inverse Kinematics
  - The Biped object
  - The pelvis
    - Working with pelvis tracks
      - Horizontal
      - Vertical
      - Turning
  - Track View - keyframing
    - The Biped keyframes
      - Types of rotation
        - Working with Quaternians
        - Working with Euler rotations
      - Working with keyframes
        - Adding keys
          - Autokey
          - Set key
        - Editing Keys
          - Using constraints
            - Horizontal
            - Vertical
          - Editing curves
          - Cut, copy and paste
            - Paste opposite

### Projects:

- See Character Animation Project Brief:
  - Keyframing

**Recommended Study Time:** 2 weeks

## Lesson 8: Principles of Animation

**Textbook:** Reading list below

This lesson will focus on the time-tested rules of animation. These are the concepts developed by the pioneers of animation, and used to create great characters from the landmark classics to the characters of today, and now codified as rules of the trade.

### **Key Points:**

- Principles of Animation
  - Ease in and ease out
  - Squash and stretch
  - Anticipation
  - Follow-through and overlapping motion
  - Secondary action
  - Weight and timing
  - Exaggeration
  - Arcs

### **Projects:**

- See Character Animation Project Brief:
  - Character Examples of POA

**Recommended Study Time:** 2 weeks

### **Reading:**

KENNEDY, Mark *Principles of Animation*.

<<http://www.animationarena.com/principles-of-animation.html>>

LASSETER, John, *Principles of Traditional Animation applied to 3D Computer Animation*

<<http://www.ev1.uic.edu/ralph/508S99/contents.html>>

BELGRAVE, Tito. A. *Applying the 12 Principles to 3D Animation*. July, 2003

<[http://features.cgsociety.org/story\\_custom.php?story\\_id=1429](http://features.cgsociety.org/story_custom.php?story_id=1429)>

## Lesson 9: Animating a Game Character

**Textbook:** Reading list below

In this lesson we cover the process of animating game characters. There will be a list of animations for a game character, and possibly limits on the number of frames in each animation. The tool chain may require all of the animations to be in one file, back-to-back, and tips will be given on avoiding problems when working with such files. Other tool chains will allow the artist to create animation in a separate Max file – and this approach has pitfalls to avoid and methods for avoiding them as well.

Many game animations are short loops, some of which will begin and end with the idle pose.

It is not always clear how some principles of animation of animation, squash and stretch for instance, can be applied to computer characters. This will be explained with examples.

Demonstration of the creation of game character animation will start with the animation of an idle animation.

### Key Points:

- **Animating Game Character**
- Working with an animation list
  - One file or many?
  - Back-to-back animations
- Short loops
- Applying the principles of animation to game characters
- The Idle pose
  - The Idle animation

### Projects:

- See Character Animation Project Brief:
  - Idle Animation

**Recommended Study Time:** 2 weeks

### Reading:

HAYES, Jeff *Creating Character Animation Assets*

< [http://www.gamasutra.com/features/19991105/hayes\\_01.htm](http://www.gamasutra.com/features/19991105/hayes_01.htm) >

KINES, Melianthe *Planning and Directing Motion Capture For Games*

< [http://www.gamasutra.com/features/20000119/kines\\_01.htm](http://www.gamasutra.com/features/20000119/kines_01.htm) >

## Lesson 10: Game Animation with Character

**Textbook:** N/A

This lesson offers a look at the process of animating. Animation is an iterative process of placing keyframes, playing back the animation, carefully analyzing the results to determine how best to improve the motion, then making small changes, and playing it back again. Students will benefit from seeing the instructor's work process. They can watch the animation start from nothing and become a walk cycle, then watch as that walk cycle is improved. Time may not allow a thorough demo of all three cycles, but the students can be asked to do all three, or more.

### **Key Points:**

- Game Animation
  - Demo:
    - Walk cycle
    - run cycle

### **Projects:**

- See Character Animation Project Brief:
  - Walk, Run, Jump

**Recommended Study Time:** 2 weeks